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HERMAN L. LØVENSKIOLD

AVIFAUNA SVALBARDENSIS

WITH A DISCUSSION ON THE GEOGRAPHICAL DISTRIBUTION OF THE BIRDS IN SPITSBERGEN AND ADJACENT ISLANDS

I. GENERAL PART
II. SPECIAL PART
III. BIBLIOGRAPHY

NORSK POLARINSTITUTT
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A complete list of publications, charts and maps is obtainable on request.

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Dr. Anders K. Orvin

Former Director
of Norsk Polarinstitutt
in gratitude

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Contents

Abstract

The paper is divided into three parts. Part I describes the land and the ecology of the avifauna of Svalbard. The increase in the number of breeding birds during the last decades in the area is also mentioned, and this is, in the opinion of the author, in accordance with the amelioration of the climate.

Parts II describes mainly the geographical distribution of the single species, but biological data are also given.

Part III contains the literature referred to in parts I and II, and also an author index.

The paper tries to cover most of what is printed or written about the birds in the Svalbard area between 1596 and 1958.

I. GENERAL PART

Introduction to part I

In the years 1948, 1949, 1950, 1952, 1954, 1956, 1958 and 1960 I took part in Norsk Polarinstitutt's expeditions to Spitsbergen and the rest of the Svalbard area. My purpose was to study the avifauna.

The main point of the first summer's investigations was that I should get my bearings as to where it might pay to work in the following years. Therefore a great many places on the coasts of the biggest of the islands, Vestspitsbergen, were visited, both on the west, the north and the east side.

In 1949 investigations were made in Kongsfjorden, on the coast by Sørgattet (between the mainland and Danskøya) and to Bockfjorden between Liefdefjorden and Woodfjorden, and later in the summer also at Kapp Martin at the entrance to Bellsund.

In 1950 investigations were made on the west coast from Sørkappøya and up to Dunøyane north of Hornsund. The outer half of this fjord was also visited.

In 1952 the first days of July were passed near Bohemanneset in Isfjorden and the rest of the time until 1st September on the coast between Kapp Borthen in the north and the southern shore of Hornsund in the south.

In 1954 investigations were made on both sides of Wijdefjorden, which is 120 km long. Some days were also spent at the head of Sassenfjorden.

In 1956 most of the time was spent in Kongsfjorden and Krossfjorden and besides this I spent about 14 days on Prins Karls Forland.

In 1958 I stayed the whole summer on Bjørnøya.

In 1960 the first camp was pitched in Recherchefjorden and from here a couple of visits were made to Van Keulenfjorden. Afterwards the coast

south of Bellsund was investigated. This part of the coast, which had not been visited by me before, is the stretch between Kapp Borthen in the south to Kapp Lyell in the north.

The last days of July and the first week of August were spent on Kongsøya, the middle one of the three islands forming the group Kong Karls Land. Here the study of the avifauna was made difficult because of the number of Polar Bears staying there.

The above-named places have been the headquarters of the expeditions of the different years. Minor visits to other places have of course also been made, but it would take too much space to mention all of them here.

During these summers I have been accompanied by the following assistants:

In 1948 Mr. A. Sommerfelt, and later also Mr. T. Gaasvær, quartermaster in the Royal Norwegian Navy.

In 1949 Professor Hans Johansen of the University of Copenhagen and Mr. L. Myhrvold.

In 1950 Mr. L. Blomberg and Mr. H. Lien.

In 1952 Mr. S. Severinsen and Mr. A. Branzell.

In 1954 Mr. T. Serck-Hanssen and Mr. F. Størmer.

In 1956 Mr. S. Severinsen and Mr. E. Christiansen.

In 1958 Mr. M. Lyngstad.

In 1960 Mr. P. Valeur and Mr. H. Sverdrup.

Nesodden near Oslo, December 1960

H. L. Løvenskiold

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I am greatly indebted to the late Professor H. U. Sverdrup, a former director of Norsk Polarinstitutt, for being allowed to partake in the expeditions to Spitsbergen in the years between 1948 and 1956, to Dr. A. K. Orvin, another former director of the same institute, for being allowed to go there in 1958 and to the present director Dr. T. Gjelsvik for being permitted to partake in the expedition of 1960.

I must also thank my comrades at Norsk Polarinstitutt, especially Commander K. Z. Lundquist, and Commander H. Lind Andersen of the Royal Norwegian Navy, chief leaders of all the different expeditions, for their kindness and good fellowship.

Last but not least I am very much indebted to Magister S. Richter, librarian of Norsk Polarinstitutt, for his assistance in proof-reading, to Mr. B. Arnesen, draftsman at the said institute, who has drawn all the maps and charts in the paper, and to Mr. P. H. Jackson and Mr. J. Clarke who have read respectively the general part and the bibliography of the present paper to correct my English.

The land

Coming to Svalbard[1] from the south, the first island we meet is Bjørnøya. Because it is almost always covered by fog, the island is usually seen only on the radar screen. From Norway it is 240 nautical miles to the island and it lies 120 miles south of Sørkapp, the southernmost point of Vestspitsbergen, between lat. 74° 20' 30'' and 74° 31' 20'' N and long. 18° 46' and 19° 17' E. The maximum length is 20 km and the breadth 15.5 km. The island is roughly triangular in shape, with the apex to the south.

The northern part of it lies 30–40 m above the sea level, forming an undulating plateau with many shallow lakes, most of them not more than a few metres deep. There are in fact 700 lakes on the island and more than one-tenth of the lowland in the north is covered by fresh water. The two chief rivers of the northern region are Engelskelva and Lakselva, the latter coming from the two biggest lakes on the island, Laksvatnet and Haussvatnet. On this northern part the island has vertical cliffs towards the sea and there are only a few places where it is possible to land with a boat and where it also is possible to ascend to the plateau.

The highest mountain is Miseryfjellet, where the highest of the three peaks is 536 m above sea level. This mountain lies to the south of the northern plateau.

There is only one really deep lake on the island, Ellasjøen on the west coast, about 43 m deep.

In the south the island is divided by a great U-shaped valley, Ymerdalen with Russeelva running through it. To the east of the valley is the mountain Antarcticfjellet and to the west of it other mountains including Hambergfjellet and Fuglefjellet. These two mountains form perhaps the largest bird-cliff of the northern hemisphere. The length of the almost perpendicular cliff wall is about 5 km, and the height is about 400 m. In the places where the mountain is built up by strata, these lie horizontally and here there is ledge upon ledge from a few feet above the sea and almost to the top of the mountain. On this enormous cliff wall almost every available seat is occupied by Guillemots, Kittiwakes and Fulmars, but only a small part of it is accessible.

In the southern part the mountains are built up by dolomites, limestones and schists (Cambro-Ordovician) belonging to the so-called Heclahoek formation. The lowland and Miseryfjellet are built up of coal-bearing sandstones and limestones from the Devonian and Carboniferous periods. The three peaks of Miseryfjellet consist of Triassic beds, the youngest formation occurring on the island.

The flora is poor, with only 50 phanerogamic plants. Of birds, 64 species have been recorded and of these 25 species have been found breeding. However, only 17 are common breeders.

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[1] For a detailed description, see introduction to part II.

As very little ornithological work has been done here, one must believe that if a constant watch were kept, many more species would be found to visit the island.

If we go north from Bjørnøya we come to Vestspitsbergen, the largest and most important island in the group we call Svalbard. Here the coal-mines are found, worked by both Norwegians and Russians, and here a few thousand people live in the mining towns all the year round.

On this island the richest flora and also the richest animal life are found and consequently it is one of the places in the Arctic most frequently visited by scientific expeditions, and in former days also by hunting parties.

The island is situated between lat. 76° 26' and 80° N and long. 10° 30' and 21° 30' E. On the west coast there are several big fjords. Reckoned from the south there is first Hornsund, then Bellsund with the branches Recherchefjorden, Van Keulenfjorden and Van Mijenfjorden.

North of Bellsund we come to Isfjorden, the largest of all the fjords in Vestspitsbergen. To the south there are several branches, Grønfjorden, Colesbukta, Adventfjorden, and Sassenfjorden, which extends into Tempelfjorden. The innermost part of Isfjorden is called Billefjorden and from the head of this to the entrance of the main fjord, as the crow flies, it is a distance of 100 km. To the north there is only one big bay, Nordfjorden, with the branches Dicksonfjorden and Ekmanfjorden.

Between Isfjorden and Kongsfjorden, which lies north of it, there is an 80 km long island, Prins Karls Forland (usually called Forlandet), which is separated from the mainland by the sound Forlandsundet.

The next fjords are Kongsfjorden and Krossfjorden, and almost at the NW corner of the island, the small but famous bay, Magdalenefjorden.

On the north coast Raudfjorden comes first and then farther east the connected fjords Liefdefjorden and Woodfjorden. To the east of them again comes the longest of all the fjords in Svalbard, Wijdefjorden, which is 120 km long. The head of it is a distance of only 20 km over the glacier Mittag-Lefflerbreen from Billefjorden.

On the east side of Vestspitsbergen the sound separating it from Nordaustlandet is called Hinlopenstretet. On this coast of the island there are two bays, Sorgfjorden and Lomfjorden. Farther south the narrow sound of Heleysundet divides Vestspitsbergen from Barentsøya. From here and all along the coast down to Sørkapp the fjord between Edgeøya and Barentsøya on the one side and Vestspitsbergen on the other is called Storfjorden. An old name is Wijbe Jansz Water.

In many places the interior of Vestspitsbergen is covered by large glaciers, but only on Olav V Land, towards the easternmost point of the island, is there an ice-cap which may be described as an inland ice, such as is to be found on Nordaustlandet.

Several of the glaciers debouch into the fjords, but many of them have in recent years withdrawn, and they no longer reach the water.

In some places the glaciers also come down into the sea. Such a glacier is Torellbreen, north of Hornsund, one of the biggest glaciers along the coast. Then we have Dei Sju Isfjella, almost all of them debouching into the sea north of Kongsfjorden. On the east side of Wijdefjorden there is a similar formation, Dei Tri Isfjella.

On and between the glaciers mountain-tops often stick out of the ice. These are the so-called nunataks. As many of them are built up of sedimentary rocks, they can have a great number of horizontal ledges which form excellent nesting-places. If such a nunatak is situated near a place where there is sufficient food in the sea, the ledges can be literally teeming with seabirds. Nunataks of this category are especially found on the great glaciers to the east of Kongsfjorden.

Between the mountains and the shore, and this is found regularly both along the sea-shore and by the fjords, there extend many quite level stretches of ground of smaller or greater area, from the foot of the mountains and towards the shore. These forelands can often comprise a vast expanse of undulating ground where there are bogs, small streams, rivers, tarns and lakes. Because the distances often are great and there are relatively only a few pairs of birds distributed over great areas, such places have been but little investigated.

One of the biggest forelands is situated between Kapp Martin in Bellsund and Kapp Linné in Isfjorden, another place is Forlandsletta on Prins Karls Forland, and the biggest of them all is Reinsdyrflya between Biskayerhuken and Liefdefjorden.

In some places the mountains rise more or less directly and often perpendicularly out of the sea, and if there are ledges and crevices suitable for nesting, this will result in birds congregating there and so we get the great bird-cliffs. Some of the largest of these are Sofiakammen in Hornsund, Midterhuken in Bellsund, Fuglehuken on the northernmost point of Prins Karls Forland, Flathukfjellet at the entrance to Raudfjorden, and Alkefjellet south of Kapp Fanshawe in Hinlopenstretet. There are of course also other bird-cliffs, but those mentioned above are the largest and most prominent ones.

In several places, especially in the fjords, there are large, flat and wide valleys which often go far into the land. Through these valleys one or more rivers flow and from almost all side-valleys run lesser streams. Sometimes it happens that the rivers have divided into several streamlets running a parallel course over the wet and boggy ground. The rivers coming from the side-valleys often spread out fanwise and all this makes the valleys difficult both to walk along and to traverse.

The interior of the island is filled up by mountains, both ice-covered and ice-free with valleys between them. There are several high peaks and the best known are Hornsundtind south of Hornsund (1431 m) and Newtontoppen (1712 m above sea-level) on Ny Friesland.

Nordaustlandet is the second largest island in the group. In summer-time the west and the north coasts can be ice-free, but not always, and even if there is no ice close to the land one can be hindered by drift-ice in reaching the shores of this island.

To the S and the SE there are two enormous glaciers, which are in fact ice-caps covering a great amount of land. The one to the SE has an almost unbroken front of more than 200 km towards the sea. Provided one can get to the head of Wahlenbergfjorden there is from this place a stretch of open, flat and bare land between the glaciers over which it is possible to reach the north coast even if the shores here should be closed because of the ice.

On the west side of the island there is only one big fjord, the above-mentioned Wahlenbergfjorden, about 60 km long. The northern part has a coast cut up by a number of fjords, all of them going in the direction north-south. Along this coast there are numbers of islands, as well as in the sea towards the north where Sjuøyane are situated. Of these Rossøya, in lat. 80° 50′ N and long. 20° E, is the northernmost island in the Svalbard group. To the east of Sjuøyane Karl XII Øyane and other islands are situated. On Nordaustlandet and on the adjacent islands both vegetation and avifauna are scarce.

East of Nordaustlandet, between long. 32° and 34° E, we have the island Kvitøya. Only in the far SW and likewise in the NE is there, in each place, a small area with open ground. Otherwise the whole island is covered by an ice-cap.

On the east side of Storfjorden there are two big islands: Barentsøya, separated from Vestspitsbergen by Heleysundet and towards the south by the sound Freemansundet from Edgeøya, the third largest in the group. On both islands there are glaciers, the valleys are boggy and the going can be difficult.

On the east side of Olgastretet Kong Karls Land is situated. It consists of three islands, Svenskøya, Kongsøya and Abeløya. In most years it is very difficult to reach this group of islands because of the ice and therefore very little ornithological work has been done here.

The last of the islands is Hopen, a long, narrow and mountainous island, 37 km long and 2 km broad. It has very rarely been visited by scientific expeditions.

Except on Bjørnøya there are not many lakes in the Svalbard area. On Vestspitsbergen there are a few, but on the other islands there is none of importance. Most of the lakes, tarns and ponds are quite shallow and will freeze to the bottom in winter-time. On Vestspitsbergen there are, however, a few big and deep lakes. They will of course get a cover of ice in winter-time, but as the ground beneath them is not frozen, they do not freeze to the bottom. Such lakes can, if the river between them and the sea does not have any waterfalls, contain a rather fine population of the Arctic Char

(Salvelinus alpinus). On the west coast there is only one such big lake, Linnévatnet, 4.5 km long and 1.5 km wide at the entrance to Isfjorden. From here and to Wijdefjorden on the north coast there are only a few such lakes. But on the east side of that fjord there is a lake district with several big lakes some way south of Mosselbukta. The most prominent are Femmilsjøen, about 8 km long, and Røyetjørna, which is shaped like a three-bladed propeller. In several of the lakes there are islands, and when the ice disappears many birds come here to breed.

All along the coast there are smaller and larger lagoons here and there and in these the water is more or less brackish.

Through most of the valleys rivers run. A few of them are so big that one can travel along them in a small boat for quite a distance from the estuary. Such a river is Sassenelva in Sassendalen. Where the rivers flow along the bottom of the valleys, the land on both sides is boggy and waterlogged, especially shortly after the snow has disappeared. It is therefore often difficult, not to say impossible, to walk here. The reason for this is that the permafrost goes 300 m down into the ground and during the summer-time only 0.5–1.0 m will thaw. Accordingly it takes some time until the ground dries up sufficiently to make walking possible.

As they are built up of different sorts of material, there are several different kinds of mountains. Most of them are built up of sedimentary rocks and the strata, as a rule, lie horizontally. As the strata are very often differently coloured, the effect of these "painted" rocks can be very beautiful.

In the mountains all geological systems from Cambrian to Tertiary are represented.

They are often table-shaped and in some places covered by a thick layer of basalt or diabas which hinders rapid erosion.

Otherwise basaltic rocks are particularly present in the eastern part of Spitsbergen, but in Isfjorden some of the sedimentary mountains on the north side of the fjord have a cover of diabas. At sea-level this kind of rock is found here at Diabasodden, Gåsøyane and on Gipshuken.

Other mountains are built up of igneous and metamorphic rocks. They are found mostly in the NW and NE corners of Spitsbergen, but also to a somewhat lesser degree in many other places. Especially the metamorphic rocks belong to what is named the Heclahoek formation.

These mountains often have very pointed peaks. As Barents came to Spitsbergen from the north to the NW corner where he saw these peaks, he named the land Spitsbergen, the land of the pointed mountains.

Ecology

One must assume that the Svalbard area was entirely ice-covered during the last glacial period, and when this period had its maximum no animal life can have existed there. Probably the same thing also happened with

the flora. It therefore seems that vegetation and animal life have wandered in during the last 10,000 years.

The vegetation, such as it appears in the area today, has a very distinct high-arctic character, but then the islands are situated not only beyond the tree-limit but also beyond the scrub-limit. It is true that the Dwarf-birch *(Betula nana)* exists there, but it is found only in a few places in the Isfjorden district and the communities are very small.

The richest zones of vegetation are mostly found in the inner parts of the fjords where it is sheltered and where the temperature during the summer-time is rather higher than along the sea-shore. Along the coast the temperature can be influenced by great quantities of drift-ice, which, in certain years, may blockade the shores for shorter or longer periods.

All animal life and likewise the flora are dependent on the Gulf Stream. This current comes up on the west side of Bjørnøya, passes along the west coast of Vestspitsbergen and sweeps around the NW corner of this island. From there it passes along the north coast and a branch of it even reaches Nordaustlandet.

From the Arctic Sea north of Siberia comes a polar current which passes on both sides of Bjørnøya where it meets the Gulf Stream. As it comes from the Siberian coast it carries a great deal of water from the great Siberian rivers, therefore the salinity is rather low and the content of mineral matter rather high. But the best indication of its origin is found in the great quantity of Siberian timber, both hewn logs and trees with roots and branches, which is cast ashore on Bjørnøya and all along the west coast of Vestspitsbergen. Here there can be found in some places immense quantities of all dimensions of timber, mainly the Siberian Larch tree *(Larix sibirica)*. To a smaller extent such timber is also found in the fjords and even so far east as on Nordaustlandet.

The trappers, in former days the Russians and in more recent times the Norwegians, have used this timber both for hut-building and for fuel.

Where cold and warm water meet, as the case is near Bjørnøya, it will result in the forming of fog and accordingly this island is very often covered by heavy mists. This is perhaps the reason why there are only about 50 phanerogams on Bjørnøya as opposed to more than 150 in Spitsbergen much farther north.

The polar current from the NE sweeps round the southernmost point of Vestspitsbergen, Sørkapp, and brings with it much drift-ice, originating mainly from the basin between Spitsbergen and Novaya Zemlya. It is this ice which sometimes blockades the west coast of Vestspitsbergen and the entrance to the fjords there almost up to Kongsfjorden. Otherwise the open and ice-free coast on the west and north side of this island and even on the north coast of Nordaustlandet, is entirely due to the influence of the Gulf Stream. On account of this warm current there is in the area a much warmer climate than found elsewhere in these latitudes.

There are several papers on the ecology of the Svalbard area. Some of them deal exclusively with birds and are mentioned in Part II. But there are at least two papers on the general ecology which are very important and quite indispensable for the study of vegetation and animal life in the area. They are the papers by Summerhayes and Elton, 1923 (397) and 1928 (450). Here the authors divide the land along the shores into four zones (see page 23). For vegetable life and insect life these zones are very important, but not so much for birds as there are few genuine land-birds in the area. The above papers also deal with birds and many interesting points are to be found, some of which will be considered in the following pages, which will treat the ecology exclusively in relation to birds.

Of passerine birds there is only one common breeder, the Snow-Bunting. The Wheatear *(O.oenanthe)* has been found breeding twice in recent years, and Hornemann's Redpoll *(Carduelis hornemanni)* is supposed to have bred, but so far no exact proof of breeding has been obtained.

The Snow-Bunting *(Plectrophenax nivalis)*, when the conditions are favourable, will breed almost anywhere between the shore and the mountains, sometimes also high up on cliff walls. It seems, however, that the bird prefers the vicinity of lakes, ponds, small streams and bogs where it can find insects to feed its young. In some places it can be seen to breed along the seashore under seemingly unfavourable circumstances, but here it feeds its offspring with the worm *Lumbricillus aegialites*, which it finds among seaweed and also in the rotten ice along the beach.

Most important for the bird is, however, a suitable nesting-site. As it breeds in fissures, crevices and holes in rocks, under boulders etc., it is entirely dependent on the presence of a certain quantity of rocks in one form or another on the breeding-ground, even if it has to fly a long way to get the insects necessary for the young in the nest.

After the young are fledged the food changes and from now on it will consist more and more of vegetable matter. Therefore the bird becomes more dependent on the four zones mentioned above. It seems, however, that one of the most favoured feeding plants is the Arctic Poppy *(Papaver radicatum)*. When trying to collect the seed of this plant one will often find that almost all capsules have been emptied by Snow-Buntings, not only in small communities, but over wide areas.

In the Svalbard area there are no resident birds of prey. Great falcons have in a few instances been recorded and they seem to belong to the Greenlandic race, *Falco rusticolus candicans*. Of other and smaller falcons there are only single reports in each case but, as a certainty, no falcon has ever been recorded as breeding in the area.

The Snowy Owl *(Nyctea scandiaca)* is, however, a much more frequent visitor to the islands than the falcons. There are more than 50 reliable records from Svalbard.

Among the trappers it is the common belief that this owl follows the

Ptarmigan and when this bird has a peak year, the Snowy Owl is sure to be found. In other years it is more or less absent.

There is no reliable record of the owl breeding in Spitsbergen and it can hardly be supposed that it will breed under the conditions that exist there today.

Falcons and Snowy Owls breed in Greenland as well as on Novaya Zemlya, and in both these places there are lemmings, an animal which is totally absent in the Svalbard area.

The Snowy Owl feeds its young on small rodents and the big falcons have been found to do the same. It is highly probable that the young of both falcons and owls, at an early stage of development, will need the soft food provided by these small animals instead of the more coarse food which they are able to digest at an advanced stage of development.

There is no lack of nesting-sites for either of the species. The falcons can find the steep cliffs where they prefer to breed and for the Snowy Owl there is the kind of moraine landscape with an open outlook, which they find suitable in Norway and where they prefer to breed on the mountain plateaus. This cannot be the reason why they do not breed.

During the summer-time there is food enough for these birds of prey in the myriads of sea-birds populating the bird-cliffs. Even in winter-time the Snowy Owl is able to sustain itself on account of the Ptarmigan *(Lagopus mutus hyperboreus)*.

It is therefore clearly seen that there is food enough for these birds, but it cannot be the right kind of food for breeding purposes.

The reason why neither diurnal birds of prey nor the Snowy Owl breed within the Svalbard area must therefore be the total absence of lemmings. Around the collieries there are rodents such as rats and mice, introduced through the steamers visiting these communities, but these animals do not, except in summer-time, live outside the mining towns. Therefore they cannot be supposed to extend beyond rather small communities.

There are six species of anserine birds which are common breeders within the area, viz. the Pink-footed Goose *(Anser fabalis brachyrhynchus)*, the Barnacle Goose *(Branta leucopsis)*, the Brent Goose *(B. bernicla)*, the Long-tailed Duck *(Clangula hyemalis)*, the Common Eider *(Somateria mollissima)* and the King Eider *(S. spectabilis)*. In a few instances other ducks have also been found breeding, but by no means regularly and in this connection they are of little importance.

The Pink-footed Goose is a bird of the big, wide and open valleys where there is sufficient grazing and a wide view; but of course they also breed in other places where they find suitable nesting-places and otherwise similar conditions in regard to food. They can nest in flat open country, but more often at the foot of rock-walls where these go up more or less perpendicularly from the grass-clad slopes. Nests have also been found on

ledges more than 100 m above sea-level. They also nest on islands with good vegetation and even on small islands and skerries not far from the mainland, where they go as soon as the young are hatched.

They prefer either these last named places where they can easily reach the sea when danger threatens, or, when breeding far away from the shore, they like to be near to lakes or larger ponds, which give them the same kind of security. This is especially important during the moulting period when they are unable to fly. This goose is a good runner and one has to be on horseback to keep pace with it. In places where there is no water to shelter them, they prefer stony hillsides where, when in danger, they will run uphill and hide among boulders and stones. Here they are very difficult to find.

When in moult a single goose will easily fall prey to a Arctic Fox, but a pair of them will be able to beat a fox to retreat. Therefore they are not afraid of breeding in places accessible to these animals, a thing the other anserine birds of the area will not do.

The Barnacle and the Brent are both smaller than the Pink-foot and they are unable to defend themselves against a fox. This fact will therefore influence their choice of breeding-ground.

They are not entirely dependent on vegetable food, but of course they like to have good grazing-grounds. The other part of their food, which consists of animal matter such as crustacea and mollusca, they find both in fresh water and in the sea.

The Brent used to breed in great numbers on eider-holms, but reckless plundering has now rendered these breeding-grounds extinct. They may still be found breeding on small islands along the shore, when these are so small that they cannot be presumed to yield a quantity of eggs and therefore are not worth plundering, or when such islands are situated in places where man seldom comes. The Brent has also been found breeding on islands formed by the greater rivers or on hillsides along these rivers where they take their young as soon as they are hatched.

The Barnacle has chosen a different sort of breeding-ground. It breeds on ledges on steep cliff walls from about 60 to 600 m above sea-level. In Spitsbergen they used to breed on pillars of hard rock which were left standing perpendicularly along the hillsides by the disintregration. The flat top of the pillars measured a few square feet, sufficiently big for a goose nest. In a few places the Barnacle also breeds among eiders and Brents on small islands along the shore. Both of these geese, when they breed in the vicinity of the sea, will take their young out there as soon as they are dry after the hatching.

The Long-tailed Duck seldom breeds on the mainland. As a breeding-ground it prefers an island either in the sea or especially in fresh water. But not all places seem to be good enough and where it is possible they prefer to breed within a tern colony. This duck is one of the few species

which is tolerated by the terns. These will attack any bird with bad intentions and a duck will rarely loose her eggs when breeding among them. In the few instances when the nest is found on the mainland, it is rarely seen outside tern colonies.

During the moulting period drakes and non-breeding ducks are usually found on salt water, where they often keep company with the Common Eider and on a certain part of the coast (see below) also with the King Eider.

The Common Eider is a bird of the sea, and it lives to a great extent on animal food. It breeds on the moss-clad and grass-clad islands which are found in several places along the shores. But instead of the tens of thousands which bred in each of these groups of small islands about 60 years ago, there are now only a few hundreds in each place. Apart from these islands, big colonies may also be found on islands in some of the lagoons.

Sometimes these breeding-grounds are entirely deserted and this happens when a fox has been left stranded there when the ice breaks up in spring-time, or when the islands are connected with the mainland by landbound ice which a fox may traverse. Small parties of eiders may also be found breeding on rocks and skerries close to the shore, but just as described above in the case of the Brent, there are here so few of them that they are usually left in peace. Several nests are also to be found on the vast stretches of the mainland, sometimes several kilometres from the shore.

The King Eider does not form colonies and the ground they choose for nesting is entirely different from that of the other species. Usually they breed near fresh water, either on the vast bogs in the valleys where there are tarns to take the young to, or near freshwater lakes or tarns. Sometimes they also breed on islands in the sea, but then there are always ponds and tarns with fresh water.

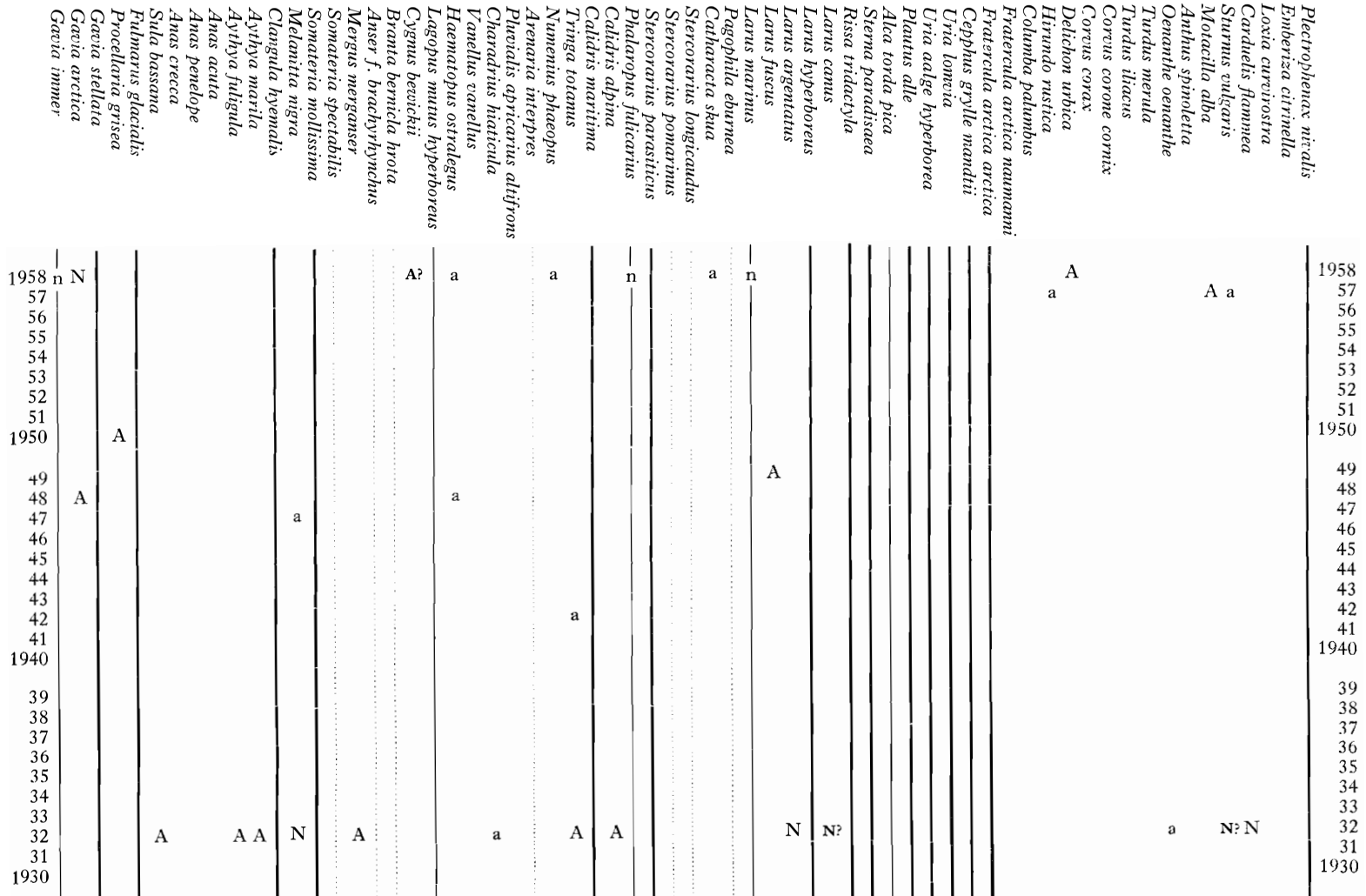
They always seem to breed in single pairs and great numbers of nests have never been found together. When the young are hatched the duck and the ducklings stay on fresh water and they do not seem to leave this kind of ground until the young are able to fly.

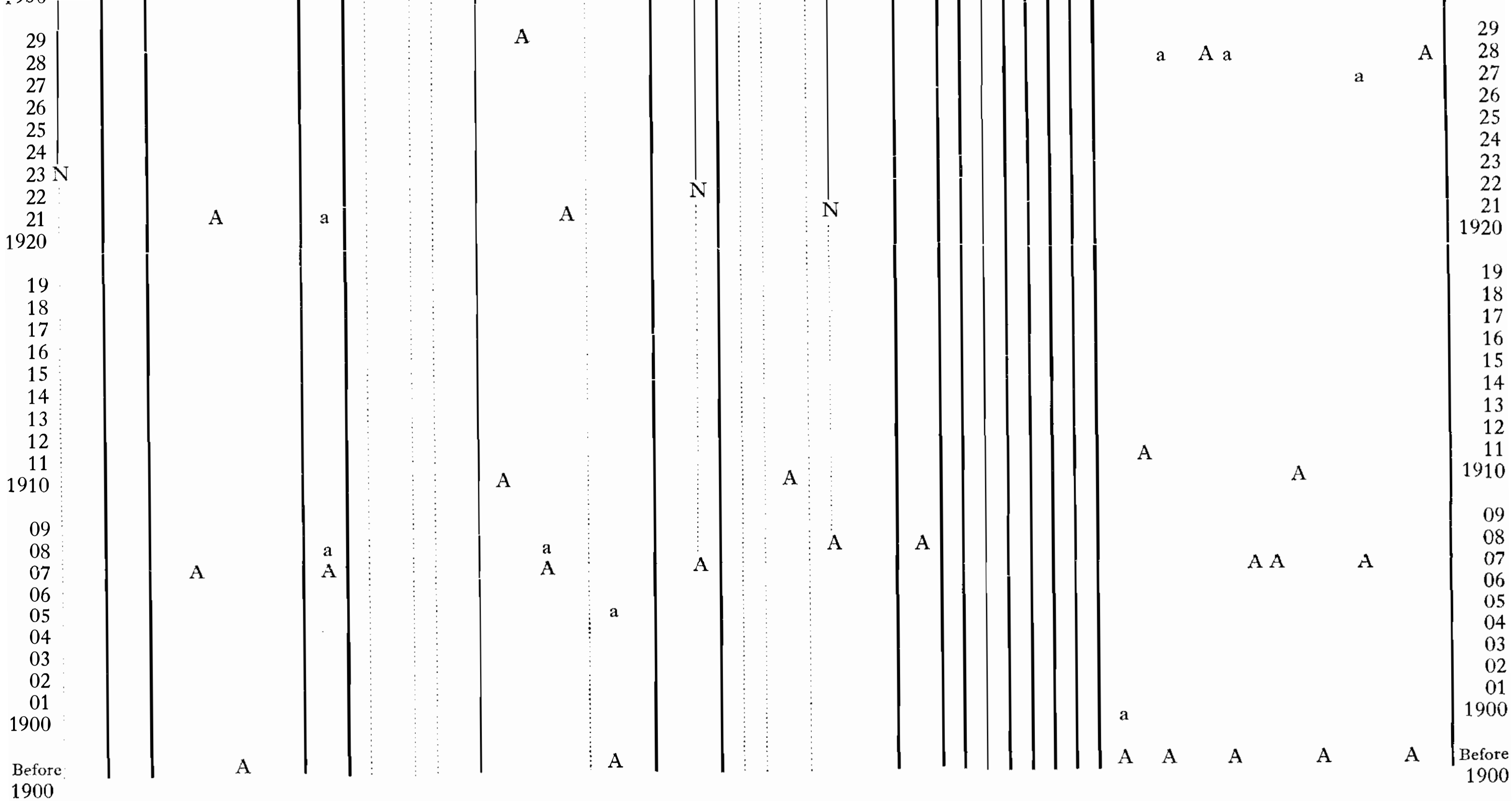
During the moult, the drakes are rarely seen along the coasts of Spitsbergen. There is, however, one exception and that is the coast south of Hornsund down to Sørkapp. In 1950 at least a thousand King Eider drakes in moult were seen here, probably many more. They kept company with the drakes of the common species, but each of them kept to itself. Here there were also several Long-tailed Ducks, mostly drakes, but some non-breeding females too. It seems that the main part of the Spitsbergen population of King Eider drakes stay here during the moult. The reason why so many ducks are found here is that there is a great abundance of sea-slugs (holothurians) in the shallow water along the coast here and both ducks and gulls feed on them.

The Fulmar *(Fulmarus glacialis)* breeds in immense numbers within

TABLE 2.

Bjørnøya



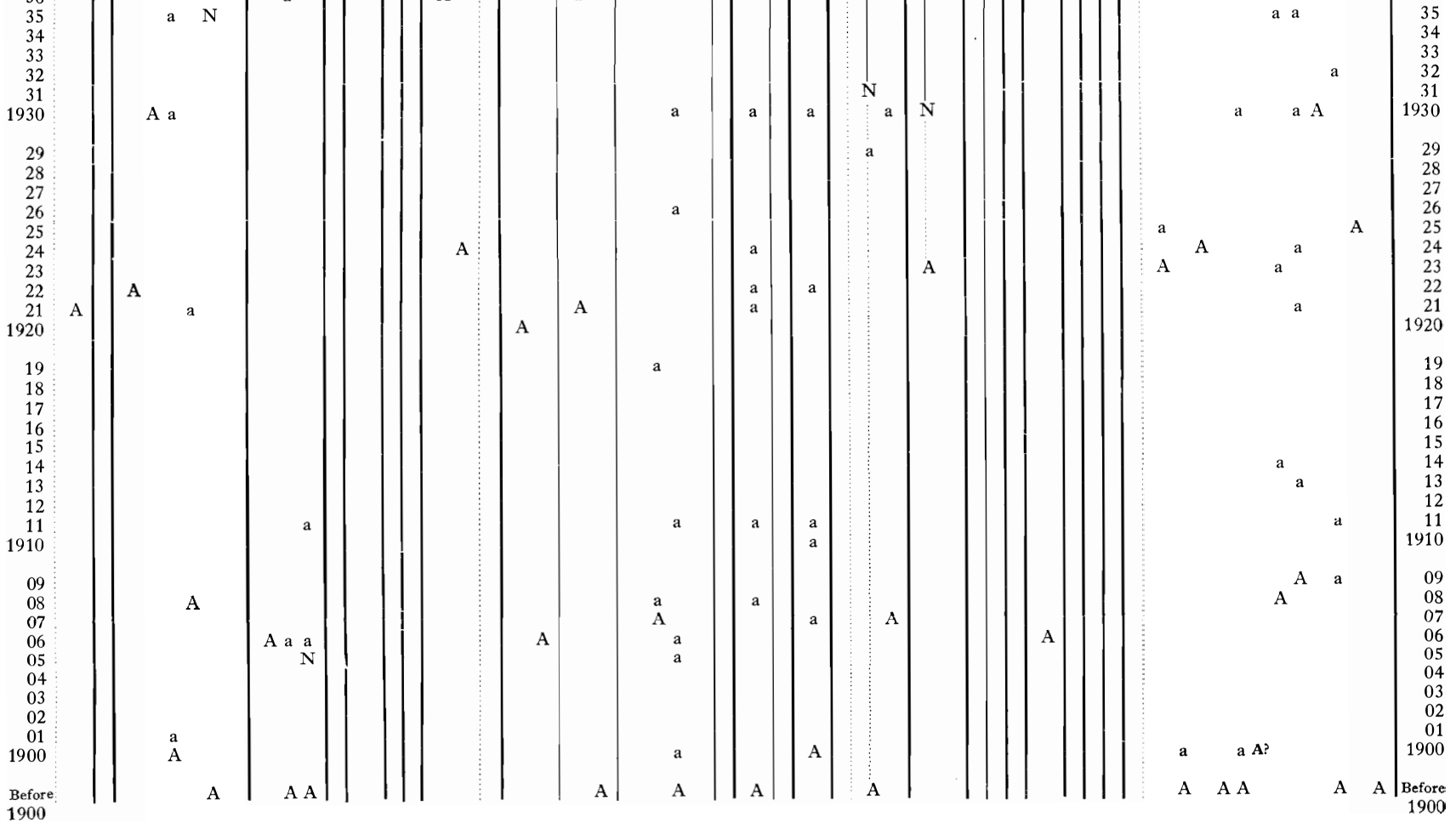


Breeder, common	(thick solid line)
Breeder, more or less regularly, small numbers	(thin solid line)
Visitor, more or less regularly	(dotted line)
Nesting, rare	n
Nesting, tried to or seemed to	N ?
Nesting, first record	N
Visitor, rare	a
Visitor, first record	A

In addition to the population of birds which existed on the island before 1920, about 50% more species have either nested or have tried to nest between 1921 and 1959.

TABLE 3.

Spitsbergen



Breeder, common	———
Breeder, more or less regularly, small numbers	———
Visitor, more or less regularly	·····
Nesting, rare	n
Nesting, tried to or seemed to	N?
Nesting, first record	N
Visitor, rare	a
Visitor, first record	A

In addition to the population of birds which existed in Svalbard (except Bjørnøya) before 1930, about 34% more species have either nested or have tried to nest between 1931 and 1958.

the area. In Spitsbergen it has chosen its nesting-sites on ledges high up on the mountains sides in almost inaccessible places. On Bjørnøya too it breeds in similar places, but colonies may also be found on the top of islands where no fox can come. The nests stand here on more or less level ground and are usually surrounded by a dense vegetation of Scurvy-grass *(Cochlearia officinalis)*.

Excellent flyer as this bird is, it will not be dependent on having the breeding-ground close to the place where it gets the food. But in some cases the colonies are found not so far away from such places, outside certain glaciers. Within rather small areas there is here an abundance of macroplankton in the sea just outside the glacier front where the water from the glacier mingles with the salt water in the fjord. In such places thousands of birds fish and a great many of them are Fulmars which take mainly crustaceans, especially *Thysanoessa inermis* (Hartley and Fisher 1934: 513).

From former times, when whales were caught in these waters, there are records and also pictures of thousands of Fulmars assembling around the dead animals which were taken to the shore. Such multitudes as were seen then at the whaling stations cannot be found anywhere in Spitsbergen today, but great numbers are still seen along the sea-shore and in the fjords.

Three species of divers have been recorded, but only one of them, the Red-throated Diver *(Gavia stellata)*, is a common breeder. Where there are suitable breeding-grounds for them, these birds are found almost anywhere in the Svalbard area. The species does not breed on the big lakes; they prefer smaller communities of fresh water such as small lakes, tarns and ponds, sometimes so small and shallow that the bird is just able to dive from the nest.

Sometimes the nest is placed on islets and sometimes on the shore itself, but it is also often built out in shallow water at some distance from the land. In such cases the material used by the bird is mud and peat, which it tears from the bottom. Sometimes these nests seem to be of a considerable age because they can be covered with moss, grass and other plants.

In the small communities of fresh water, where this bird prefers to breed, there are never fish for them to catch. It may of course happen that they breed on lakes where the Arctic Char *(Salvelinus alpinus)* occurs and this has been seen on Bjørnøya, where this fish is found in most of the many lakes. In such places the bird will, of course, fish and they also go to the greater lakes in Spitsbergen to get their food. But the fishing in fresh water is by no means important for them as most of their food is caught in the sea. In a few instances the nest has been found inland, but most pairs breed relatively close to the shore, both at the sea-shore and in the fjords, and the bird can often be seen on the wing between the breeding-ground and the nearest salt water.

Of the phalaropes, both of the two European species have been found.

One of them, the Grey Phalarope *(Phalaropus fulicarius)* is a fairly common breeder. The other one, the Red-necked Phalarope *(Phalaropus lobatus)* has been found breeding only once.

The Grey Phalarope is never found nesting far from the shore. The distance from the breeding-ground to the sea is rarely more than a kilometre. The bird prefers a boggy and swampy ground with small ponds for its nesting sites. It seems to be especially fond of places where the relatively high, dry grass from last year is left standing. In such cases, the nest is often built deep down in the grass close to the water's edge where the sitting male bird is completely hidden. But it can also be found in patches of the same dry grass up to 40 m from the nearest pond. Once a nest was found quite openly on shingle in a place where there was no fresh water at all, only a lagoon with salt water at some distance.

Nests have also been found high up on hilly islands among Andromeda *(Cassiope tetragona)* and these islands were totally devoid of fresh water.

The birds seek their food from the small communities of fresh water where they prefer to breed, but they can also be seen feeding in salt water. Then they keep very close to the shore, so close indeed that they sometimes have to wade as the water is too shallow for them to swim.

The Turnstone *(Arenaria interpres)* has a rather limited distribution and breeds only on the west coast of Vestspitsbergen, where it is always found in the vicinity of the sea. The favourite nesting-places seem to be either in small patches of Mountain Avens *(Dryas octopetala)* among lichen-clad stones, where the white, yellow and black colours blend perfectly with those of the bird itself, or on more or less barren rocks among sandy patches, where conditions in regard to colours are rather similar to those mentioned above.

The genus *Calidris* is represented by three species, the Knot *(C. canutus)*, the Dunlin *(C. alpina)* and the Purple Sandpiper *(C. maritima)*. The two first ones and also the Sanderling *(Crocethia alba)* have been found breeding only in a few instances and the only one which is abundant and a common breeder is the Purple Sandpiper.

Where the ground is flat or undulating with a vegetation of lichens and low plants, the nest can be found anywhere from close to the shore to far up on the hillsides. The bird has been found breeding up to more than 200 metres above sea-level.

The condition of the soil on the nest site seems to be an important thing, for the scrape is rather deep and it seems as if the bird makes a new nest every year. One would at least think that this must be the case, on account of all the empty nest-scrapes which can be found everywhere between the coast and the mountains.

The Ringed Plover *(Charadrius hiaticula)* is a rare breeder in the area, but in the places where it lives, the conditions are similar to those which are found at the favourite nesting sites in other parts where this bird breeds.

The Arctic Tern *(Sterna paradisaea)* breeds all around the coasts of Svalbard, sometimes in great colonies, but also only a few pairs together; single nests have also been found. The favourite nesting area seems to be small, level and moss-clad islands in freshwater lakes, or on the eider-holms in the fjords and along the sea-coasts. On the mainland big colonies may also be found close to the shore, but here rather large numbers are found as a mutual protection against skuas, big gulls, foxes and other enemies. The birds prefer a level or slightly undulating ground with a low and sparse vegetation and they are more or less dependent on the nearness of the sea where they fish. In the few lakes where the Arctic Char abounds they sometimes settle and here they take small fish of that species.

In the very few instances when Sabine's Gull *(Xema sabini)* has been found breeding within the Svalbard area, the nest has always been found in tern colonies. According to Salomonsen it lives to a great extent on the eggs of the Arctic Tern (588: 338).

The Glaucous Gull *(Larus hyperboreus)* is very abundant, especially in Vestspitsbergen, but it is found also in all other parts of the Svalbard area. This gull has taken over the role of a predatory bird and it is a menace to all animals which it is able to kill and devour, from the new-born seal to birds as big as geese, if they are ill or wounded.

They nest mainly where there are colonies of other birds and are especially numerous on the eider-holms. Where there are bird-cliffs, several breeding pairs are usually found, and here they build their nests above all the other birds. The nests are usually found separated from each other, but in some instances the gull will form small colonies at the outskirts of the bird-cliff where up to 60 pairs have been found nesting close together on grass-clad slopes or ledges.

During the breeding season they live mainly on the eggs and young of other birds and can be seen making raids on the ledges of the bird-cliffs to take them. They will kill any bird which is not able to evade them and can swallow whole birds up to the size of a grown Black Guillemot *(Cepphus grylle)*. In the nests pieces of fish are sometimes found, including parts of very big common herrings, and on some parts of the west coast they also take sea-slugs (holothurians).

In the collieries they act as scavengers and take all sorts of edible refuse.

The Kittiwake *(Rissa tridactyla)* breeds as elsewhere on perpendicular or overhanging cliff walls, sometimes near to and sometimes far away from the feeding-grounds. The bird lives almost exclusively on small crustaceans and these animals they find mainly in three different areas. One is out into the sea along the coast, another outside certain glaciers debouching into the fjords and, here there are zones where macroplankton is abundant. The third place is in sounds with a strong tidal current which brings small animals up to the surface. If possible the Kittiwake nests as

close to such feeding-grounds as possible, but if suitable nesting-sites cannot be found near such places, the birds will often have to travel a long distance to get their food.

The Ivory Gull *(Pagophila eburnea)* breeds in a few places on Vestspitsbergen, but the main distribution is more easterly and the biggest colonies are found on Nordaustlandet, Kvitøya and on Kong Karls Land. It breeds both on level ground and on steep cliff walls.

During the winter-time it lives on the remains from the meals of the Polar Bear and it will also take excrement of bear and seal. When fishing from the sea, the food is taken in flight from the surface and the bird very rarely alights on the water.

The Arctic Skua *(Stercorarius parasiticus)* is a common breeder along the coasts of the Svalbard area. Its main resource of food is what it can take from other birds and it is known to pursue several kinds of other birds to take their food. The main prey is, however, the Kittiwake, and therefore it is often found breeding near the colonies or the flylines of this bird. Where the Kittiwakes have to pass over level ground on their way from the feeding-grounds to the nests, the skuas often settle down to breed and here several pairs may be found nesting with an approximate distance of about one kilometre between the nests. Here they will attack and pursue the small gulls when they come in from the sea, laden with food for their young ones. They also breed near the colonies of other birds, such as the Little Auk *(Plautus alle)*, and when these take their young out to sea, the Arctic Skuas devour a fantastic number of the small auks.

The nest is as a rule found on wet or boggy ground, but it can also be situated in more arid surroundings.

The members of the *Alcidae* family, the Guillemot *(Uria lomvia)* and on Bjørnøya also *U. aalge hyperborea*, the Black Guillemot *(Cepphus grylle mandtii)*, the Little Auk *(Plautus alle)* and the Puffin *(Fratercula arctica naumanni)*, all of them seek their food in the sea. The Guillemot and the Little Auk usually go far away from the breeding-grounds, mainly out to sea, for their food, but both the Black Guillemot and the Puffin keep much closer to the shore and are seldom found out of sight of land. For the latter two the feeding ground extends from shallow to deep water just outside the cliff where they nest, the former two occupy the whole stretch of water from the deep outside the cliffs to so far out to sea that the land is out of sight.

The Ptarmigan *(Lagopus mutus hyperboreus)* usually keeps to the same kind of environment as the nominate form does in Norway, i. e. high up in the mountains among broken rocks on rather steep slopes. In some years, however, the bird can be found breeding down to sea-level, probably because of over-population or perhaps too much snow on the usual breeding-grounds.

The bird feeds on a great number of plants, but in summer-time the

favourite food seems to be the Viviparous Bistort *(Polygonum viviparum)* and during the winter mainly the Polar Willow *(Salix polaris)*.

During the winter-time the wind usually sweeps the ground in the lowlands almost free of snow and the birds have then only a thin layer to go through to get at their food. The bird is also known to dig deep tunnels where the snow is deep, for the same purpose.

Which birds are now to be found in the different parts of landscape in the Svalbard area?

On the open sea, out of sight of land, the following birds feed: the Fulmar, the Kittiwake, the Guillemot and the Little Auk. On the sea, but within sight of land all the above birds can be found and in addition the Long-tailed Duck, the Eider, the King Eider, the Red-throated Diver, the Arctic Tern, the Glaucous Gull, the Ivory Gull, the Arctic Skua, the Black Guillemot and the Puffin.

In a few places close to the shore, during a certain period of the summer, there will be found thousands of birds feeding. These places, as mentioned before, are zones just off the face of some of the big glaciers and these feeding-places are found where the freshwater current from glacier river meets the salt water of the fjord. Here enormous quantities of plankton are found.

In Spitsbergen four such places are known, but there are probably more of them. They are outside the following glaciers: Nordenskiöldbreen in Billefjorden, Smeerenburgbreen in Smeerenburgfjorden, Monacobreen in Liefdefjorden and Mittag-Lefflerbreen in Wijdefjorden. Of these places the one in Billefjorden has been the subject of a thorough investigation by Hartley and Fisher. The main food of the birds here is the crustacean *Thysanoessa inermis* and the birds feeding on it are: Kittiwake, Fulmar, Arctic Tern, Glaucous Gull, Ivory Gull, Arctic Skua (through robbing the Kittiwakes), Guillemot, Black Guillemot, Little Auk and Puffin. The mean number of *Thysanoessa* removed per day by Kittiwake alone from the zone was approximately 6,000,000 (513: 389).

On the shore itself and in the shallow water of the littoral zone, several birds find their food. Here we meet the Snow-Bunting, all the three species of geese, the Long-tailed Duck, both of the eiders, the Grey Phalarope, the Turnstone, the Ringed Plover, the Purple Sandpiper, the Arctic Tern, the Glaucous Gull, the Kittiwake and the Black Guillemot.

We now come to the dry land, and here I shall refer mainly to the paper by Summerhayes and Elton. They divide the coast landscape into the four following zones: 1. The Barren Zone. 2. The Dryas Zone. 3. The Cassiope Zone, and 4. The Inner Fjord Zone. The list they give of the birds living and breeding normally in the dry land areas of Svalbard (omitting Bjørnøya), includes the birds normally inhabiting moss-lichen heath, "fjellmark", Dryas communities and Cassiope heath, but not those of the grass-turf produced by the manure from birds. It does not include

the sea-birds which come to the land to breed, since they play no part in the life of the land communities (450: 207-208). The birds are the following: Snow-Bunting, Purple Sandpiper, Turnstone, Sanderling, Ptarmigan and Pink-footed Goose.

On the ordinary "fjellmark" only one species commonly breeds, the Purple Sandpiper (p. 216). On the Empetrum heath they found the Purple Sandpiper and the Snow-Bunting breeding.

At the head of the fjords there are often wide open valleys where small and large rivers flow. At the bottom of these valleys, especially, the ground is often boggy and wet and usually there are lakes, tarns and ponds. In these freshwater communities the King Eider and the Grey Phalarope can be found and the valleys also are inhabited by Snow-Bunting, all three species of geese, the Arctic Skua and sometimes also the Long-tailed Skua, and in a few places even the Dunlin has been found. In some years the Ptarmigan may breed almost down to the bottom of the valley, but this bird usually keeps to the steep rock-strewn slopes high up on the mountain-sides.

On the big glaciers nunataks may often be seen, i. e. mountains sticking out of the ice and surrounded by it on all sides. They can be just single peaks, but they can also consist of larger mountain-ranges. If these nunataks are situated not too far away from the sea and food is easily available, they can be populated with great numbers of sea-birds such as Kittiwakes, Fulmars, Guillemots, Black Guillemots and Little Auks. Because of the manure from the birds, in some of these places there can be a luxuriant growth of plants and in such cases even the Snow-Bunting may be found on the nunataks.

The birds and their distribution

In the literature dealing with Svalbard there are mentioned in all 110 species and races of birds which are said to have occurred within the area. Of these 110 different birds there are 17 species which with all certainty never can have been found there. Of the rest, 93 birds, there are a few whose occurrence is doubtful as there is no exact proof of the finds, but there is no reason to believe that they could not have been seen there. (See table 4, Part II).

Of the bigger islands which make up what we call Svalbard, Bjørnøya, because of its situation far outside the area, is a case by itself.

Here 64 species and races have been found. Of these 17 are common breeders, 8 are rare breeders, 5 are common visitors, and 34 are rare visitors.

The interesting thing, however, is that at least two races which are common breeders on this island, are not found in the rest of the area at all. The birds are *Uria aalge hyperborea* and *Fratercula a. arctica.* Then *Gavia immer* breeds in varying numbers on the island, but it has never been found breeding in Norway. It is also found in Vestspitsbergen and it certainly

breeds there although there is no proof of breeding. It will, however, only be a question of time until eggs or young are found.

Of the 8 rare breeders, *Carduelis flammea* is a doubtful one. There are 5 common visitors. Of these *Anser fabalis brachyrhynchus*, *Branta bernicla hrota*, *Somateria spectabilis* and *Arenaria interpres* will pass the island on migration. This must also be the case with *Branta leucopsis*, but this species has never been recorded there. *Pagophila eburnea* is mostly a winter visitor.

34 species are rare visitors and some of them must be said to be somewhat doubtful as long as no exact proof of their occurrence is produced. They are: *Corvus corax*, *Turdus iliacus coburni* and *Cygnus bewickii*. 21 species have also visited other islands in the group, especially Vestspitsbergen, but the following 13 species have only been found either on Bjørnøya itself or on the sea around the island. They are: *Carduelis flammea* and *Larus canus*, both of which have been suspected of breeding. The rest, of which the majority have been found only once, are: *Loxia curvirostra, Emberiza citrinella*, *Anthus spinoletta*, *Motacilla alba*, *Turdus iliacus coburni*(?), *Aythya fuligula*, *Sula bassana*, *Puffinus griseus*, *Columba palumbus*, *Vanellus vanellus* and *Larus fuscus*. There is a clearly marked difference between the avifauna of this island and that of the rest of the area.

As Bjørnøya is much nearer to the European continent than Spitsbergen, it will be more often visited by species with a more southern range.

Some species, storm-driven from Norway, will mostly meet death in the sea, but of the few that survive many will have a greater chance to reach Bjørnøya than to get as far as Spitsbergen.

More birds have been found on Vestspitsbergen than on Bjørnøya, but the reason for this is obvious. Firstly, the conditions for general bird-life are better on the greatest of the islands in the area, not least because of the vegetation. Vestspitsbergen has more than 150 phanerogamic plants, whereas on Bjørnøya there are not more than about 50. Secondly, most of the ornithological work has been done on the greater island and relatively few expeditions have visited Bjørnøya. Therefore the island can have been visited by many species which have never been recorded on the spot.

In recent years several species have been found as newcomers to Spitsbergen. These have first come to Bjørnøya and from there they have wandered farther north. The island is therefore a gateway of invasion for more southern species which expand northwards.

In Vestspitsbergen, including Prins Karls Forland, 69 species and races have been found. Of these, 22 species are common breeders and 17 are rare breeders. Five species of the latter seem to be somewhat doubtful as no direct proof of breeding has been adduced. They are: *Carduelis hornemanni*, *Aythya marila*, *Melanitta fusca*, *Larus argentatus* and *Alca torda pica*. There are 30 rare visitors and of these *Corvus frugilegus* and *Cygnus bewickii* are doubtful.

On Nordaustlandet 30 species have been found. 17 are common breed-

ers, 2 are rare breeders and of these *Xema sabini* is doubtful. 11 species are found to be rare visitors.

In the area marked Storfjorden, which is mainly made up by the two big islands Edgeøya and Barentsøya with adjacent smaller islands and the sea around them, 29 species have been found. Of these 16 are common breeders, 2 are rare breeders, 10 are rare visitors and 1 a common visitor.

On Kong Karls Land 22 species have been found. 10 are common breeders, 3 are common visitors and 9 are rare visitors.

On the island Hopen 19 species have been found. 10 are common breeders, 3 common visitors and 6 are rare visitors.

On Kvitøya 10 species have been found. 3 are common breeders, 3 are common visitors and 4 are rare visitors.

As mentioned above, Bjørnøya is a case by itself and the same can be said of the island Hopen. It is situated to the far SE in the group of islands, is isolated, surrounded by ice far into the summer and the conditions for a varied bird-life are not very good. Moreover relatively little ornithological work has been done on the island.

Table 1.

	No. of species found	Common breeders	Rare breeders	Common visitors	Rare visitors
Bjørnøya	64	17	8	5	34
Vestspitsbergen and Forlandet	69	22	17		30
Nordaustlandet	30	17	2		11
Storfjorden (Edgeøya and Barentsøya)	29	16	2	1	10
Kong Karls Land	22	10		3	9
Hopen	19	10		3	6
Kvitøya	10	3		3	4

Most of the ornithologists who have gone to Spitsbergen, have visited the largest of the islands, Vestspitsbergen, but some of them have gone farther abroad and several of them have also been on Nordaustlandet. Some work has also been done in the area marked Storfjorden, but very few have visited Kong Karls Land and Kvitøya. The reason for this is that these two places are more or less inaccessible during most of the year. Only under good conditions, when there is not much ice, can they be reached in July–August, very rarely earlier in the season.

Because of this we know little of the numbers of species or about the number of individuals within each species in these places. But even when this is taken into account we know that relatively few species can find such conditions here that they can rear a family.

On Kong Karls Land vegetation is relatively scarce and there seems to be little animal life in the sea around the islands, and accordingly there is also a relatively meagre avifauna there. On Kvitøya almost the total area is covered by an ice-cap and only in the SW and in the NE are there small areas with bare ground, and accordingly only a few species of birds can manage to live there.

The second largest island, Nordaustlandet, and the small islands to the north of it also have a hard climate for birds. But on the west and also on the north side there is open water in summer-time. Therefore the bird-life is somewhat richer here than in the two places named above. On the SE coast of Nordaustlandet the ice-cap goes down into the sea and over a stretch of several km there is only one single small spot, Isispynten, with bare ground where several species have settled to breed.

The richest avifauna is found in Vestspitsbergen where the coasts to the west and to the north are ice-free for a great part of the year, often from early spring until late in the autumn. In several places the vegetation is rich and in some sheltered valleys, the high latitude considered, it is even luxuriant. In many places there is a rich animal life in the sea, both far out, along the coasts, and in the fjords. Into many of these fjords great glaciers debouch and just off the face of the glaciers there are often areas which teem with macro-plankton. Therefore the conditions for a number of species of sea-birds and also for some land-birds seem to be good.

In the Svalbard area there is only one sedentary bird, the Spitsbergen Ptarmigan, all the rest being migratory birds.

If we look at the Svalbard area, apart from Bjørnøya, as a whole, we shall find that there is a marked decrease in both the number of species and the density of birds from the SW to the NE. (See table on page 26.)

The food of the sea-birds and where they find it

The scientists of the last century met with many problems in Spitsbergen, and one of them was the flocks of birds which they saw flying north from the north coast of Vestspitsbergen and then disappearing over the ice towards the North Pole.

Why did the birds go north? Obviously because there had to be land or at least islands there, where they could breed.

On 23 June, 1861, Chydenius saw flocks of birds going in a NE direction from the island Klovningen. He supposed they were flying to a land in the ice NE of Spitsbergen (89: 49).

It was thought that this land was the home of the Ivory Gull, and writing about this Klinckowström relates that nests of the bird had been found on the west coast of Nordaustlandet and also on Storøya to the east of the bigger island, and he continues:

"On neither of these places was the bird abundant and both places

must be reckoned as the southern border of its breeding area, which is the north coast of Greenland, Franz Josef land and the mysterious polar land, to which guillemots and eiders set their course, when, during the first half of the summer, they fly out into the sea north of Spitsbergen. There they see where the innumerable Ivory Gulls, which we meet everywhere among the ice, have first seen the light." (172: 150).

On the first *Fram* expedition in 1893–1896, it was found that the sea north of Spitsbergen was very deep with depths down to 3000 m. Later investigations have confirmed this and today there is no doubt about the non-existence of any land or islands between Spitsbergen and the North Pole.

But why do the birds go north? They do so because of the food they find in the channels in the ice all along the 82° N, from north of Spitsbergen to the sea east of Franz Josef Land.

The kind of food which they find here is plankton, a collective term for different floating marine plants and invertebrates, including several species of crustacea. It is mainly on the latter animals that the birds feed.

There are enormous quantities of plankton, which are produced by the sea, and we shall look at what is going on in certain parts of the ocean in spring-time and during the summer.

In the spring when the snow melts, the rivers carry a great amount of fresh water to the sea. This water has a certain content of mineral matter in the form of soluble salts and these salts act as manure when they reach the salt water.

Let us take the Norwegian coast as an example. Here the fresh water, brought out to sea by hundreds of small and large rivers, sooner or later will meet the Gulf Stream with its high temperature and high salinity and intermingle with it.

When cold water with a relatively high percentage of mineral salts meets warm water with a high salinity, suitable conditions will usually be formed for the growth of marine plants and animals which make up the above-mentioned plankton. This is what happens in the sea off the Norwegian coast and in many other parts of the ocean where similar conditions are to be found.

First comes the plant-plankton, microscopic plants such as green algae, diatoms etc., then small, almost microscopic crustacea, living on the plants just like cattle grazing on a meadow. Finally comes the macroplankton, which consists mainly of somewhat bigger animals such as crustacea, pteropodae etc., and they live on the animal microplankton. When sufficient quantities of macroplankton have come into existence, there will be food enough both for fish and birds. Therefore the sea-birds are usually found feeding in zones where the macroplankton is to be found.

As mentioned in the chapter on Ecology, there are in Vestspitsbergen several places (at least four), where enormous quantities of plankton

are found just outside the front of a glacier. Here the river or rivers from the glacier, having a rather high content of mineral matter and a very low temperature, meet the water of the fjord with a higher temperature and, of course, also a higher salinity. The result is that just outside the glacier there can be zones teeming with marine invertebrates. Outside the glacier Nordenskiöldbreen in Billefjorden (Isfjorden), Hartley and Fisher (513) showed that the Kittiwake alone took about 6,000,000 of the crustacean *Thysanoessa inermis* per day.

When such results are reached within a restricted area like the immediate neighbourhood of a glacier, what then is going to happen when nature works on a larger scale? To see what happens in the depths of the ocean is not possible, but sometimes we can see the results of it.

A very good example of just this sort of thing occurs around the guano islands off the Peruvian coast. Here the strong and cold Humboldt Current comes up northwards along the coast of Peru where it meets the warm equatorial water. The immediate result is enormous quantities of plankton and this plankton is food for myriads of fish. The fish again is food for the almost unbelievable numbers of birds living on the guano islands which lie just in the path of the Humboldt Current. In his book "Bird Islands of Peru", Murphy has a very interesting chapter on the Humboldt Current (424: 157–181), which clearly shows what happens there, and also how the conditions for the existence of such enormous quantities of birds are built up.

However, what happens in the equatorial zone on the coast of Peru, has its analogous counterpart in the Arctic, and we find parallel cases in the sea around the Svalbard area.

Here there are several places where cold and warm water meet, but in this connection there are three big areas which are especially important.

To get an idea of what goes on, it will be necessary to know something about the sea and the direction of the main currents around the Svalbard area.

The sea between Norway and Spitsbergen is rather shallow, with only a few depths of more than 450 m. It is called Barentshavet, or the Barents Sea. The bottom of Barentshavet is a part of the great continental shelf upon which the whole of the Svalbard area rests.

If we take the 500 m contour to be the border line of the shelf, we can follow it from 70° N outside the Norwegian coast, then north between 10° and 20° E long, a little west of Bjørnøya and up to the sea outside Isfjorden coast. From here the 500 m contour passes west of 10° E and comes in again east of this meridian north of Amsterdamøya. From Norway and up to here and to the west of the 500 m contour, the bottom drops from 500 to 2000 m and even to 3000 m.

From the point north of Amsterdamøya the 500 m contour takes a north-easterly direction, and north of Nordaustlandet it is found again at about 81° 30' N.

On the chart (Fig. 1) it will be seen that at about the above latitude, the bottom descends very steeply to 3000 m and farther north the depths are 4000 and even 5000 m.

As far north as this, the border line, the 500 m contour, with smaller or greater divergencies, follows on the whole the 82° N to the sea east of Franz Josef Land.

The Gulf Stream flows up north past the Norwegian coast and then passes between Spitsbergen and Greenland. One branch goes into Barentshavet, but the main current goes north along the west coast of Vestspitsbergen. At the NW corner of this island a part of it swerves round the corner and goes east past the north coast of Nordaustlandet, while other branches go north and north-east, up to about 82° N.

There are three main places where the Gulf Stream meets cold polar currents in the sea between Spitsbergen and Greenland. On its western side it has the strong current coming from the north and going south along the east coast of Greenland. The stretch of sea where these two currents pass each other lies probably about 200 km west of the west coast of Vestspitsbergen.

From the NE comes another cold current which meets the Gulf Stream in the vicinity of Bjørnøya. Here the cold and the warm water meet, and where this happens, it often results in the forming of mists. Therefore, for a greater part of the year the island will be shrouded in fog. This cold current then follows the Gulf Stream north past Vestspitsbergen and even to Nordaustlandet.

Owing to its origin, the current from the NE brings with it a great quantity of fresh water from the great Siberian rivers. We know that this is so and we have strong proof of it in the immense number of both hewn logs and trees with roots and branches which are cast ashore, mainly on the west coast of Vestspitsbergen but also around almost all the coasts of Svalbard. Far the greater part of the timber consists of logs cut in the big forests of larch trees in the Siberian *taiga*.

The polar current coming from the sea north of Svalbard, meets the Gulf Stream somewhere about 82° N. As the sea is usually ice-covered, it is difficult to know what really happens here, but the Gulf Stream, with its high salinity, is the heavier one and is therefore probably forced down over the continental shelf by the lighter water of the very strong polar current. There is also the possibility that the Gulf Stream may go east along the shelf.

However, the first guess is probably the right one and there is an indication which points in this direction. In 1827, Parry tried to reach the North Pole from Spitsbergen. He set out from Sorgfjorden with sledges and boats and reached 82° 45' N. At this point the polar current took him southwards during the night just as far as he had gone north on the previous day, and so he had to give up and turn back here. In his narrative there is nothing to show that any current took him eastwards along the 82° N.

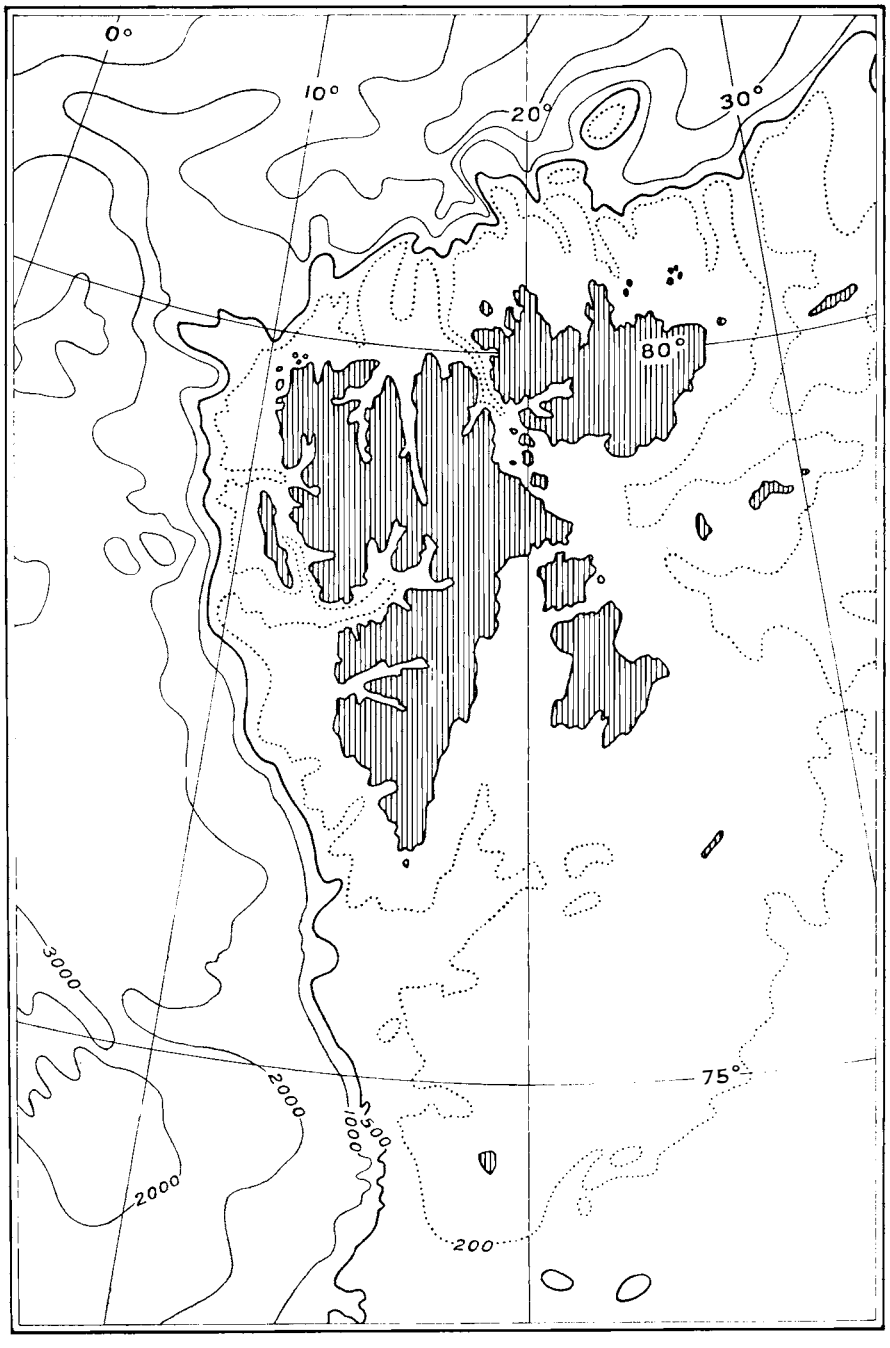


Fig. 1. Bathymetrical chart of the sea around the Svalbard area.

As mentioned above there are three main areas, besides several minor ones, where the Gulf Stream meets cold polar water with a rather high content of mineral salts.

The first place is Bjørnøya. Here the Gulf Stream meets the polar current from the NE carrying with it fresh water from the great Siberian rivers with a high content of mineral matter. The immediate result is the production of food for both fish and sea-birds. Therefore there are fleets of trawlers all around the island, and on its southernmost point there is a bird-cliff, perhaps the largest in the northern hemisphere. All along the west coast of Spitsbergen there are similar conditions and the reason for this is two-fold. Firstly we must suppose that the warm and cold waters from, respectively, the Gulf Stream and the polar current will mingle all along the west coast, and secondly all the fresh water which in summer-time is brought out into the sea from the great number of rivers, will also play a part in this connection.

The visible result we have in the colonies of sea-birds from Sørkapp in the south to the islands on the NW corner in the north, and the biggest colonies are as follows:

Sofiakammen, a mountain on the north side of Hornsund, is an enormous bird-cliff. On both sides of the fjord, especially towards the entrance and along the coast to the south and to the north of the fjord, there are continuous colonies with almost unbelievable numbers of Little Auks. In Bellsund we have the bird-cliff Midterhuken and in Isfjorden, on the north side and not so far from the entrance, Alkhornet.

On Prins Karls Forland there is an enormous bird-cliff, Fuglehuken, on the NW corner, and from Kapp Mitra at the entrance to Krossfjorden and Kongsfjorden and up to Magdalenefjorden, vast numbers of Little Auks breed. On almost all the islands on the NW corner of Spitsbergen there are colonies of different kinds of sea-birds.

That both the Gulf Stream, and the water from the rivers on the west coast of Spitsbergen, play a part here can be seen from the charts of temperature and salinity, Figs. 2, 3 and 4.

The second place where cold and warm waters meet and where the birds from Spitsbergen feed, is on a stretch of sea about 200 km west of the islands. This is the place where (probably) the Gulf Stream meets the polar current coming from the north and passing south along the east coast of Greenland. About this Kolthoff says: "The bird-life (on the west coast) is more rich than on the east side of Spitsbergen and from investigations made under the Zoological Polar Expedition of 1900, it was shown that several species of birds, namely Brünnich's Guillemot, the Little Auk, the Fulmar and the Ivory Gull, fly up about 20 Swedish miles (200 km) out to sea from Spitsbergen and Jan Mayen, to fetch food for their young. So they were seen at this distance to fly in rather great numbers towards

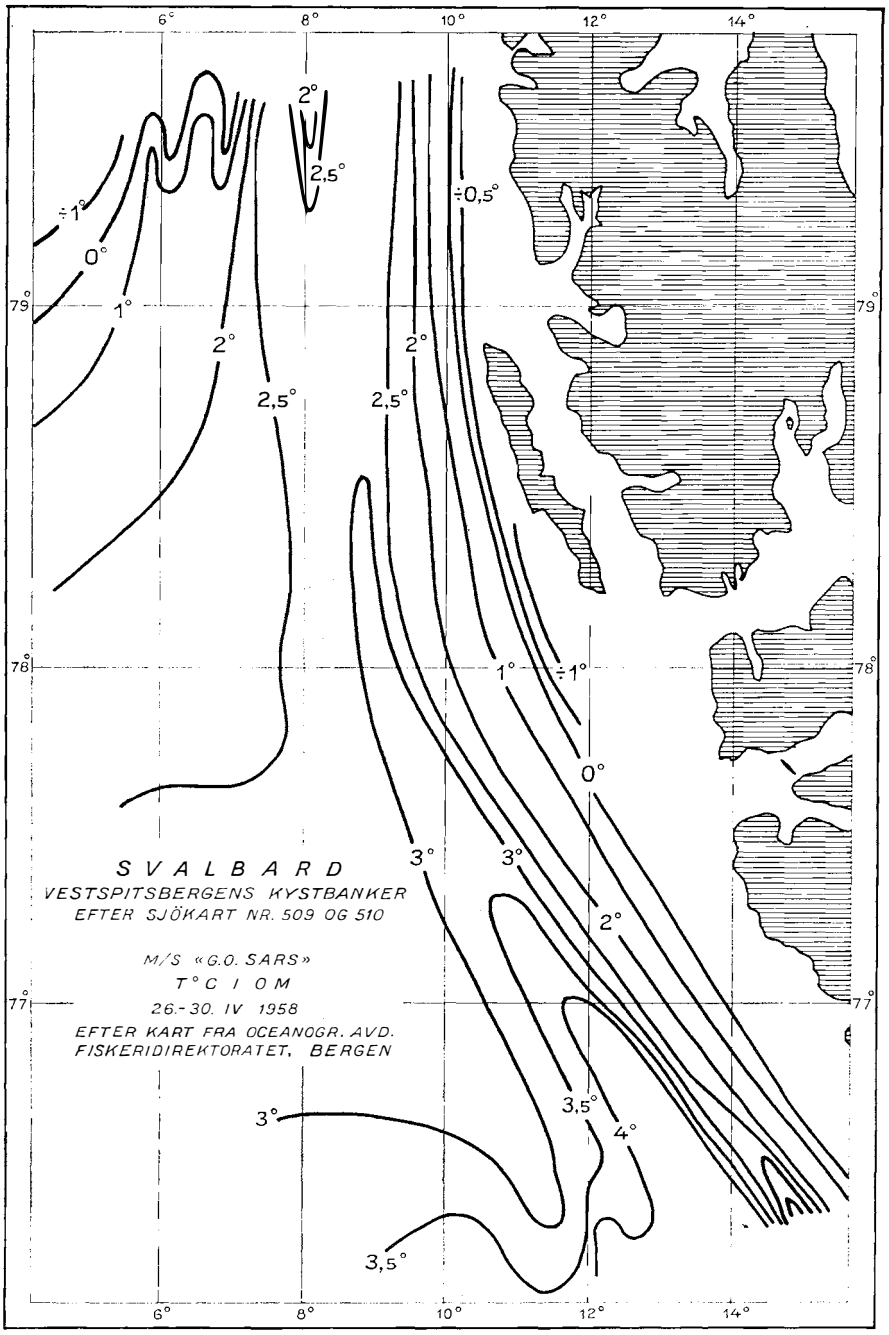


Fig. 2. The surface temperature outside the west coast of Vestspitsbergen in the period 26–30 June, 1958. The effect of the Gulf Stream is clearly seen, especially in the 3° curve. (After chart edited by Fiskeridirektoratet, Bergen.)

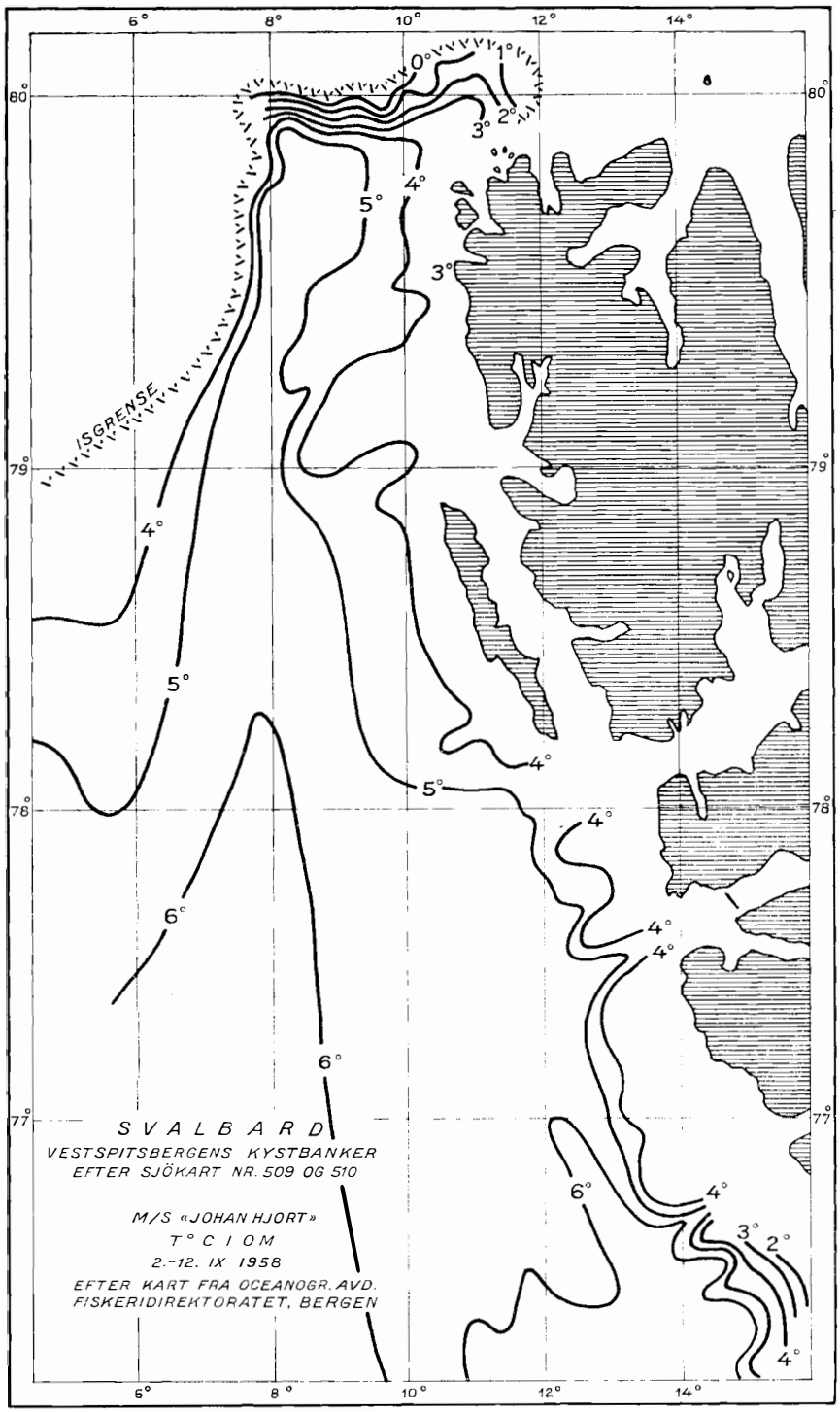


Fig. 3. The surface temperature outside the west coast of Vestspitsbergen in the period 2–12 September, 1958. The sea has now a much higher temperature and the development of plankton has terminated. The effect of the Gulf Stream is still to be seen. (After chart edited by Fiskeridirektoratet, Bergen.)

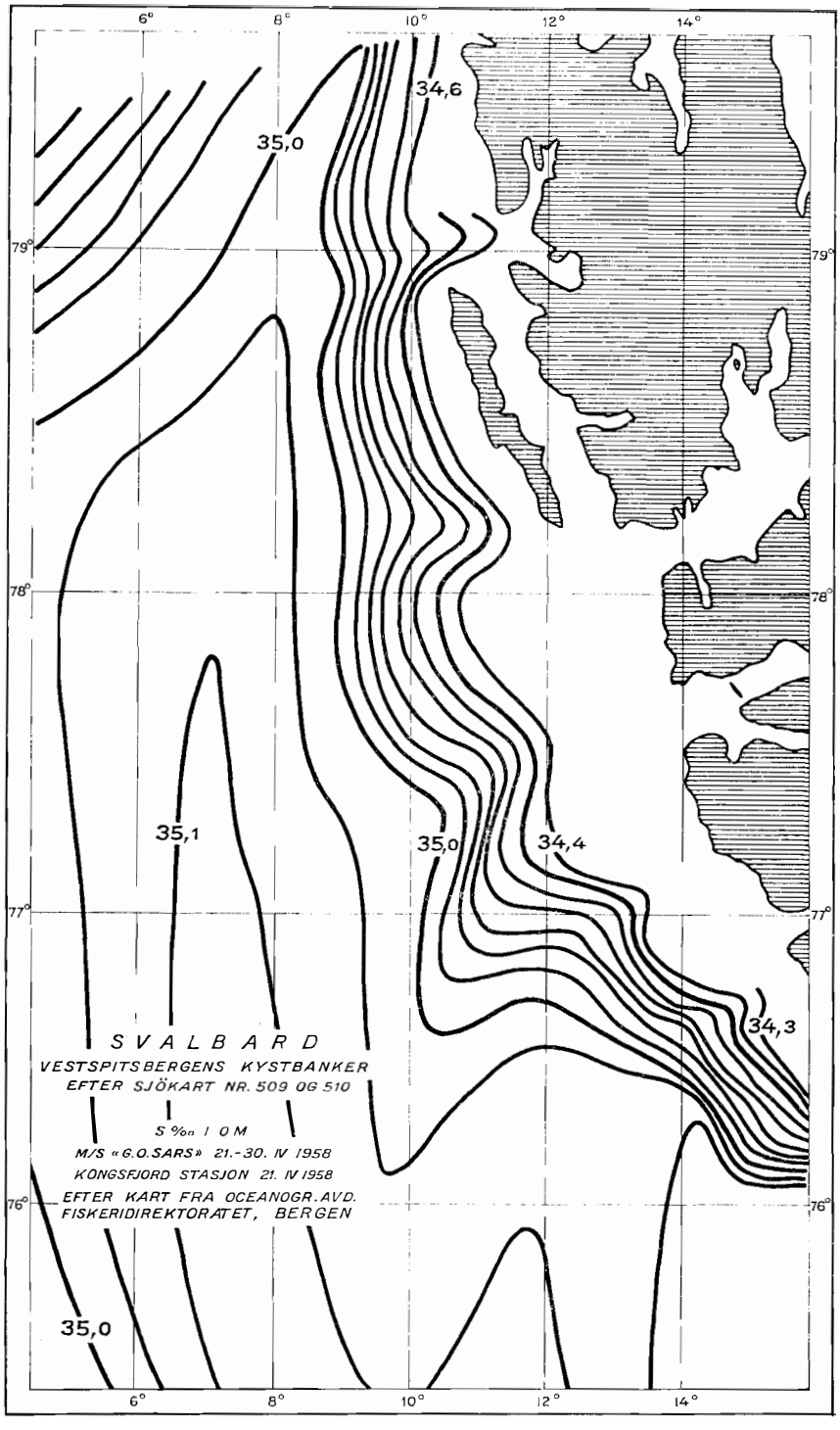


Fig. 4. The salinity of the surface layers outside the west coast of Vestspitsbergen in the period 21–30 June, 1958. The sea close to the shore is influenced by the fresh-water, farther out the effect produced by the Gulf Stream is clearly to be seen. (After chart edited by Fiskeridirektoratet, Bergen.)

the land. Almost all birds obtained had bred that year and many of them carried food for their young." (251: 99).

At about the same distance from the west coast of Spitsbergen, d'Orléans (277) saw the same birds between 10 and 15 July, 1905 (p. 341).

The third place is along the 82° N north of Svalbard.

From this area we have the narratives of three expeditions which have passed this degree during the summer-time. To begin with the eastern-most, Nansen and Johansen crossed the ice north of the eastern part of Franz Josef Land between 15 June and 8 August, 1895, and saw great numbers of birds here (237: 24–43).

In 1897, Andrée met with numbers of birds on both sides of the 82° N, north of Kvitøya (461: 267–277).

Fram came to Spitsbergen from the north in 1896, and reported several species of birds around 82° N (237: 44–53).

Parry, in 1827, tried to reach the North Pole from Spitsbergen, and between 25 June and 15 August he saw several species of birds around 82° N (46: 60–123). At 82° 26′ 44″ N he no longer saw any birds in the "holes" of water as he had done farther south (p. 87). On 9 August at 81° 40′ N no fewer than 200 Rotges *(Plautus alle)* were seen (p. 116). "The sea was crowded with shrimps and other sea-insects, principally by the *Clio Borealis* and *Argonauta Arctica*, on which numerous birds were feeding" (p. 118).

Along 82° N the northernmost runners of warm water meet the strong polar current north of Spitsbergen and the probable result is that the warm and heavy Gulf Stream water is forced down over the continental shelf, which here falls from 500 to 3000 m. The result is a mixing of the two kinds of water and the growth of plankton. Moreover the heavy water of the Gulf Stream will probably force up cold water from the bottom of the sea. This water is also rich in minerals because of the dead bodies of all the myriads of pelagic plants and animals which slowly and unceasingly sink to the bottom.

In all of these areas there is a production of food and that is the reason why the Spitsbergen birds are found in numbers there.

However, when there is food for birds, there will also be food for fish. This fact was already in 1933 published by Belopoldski, who showed that in the areas of the Barents Sea where he met the great congregations of Fulmars and Kittiwakes, there were also great amounts of fish (486: 105).

Non-breeding

Non-breeding is a phenomenon well known from Svalbard as well as from other arctic territories. The cause of the actual non-breeding, however, has fostered several theories, but none of them has met general approval.

It seems that non-breeding in one and the same district will occur in cycles of four years. Geese and ducks seem to be mostly affected by it, but several species of other birds also have periods when they do not breed.

Most authors on this subject take into account all species and all cases where birds do not breed, but non-breeding can originate from different causes and it is well worth while to try to define what we understand by actual "arctic non-breeding".

Here we must discern strictly between the non-breeding caused by known factors and the actual "arctic non-breeding", the origin of which is still in the dark.

There are several causes known, which may prevent birds in the Arctic as well as in other places from breeding. In the Arctic at least, some of them may be of a strictly local nature, as when one or more foxes have found their way to an island where eiders and geese generally breed. The animals have come over there in winter-time and have been left stranded when the ice disappeared. This was the case on Akseløya in Bellsund in 1948 and on Sørkappøya in 1950. Then islands and islets where eiders and other defenceless birds breed, may be landbound by ice for such a long period that the birds do not dare to breed there, because foxes may traverse the ice from the mainland. This was also the case on Gerdøya in Kongsfjorden in 1949.

In other instances of more general nature, non-breeding may be caused by climatological conditions. In some years the ice will cover the fjords and also the sea far into the summer and then it may be difficult for some species to reach the feeding-grounds as the distances are too great.

In some years it happens that snow will cover the ground far into the summer, in fact for so long a period that the instinct of propagation becomes extinct in the birds, and for this reason they will not get around to breeding. In 1949 almost all the ground on the north coast of Vestspitsbergen was snow-covered until the beginning of July and a great number of species did not breed there at all.

A very important factor is the food-supply. When the right kind of food is lacking there are several birds which will not breed. The crossbills for instance are dependent on the seed of the conifers and therefore they are found breeding only in certain districts and in certain years when they can find ripe seed in abundance.

Other birds which are strictly dependent on a certain sort of food, are the nocturnal and, to a certain degree, also the diurnal birds of prey. The species in question live mainly on small rodents and in Norway these animals have a four-year cycle, somewhat different for the south and for the far north.

When there is a "black year" within an area, with few or almost no rodents, a number of species which feed their young with these animals will not breed at all. This is the case with several owls, such as *Nyctea*

scandiaca, *Asio flammeus* and *Surnia ulula*. Among the diurnal birds of prey we find especially *Circus cyaneus* and *Buteo lagopus* behaving in this way, and among the skuas, *Stercorarius longicaudus*. All of them are birds which we find on the mountain plateaus in southern Norway and in similar surroundings, but lower down towards the sea-level in the far north. Some of these birds also occur in the Arctic and here they have their non-breeding periods exactly as in Norway.

Schaanning who wintered on Novaya Zemlya 1902–03 saw only a single Snowy Owl there in 1902. During the first part of the winter of 1903 they lived on Black Guillemots, but after the lemmings had appeared on 25 May, the owls lived almost exclusively on them. No fewer than 30 pairs nested in the vicinity of his hut (348: 155).

From Greenland there are similar reports on this owl and also on the Long-tailed Skua.

In the above-named cases there are obvious and clear reasons for non-breeding. But when we come to the actual "arctic non-breeding", we do not know why a certain population of one or more species of birds do not breed, when the conditions, in our opinion, should not hinder propagation. It has been said that the light plays a prominent role, and it is well known that the light will have a marked influence on the growth of the gonads. But it has been found that when the eiders and geese of a district did not breed, the Red-throated Divers in the same district bred normally and this bird is also known to have its periods of non-breeding.

About this interesting phenomenon much has been written, but here only a few of the more important papers shall be mentioned.

As early as in 1825, Faber knew the non-breeding phenomenon very well and he says that several ornithologists had given attention to it. He himself had found it mostly among waders and what he calls swimming birds and he names a great number of species in which non-breeding had occurred (45: 102).

In 1933 Bertram and Lack visited NE Greenland, and in a paper from 1934 he also writes on "Non-breeding in the Arctic". There were no lemmings in the district where they were that year and consequently no Snowy Owls were breeding, neither did they find any nest of the Long-tailed Skua. Other species, however, were also affected, such as Red-throated Divers, almost certainly Pink-footed Geese and Long-tailed Ducks and perhaps Eiders, King Eiders and Glaucous Gulls. They refer to a number of papers where non-breeding is mentioned or treated (500: 824).

Glen relates that in 1936 the Red-throated Divers were unaffected on Nordaustlandet, but a great number of Eiders and Brent Geese were non-breeding. He also says that the gonads of the eider drakes were fully developed, but the ovaries of the females were not developed at all, and he adds: "Undue prominence ought not to be given to these conditions, which may pertain merely to one certain year, but if they are found again,

they must seem to indicate that the cause is to be sought in some factor which affects the sexual development of the ducks, and not of the drakes." (520: 301–302). See also Glen (521: 304).

C. G. Bird refers to non-breeding in general and suggests that the light has a great influence on the development of the gonads, and that the cause might be sought in this direction.

Both 1936 and 1937 were normal breeding years on NE Greenland, but 1938 was a non-breeding year and Red-throated Divers, King Eiders, Long-tailed Ducks and Long-tailed Skuas did not breed, and but few of the Pink-footed Geese were breeding. Snowy Owls were not seen and only one brood of the Rock-Ptarmigan was found. Bird also saw flocks of Turnstone, Dunlin and Knot, apparently in adult plumage, flying about, and these may not have been occupied with nesting duties. This he mentions to show that waders do not seem to be completely excluded from the problem. He concludes with the suggestion that late arrival on the breeding ground may be of influence, because thereby the growth of the gonads would be affected. 1938 was such a year with late arrivals (535: 2–8). See also Bird and Bird (544: 671).

The most extensive paper on "arctic non-breeding" is that of Marshall, based on records from the field in Jan Mayen in 1947 and on anatomical investigation of a material of gonads collected on the island. This material was compared with material from breeding specimens of the same categories collected in England.

He concludes by saying that the causes of non-breeding vary from species to species. Further, that the female non-breeders in general fail to reach the gonad maturity achieved by the males. He also tries to explain non-breeding in the following way: "It would appear that the gonad cycle of non-breeders of both sexes does not develop to its full extent because the environment does not present to the extero-ceptors the appropriate stimuli (including behavioural interactions) to which each species has evolved its neuro-endocrinal response." (603: 310–331).

Several cases of non-breeding have been found in the Svalbard area. One of the instances not mentioned above is to be found in a paper by Bertram & Lack, where non-breeding in several species on Bjørnøya in 1932 is shown (488: 286).

Løvenskiold saw non-breeding in the Arctic Skua *(Stercorarius parasiticus)*. This bird was numerous in pairs on Sørkapp Land in Vestspitsbergen in 1950. From 12 July to 12 August about 20 pairs were seen. Of these only one pair had a nest with eggs and no young birds were seen (615: 103 and diary).

The climatic conditions and their influence on the avifauna

In 1897 Andrée, with his two companions Fränkel and Strindberg, went north from Spitsbergen in the balloon "Örnen". They disappeared, and for more than 30 years nothing was known about their fate.

In 1898 a Swedish expedition set out north to seek for Andrée and his followers. Nathorst and Kolthoff took part in the expedition and they had hoped to find at least traces on the island Kvitøya. When they came to the open, non-ice-covered land at the SW corner of the island the ground was partly snow-covered.

During their stay there the snow was still falling and they found nothing. They must surely have passed the camp of Andrée or even have walked over it, but it was already covered with a layer of snow (or ice) which did not disappear until 1930 when the camp was found by mere chance by the Norwegian expedition led by Dr. Gunnar Horn.

In the camp there was very little disturbance and it seems that it probably had rested undisturbed under its cover of ice and snow for more than 30 years.

The reason why the camp could be found was the rise in temperature which began in 1917. This resulted in a higher temperature of the air and even at such high latitudes as the SW corner of Kvitøya, the ice which covered the camp had to disappear.

This phenomenon, the variation in the climatic conditions, has been studied by the Norwegian geophysists Th. Hesselberg and B. J. Birkeland (622 a). The paper referred to here, "The Continuation of the Secular Variations of the Climate of Norway 1940–50", deals also with the rise in the temperature and here it is said:

"During the 200 years that have elapsed since the meteorological observations began in Norway there have been incessant climate variations. The changes which took place before 1860 are, however, smaller than those occurring later and the largest variations took place in the 1930-years. The changes were greatest in the winter and the autumn, smaller for the spring and smallest for the summer. The largest variations took place in January and the smallest ones in July, the months for the yearly maximum and minimum of temperature in Norway. The variations were greater in the northern parts of the country than in the southern parts and they were greatest in Spitsbergen. Further they were larger in the interior of the country than along the coasts.

From the 1860-years the 30-year means of the atmospheric pressure began to rise at Posta Delgada and at the same time the Islandic Low became deeper and moved northwards with the effect that the dominating southern air currents from the southwest over NW-Europe augmented in force. In the neighbourhood of Norway the atmospheric pressure had fallen more

over the sea than over the land and the result was an additional air current from SSE, in force about 20 % of the mean southern stream.

This was confirmed by the wind statistics, that showed an increase in the frequency of southern winds. In Oslo the frequency of southern winds augmented with about 25 %, while the winds from north became less frequent with about 20 %. At the same time the frequency of winds from east increased a little while the number of winds from west diminished. The wind statistics for Oslo thus indicate an additional stream of air from SSE.

The increasing air current from SSE brought milder and more humid air from more southern latitudes and give a direct explanation of the fact that the temperature rose all over the country and that the humidity and the precipitation augmented over great parts of Norway.

On the average for the whole country the mean annual temperature rose about 0.6° C. The rise of temperature was smallest at the south-western stations and augmented towards east and north. For Oslo it was 0.5°, in Skudenes 0.2°, in Bergen 0.4°, at Finnmark 1.0° and at Spitzbergen about 2° C.

The rise of the temperature seems on the whole not great, but it is great enough to elevate the annual isotherms 100 m or to push them 200–300 km further to the north.

On the average the vapour pressure increased with 0.4 mbar, that corresponds with 5 % augmentation of the water vapour in the air. At the same time the relative humidity increased with $1^1/_2$ percent, but this rise is not valid for all stations.

The explanation of this fact is simple enough. The augmenting air currents from south brought warmer air with a greater content of water vapour. On the way toward north the air is cooled and thus gets a higher relative humidity. The greatest increase of the relative humidity we found on the eastern and southern slopes of the central mountain ridge, where the air was cooled during the ascent. On the other side of the mountain ridge, where the additional air current descends and the air is warmed, there was no increase or even a decrease of the relative humidity.

As an augmenting air current from the south brings more water vapour in over Norway we must expect an increase of the precipitation over the country as a whole. The observations showed that this increase was over 10 % in the eastern part of the country and on the eastern and southern slopes of the central mountain ridge, while the precipitation decreased on the western and northern slopes of the ridge i. e. on the leeward side of the increasing winds from SSE.

We thus see that there are close relations between the secular variations of the different meteorological elements and that these relations are easily explained from the physical laws. The variations are large enough to have an appreciable influence on the living conditions in a country that as Norway

is situated at the northern limit of the inhabited world. The glaciers have withdrawn considerably, the upper limit of the woods has risen, the conditions for agriculture were improved, the amount of sea ice diminished so that the yearly shipping season between Norway and Spitzbergen augmented from 100 to 200 days, the considerable changes in the water transport of the rivers have an effect on electricity production, the higher temperature in the coastal waters were of importance for the fisheries etc.

It is thus evident that it is of considerable interest, not only for scientific but also for practical reasons, to continue the study of the variations of the climate in Norway. In doing so we will follow the plan of the preceding papers, with the simplifications that seem reasonable.

This résumé only gives a very short account and we must for further information refer to our original papers on the secular variations until the year 1940."

Farther on in this paper it is shown that the increase in the temperature of the air has stopped and that there is even a fall which gives lower mean temperatures for the year in the period 1940–50 than in the period 1930–40.

About the conditions in Finnmark and Svalbard the following is said:

"As mentioned in chapter 3 the series of homogeneous meteorological observations was broken during the war at our arctic stations and in Finnmark. In Svalbard the stations were destroyed in the year 1940 and in Finnmark in 1943, the stations were as far as possible re-established at the same places as before at the end of the war. For all of them the series must, however, be considered as broken, so that a new series have begun after the war.

Table D[1] gives the annual means for a few 5-years periods before and after the war so that a comparison can be made.

As will be seen from this table the mean annual temperatures for Spitsbergen and Bjørnøya are so much lower than before the war, that it seems justified to say that the recent fall in the temperatures extends to the arctic regions."

In a paper from 1958: "The Recent Variation of the Climate at the Norwegian Arctic Stations"[2] Th. Hesselberg and T. Werner Johannessen state that the series of observations in Spitsbergen goes back to 1912 when the meteorological station in Isfjorden was erected and they continue: "During the first years the observations show no conspicuous climatic change, but then comes a rapid rise of the temperature in the years 1917 to 1922. The increase of the mean temperature in this period was about 7 degrees Celsius in the winter, 3 degrees in the spring, 2 degrees in the summer, 3 degrees in the autumn and 4 degrees for the whole year. After the year 1922 the

[1] Not printed here.

[2] Polar Atmosphere Symposium, Part I, Meteorology Section. Pergamon Press. London 1958.

temperature continued to rise until the war broke off the series, but the rise was much slower. The temperature increased in these years about 1 degree Celsius.

After the war the temperatures are a little lower, the temperature rise thus seems to have culminated."

However, the calculation of the 30-year means of the temperature from the period 1912–41 to the period 1930–59, made at the Meteorological Institute of Oslo, shows that there still is an increase of the temperature both in Norway and in Spitsbergen.

This is clearly shown in a letter to the author from Dr. Thor Werner Johannessen at the Meteorological Institute of Oslo, to quote:

"Temperature Variations at Isfjord Radio, Andenes and Karasjok.

The enclosed table shows the continuous 30-year means of the mean annual temperature for Isfjord Radio, Andenes and Karasjok from the period 1912–41 to the period 1930–59. The numerical values are drawn into the enclosed diagram.

The missing values from Isfjord Radio for the years 1942–45 are interpolated as well as it was possible to do so, by the aid of the numerical values from Vardø, Ingøy and the Russian station Bukta Tikhaya, 82° 20′ N, 52° 48′ E.

From the table and the curves it is apparent that the mean annual temperatures show an increase on all stations in the series of years investigated. The rise is greatest for Isfjord Radio with 1.3° C from 1912–41 to 1930–59, for Andenes and Karasjok the rise is respectively 0.4° and 0.3°.

It is, however, impossible to say whether this rise will continue or not."

In this connection it is interesting that the summer of 1960 was the warmest that anybody could remember in Spitsbergen. The pack-ice was not met with until a latitude of 81° 30′ N was reached and the sea around Kong Karls Land was completely free from ice.

During the recent decades an extensive literature about the present climate fluctuations has been published, but only a few of these papers shall be mentioned here.

In a paper on "The Present Climatic Fluctuation", Ahlmann (575) points to the fact that an increasing atmospheric circulation over the northern Atlantic will result in the water of the north-going sea-currents being saltier and warmer than previously. The continued systematic observations of the coastal waters of Norway have also shown an increase in temperature during the last decades (p. 186).

That the higher temperature of the air has influenced the temperature of the sea is a phenomenon which has resulted in much new biological evidence.

Ad. Jensen (538) has demonstrated these facts in respect to marine animals, especially fish, in a paper: "Concerning a Change of Climate during recent Decades in the Arctic and Subarctic Regions from Greenland

in the West to Eurasia in the East, and Contemporary Biological and Geophysical Changes".

Among other facts, it is here stated that in 1882 enormous quantities of cod were caught on the banks on the west coast of Spitsbergen, but in 1883 the whole catch was but 3 cod. It was not until 1925 that the fisheries here gave good results again.

Jensen summarizes thus: "The region dealt with in this paper embraces the Arctic and Subarctic from Greenland in the west to Eurasia in the east.

From the review undertaken it appears, that many southern (boreal) species of animals, including mammals, birds, fishes and invertebrates, have in recent years been able to extend their area of distribution farther north, whilst on the other hand the southern limit for certain northern (arctic) species has retreated northwards. Further, a number of southern (boreal) species, which formerly only occurred here and there and in small numbers, have now become common and occur in large quantities.

The cause of these zoogeographical changes is sought in the fact, which has occurred contemporaneously, that the temperature of the sea and air has risen in the regions in question. Along with this rise of temperature there has also been a retreat of the ice-boundary in arctic seas, whilst on land the glaciers and tundras have diminished and retreated."

Of great interest is a paper by Salomonsen (579): "The Distribution of Birds in the Recent Climatic Change in the North Atlantic Area", although it deals only with birds from Greenland, Iceland, the Faeroes and Denmark, and nothing from the Scandinavian Peninsula or Spitsbergen is to be found.

It is here stated that from a faunistic point of view it is necessary to separate the "nidiates" (populations which breed regularly, annually in the area in question) from the "accidates" (birds which occur only irregularly in the area, single individuals or flocks being recorded at intervals of several years). The third faunistic category, the "annuates" (populations regularly, annually occurring in the area in question without breeding), play a minor role in this respect, as – so far as we know – they have undergone small and quite insignificant changes in recent years. (A definition of these faunistic categories has been given by Salomonsen in: The Avifaunistic Analysis and its Terminology, Dansk Ornithologisk Forenings Tidsskrift, 1946. Summary in English, p. 42.)

The greatest changes seem to have taken place in Iceland, and about this Salomonsen says:

"The avifaunal change in Iceland is in satisfactory accordance with developments in central and North-eastern Europe as recently analyzed by O. Kalela (Ornis Fennica, 1946, p. 77). Since about 1870 the winter-temperatures have steadily increased and a number of birds have increased in number or moved to the North. All these birds are residents or very

early arriving summer-residents, which are capable of taking advantage of the climatic amelioration in winter and early spring. Similarly, all species which have immigrated to Iceland since about 1900 or have increased as winter-visitors belong to the same categories. In recent years (after 1930) the summer-temperatures have also increased and southern species more susceptible to the cold have moved to the North. Similarly in Iceland a number of southern species have appeared as rare accidates in this period."

In a more recent paper on "Changes in the Geographic Distribution of Finnish Birds and Mammals in Relation to Recent Changes in Climate", the above-mentioned author, O. Kalela, has further developed his viewpoints.

This paper is to be found in a symposium edited by Professor Ilmari Hustich, "The Recent Climatic Fluctuation in Finland and its Consequences" (Fennia 75, Helsinki 1952).

This symposium shows how thoroughly these problems have been investigated in Finland, and it contains chapters on: Temperature changes, the freezing of Baltic, plant-biological phenomena, on birds and mammals, insect life, forest growth, game economy, fish and fishery and agricultural production, all of them in connection with the climatic fluctuations.

When we now return to Svalbard it is necessary to separate Bjørnøya from the rest of the area, not least because this island is situated at 74° 30′ N lat., about 200 km or 110 nautical miles from the southernmost point, Sørkapp, on Vestspitsbergen.

Bjørnøya is a gateway for many species going north and several of them have stopped here, or they are at least not known from more northern latitudes.

Until 1920 the following 17 species were known to breed on the island: 1. *Plectrophenax nivalis*, 2. *Clangula hyemalis*, 3. *Somateria mollissima*, 4. *Fulmarus glacialis*, 5. *Gavia stellata*, 6. *Calidris maritima*, 7. *Sterna paradisaea*, 8. *Larus hyperboreus*, 9. *Rissa tridactyla*, 10. *Stercorarius parasiticus*, 11. *Alca torda pica*, 12. *Uria aalge hyperborea*, 13. *Uria lomvia*, 14. *Cepphus grylle mandtii*, 15. *Plautus alle*, 16. *Fratercula a. arctica*, and 17. *Lagopus mutus hyperboreus*.

These birds are what Salomonsen describes as "nidiates". From 1921 and up to 1958, the following 9 species have either bred, have tried to breed or have been found under circumstances which have indicated breeding as highly possible: 1. *Sturnus vulgaris*, 2. *Carduelis flammea*, 3. *Melanitta nigra*, 4. *Gavia immer*, 5. *Gavia arctica*, 6. *Phalaropus fulicarius*, 7. *Larus canus*, 8. *Larus argentatus*, and 9. *Larus marinus*.

Of these we know that the Starling has been found several times since 1907 on the island and that in 1932 a nest was found, but there were no eggs. The Redpoll was found there in 1932, when young birds were seen. They could probably not have flown there from Norway, and as the species does not exist in Spitsbergen, it is highly probable that the young birds

were hatched on Bjørnøya. *Melanitta nigra* has been found breeding only once. The Great Northern Diver has been known as an inhabitant of the island before 1900. In 1923 the first nest was found and since that time it has bred regularly, but in varying numbers. The Black-throated Diver *(Gavia arctica)* was recorded in 1948 and was found breeding in 1958. The Grey Phalarope was found for the first time in 1907, the first nest was found in 1922 and now it breeds regularly in small numbers. The Common Gull *(Larus canus)* has been found under circumstances which made breeding highly possible and the Herring Gull *(Larus argentatus)* has bred on the island. The Great Black-backed Gull *(Larus marinus)* was first seen in 1908, the first nest was found in 1921 and now it breeds regularly.

In addition to the population of birds which existed on the island before 1920, about 50 % more species have either nested or have tried to nest between 1921 and 1959.

In this connection it is difficult to say anything about the birds which are called "accidates" by Salomonsen.

Bjørnøya has not often been visited by ornithologists, and the number of records are of course more or less proportional to the number of observers. We know, however, that of accidates, 13 species were found before 1921, and after that time 12 new species have been recorded.

It seems that Spitsbergen, by which in this case is meant Vestspitsbergen, Prins Karls Forland, Barentsøya and Edgeøya, is influenced by its more northerly situation. Curiously enough, the invasion of more southerly species begins here almost exactly a decennium later than on Bjørnøya.

Before 1931 the following 26 species were known as breeders in Spitsbergen: 1. *Plectrophenax nivalis*, 2. *Anser f. brachyrhynchus*, 3. *Branta bernicla hrota*, 4. *B. leucopsis*, 5. *Clangula hyemalis*, 6. *Somateria mollissima*, 7. *S. spectabilis*, 8. *Fulmarus glacialis*, 9. *Gavia stellata*, 10. *Phalaropus fulicarius*, 11. *Arenaria interpres*, 12. *Calidris canutus*, 13. *C. maritima*, 14. *Crocethia alba*, 15. *Charadrius hiaticula*, 16. *Sterna paradisaea*, 17. *Xema sabini*, 18. *Larus hyperboreus*, 19. *Rissa tridactyla*, 20. *Pagophila eburnea*, 21. *Stercorarius parasiticus*, 22. *Uria lomvia*, 23. *Cepphus grylle mandtii*, 24. *Plautus alle*, 25. *Fratercula arctica naumanni*, 26. *Lagopus mutus hyperboreus*.

In 1930 *Larus marinus* was found breeding and the following 8 species were either found breeding or it was at least very probable that they had bred or had tried to do so, between 1931 and 1958: 1. *Oenanthe oenanthe*, 2. *Anas crecca*, 3. *Anas acuta*, 4. *Aythya marila*, 5. *Phalaropus lobatus*, 6. *Calidris alpina*, 7. *Larus argentatus*, and 8. *Stercorarius longicaudus*.

Of these, Scaup Duck was seen with ducklings in 1948, but no specimen was obtained. The Herring Gull which was found in 1950, behaved as if it were breeding and one of the 4 birds seen was obtained. This bird had distinct brood-patches. Of the rest, the Long-tailed Skua, the Wheatear and the Pintail have bred more than once, the Dunlin is supposed to have done so, but the Teal has bred only once.

The Great Black-backed Gull which began to breed at Sørkapp in 1930 has now reached Forlandsøyane outside Prins Karls Forland, where it bred in 1956.

In addition to the population of birds which existed in Svalbard (except Bjørnøya) before 1930, about 34 % more species have either nested or have tried to nest between 1931 and 1958.

Concerning the accidates, we have exactly the same situation in Spitsbergen as on Bjørnøya. Between 1900 and 1919, 10 new species were found and between 1920 and 1958 the number of new records was 13.

The tables reveal that for the two periods of war, the one between 1914 and 1918 and the other between 1940 and 1945, no or almost no observations were made at all.

As a conclusion it can be said that the climatic fluctuations have had a marked influence on the avifauna of the Svalbard area.

The attached tables (Tables 2 and 3) show the birds observed in Spitsbergen and Bjørnøya respectively.

Some species which must be protected

Salomonsen (630 b) shows in a paper on "The Present Status of the Brent Goose (*Branta bernicla* (L.)) in Western Europe", that the population of this goose in the period 1875–1900 was about 20,220 birds. In 1920–35 there were about 11,010 of them and in 1948–56 only 1,555 Brent Geese. This shows such a rapid decrease that there is a great danger of this interesting species becoming extinct in Europe in a few years.

In the Svalbard area the bird is protected by law. It must not be shot, nor is it allowed to take its eggs.

This species has, to a great extent, bred on eider-holms and these islands have been and still are repeatedly plundered during the whole of the summer-time. The marauders work very thoroughly and the first, the second and even the third clutch of Eiders' eggs, as well as those of the Brent, are taken.

This plundering has resulted in an almost unbelievable reduction of the population of Eiders in Spitsbergen. On Forlandsøyane where 10,000 pairs were breeding in 1900, there are now only between 200 and 300 pairs. It is a great shame that such plundering can take place year after year without anything being done to stop it.

To protect the Brent Goose in Spitsbergen there is only one remedy and that is the employment of all means to stop the robbing of nests of Eider and geese, and then to fine severely the marauders as well as those who shoot Brent Geese.

In Spitsbergen the Barnacle Goose is still more rare than the Brent. In its normal breeding-places on cliff-walls which are more or less inaccessible, they are usually well protected and as with the preceding species, this

bird also is protected by law all the year. But it happens that in some places they also breed on islands in the company of eiders and Brents. Such a place, among others, is Dunøyane and here they are exposed to the same plunderings as the other birds.

In Vestspitsbergen we have a rare species of gull and that is Sabine's Gull *(Xema sabini)*. This bird breeds, but perhaps not even yearly, in one or two pairs on this island. It is protected all the year, but it sometimes happens that a scientific expedition applies for permission to shoot the bird and to take its eggs. Such permission is not given.

Until 1950 Ross's Gull *(Rhodostethia rosea)* was unknown in Spitsbergen, but that year a single specimen was seen. A few years later it seems that the bird tried to breed at the radio-station at Kapp Linné in Isfjorden. The end of it was that the bird was shot and thrown away and the egg was not taken care of. It is to be hoped that this species will be protected within the Svalbard area and that it again will try to breed there with more success than the first time.

For other birds there does not seem to be any instant danger of extermination, but I would here sincerely request all scientists going to Spitsbergen to study birds, not only to spare and protect the above-named four species, but also all of those which similarly are rare and which have been found only a few times breeding within the area.

II. SPECIAL PART

Introduction to part II

To many readers the name Svalbard will be more or less unknown, but the correct signification is the following: Svalbard is a group name for all the islands in the Arctic Ocean placed under the sovereignty of Norway. The islands are situated between the latitudes 74° and 81° N and the longitudes 10° and 35° E.

The Svalbard area thus consists of Spitsbergen and the adjacent islands. Spitsbergen itself is made up of five big islands and a great number of small ones. The five big islands are: Vestspitsbergen (area 39,000 sq. km), Nordaustlandet (15,000 sq. km), Edgeøya (5,150 sq. km), Barentsøya (1,300 sq. km), and Prins Karls Forland (650 sq. km). The adjacent islands are: Kvitøya, Kong Karls Land, Hopen, and Bjørnøya. Together these cover a total area of 805 sq. km. The whole of Svalbard covers a total area of 24,946 square miles.

To be able to study the birds of an area successfully it is important to know where they can be found. If this knowledge is lacking, much valuable time will have to be spent in seeking the species in question, and in the Arctic, where the season is a very short one, every day is of importance.

I have therefore tried to show where the different species can be found, and accordingly the present paper deals mainly with the geographical distribution of the birds; but besides this, almost all published facts of interest, some of which are not to be found in print, are put down each in its special place under the different birds.

In the present part the information is given in the following order: Geographical distribution, Occurrence in Svalbard, Colour phases (if any), Birds in aberrant plumage, First records, Records without any special locality. The distribution in the Svalbard area, sections I—XIV, and Records from the sea around Svalbard.

The sections are: I Bjørnøya. II Hornsund. III Bellsund. IV Isfjorden. V Prins Karls Forland. VI Kongsfjorden. VII NW Spitsbergen. VIII Wijdefjorden. IX Hinlopen. X Nordaustlandet. XI Storfjorden. XII Kvitøya. XIII Kong Karls Land. XIV Hopen.

(At the end of the paper there is a map in the scale of 1 : 2,000,000 upon which the names and the numbers of the sections are impressed.)

Then come: Migration, General habits, Breeding, Food, Parasites.

For the common breeders and for a few others contour maps showing their distribution are to be found enclosed. The breeding-grounds are marked with filled circles, observations of single (or more) birds with open circles.

Apart from the geographical distribution, the paper is also intended to be a source of information on where the greater part of what is known about the birds of the area can be found.

In several of the many different books and papers dealing with Spitsbergen, there is so much written about the birds that it would be impossible to print even a small part of it. Each record is therefore (if possible) given with a reference.

Many valuable facts have been found in trappers' diaries. The trappers — and there have been many of them in the area — usually know the more common species very well indeed. They are wont to look for the birds when they return after the long period of darkness as harbingers of spring and better times. When they disappear in the autumn it is a sure sign of the coming winter. Therefore the trappers are keen to observe the first arrivals and also the departures.

During eight summers I have met many of these veterans in Spitsbergen. When they have been asked the name of a more common bird which we have seen simultaneously, the answer has unvaryingly been correct. When entering in their diaries which bird they have seen, they are most of them very conscientious, and one can find entries such as: "Saw a small bird which was not a Snow-Bunting."

Relatively few scientific expeditions have wintered in Spitsbergen, and of these only a few have had members who have been interested in birds. Because of this we have known little or almost nothing about the migration in these parts.

At Norsk Polarinstitutt in Oslo are kept a great number of trappers' diaries, partly originals and partly copies. These have seemingly been very little used until now.

Owing to the information on migration in these diaries, a great many facts have been found, and therefore, if the chapters on migration in this paper are found to be of value, it is primarily the trappers who should have the credit for it.

I hope to have found most of the printed papers and books in which the Spitsbergen birds are dealt with. There are, however, a few which I have not been able to get hold of, and besides, some which are printed in languages which render them useless. On the other hand, there are probably also papers which I have not heard of. I should be very thankful to be given information about such papers, which I am certain to have missed.

Even if this paper has its shortcomings, I hope that as a whole it will be able to give some valuable information on avifauna in the Arctic. At least it should be an advantage to get so many records collected together from different journals, books and papers, and have them printed in one volume.

References to books and papers are quoted in the following manner: (518 : 25), where the first number refers to the author's number in the bibliography and the second number to the page.

References to diaries and letters are quoted: (1956, 623) or (1925/26, 637). Here the year comes first and then the number in the bibliography.

Each bird has its own number, starting with No. 1,, except for the birds which are mentioned in the literature on Svalbard and which have never been found there. They have no number.

Acknowledgements

It would not have been possible for me to undertake to write this paper without the assistance and help which I have got from the University Library in Oslo.

Here I had a quiet work-room at my disposal, and at the same time. I had the use of the library's hundreds of volumes needful for my work. Besides, many books and papers which were difficult to obtain from abroad, I got as microfilms through the library.

I would like to thank the previous director, Mr. W. Munthe, the present director, Mr. H. L. Tveteräs, the head librarian, Mr. P. Kleppa, and the librarian, Mr. H. Fiskaa, superintendent of the reading room, for the excellent help and consideration which I have got during the years it has taken me to complete this paper.

I must also thank Mr. S. Richter, librarian of Norsk Polarinstitutt, for many valuable pieces of information, and also for his assistance in going through my paper for the correct spelling of the place-names, and for his help in reading the proofs.

I would also like to thank Mr. N. Blurton Jones for his correcting of the English in the present part of my paper. As an ornithologist who has been to Spitsbergen, he has been of invaluable help to me.

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The distributions of birds in the Svalbard area

In the literature dealing with the birds found in the Svalbard area, the present paper included, there are mentioned in all 110 species and races. However, of these, 17 species have never been found in the area.

Some of these 17 species have been mistaken for other birds, and some of the authors have not been ornithologists and have not known which bird they have seen. Some of the records are of course so old that the question of races had not yet arisen.

Table 4 shows the distribution of the birds in the 14 sections of the area (see map at the end of the paper).

The birds belong to the following orders and sub-orders:

Gaviformes: Four species. One is a common breeder, two have bred on Bjørnøya but not in Spitsbergen, and one species has never been recorded from Svalbard.

Podicipediformes: One species has been recorded once.

Table 4.

Name	Sections													
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
The birds for which there are no distinct localities are put down in the column marked Spitsbergen. Here the birds which have never been found in the area are put down with an O. B common breeder b rare breeder V visitor v rare visitor O never found	Spitsbergen	Bjørnøya	Hornsund	Bellsund	Isfjorden	Prins Karls Forland	Kongsfjorden	NW Spitsbergen	Wijdefjorden	Hinlopen	Nordaustlandet	Storfjorden	Kvitøya	Kong Karls Land	Hopen
Gavia immer		B	v	v?	v	v	v	v	v						
Gavia adamsi	O														
Gavia arctica		b				v									
Gavia stellata		B	B	B	B	B	B	B	B	B	B	B		B	v
Podiceps griseigena	v														
Diomedea melanophrys	v														
Procellaria grisea		v													
Fulmarus glacialis		B	B	B	B	B	B	B	B	V	B	B	V	V	B
Sula bassana	v														
Phalacrocorax carbo	O														
Ardea cinerea					v										
Anas plattyrhynchos											v				
Anas crecca		v	v		v		b								
Anas penelope		v			v										
Anas acuta		v			v		b								
Anas querquedula	O														
Aythya fuligula		v													
Aythya marila		v		b?											
Clangula hyemalis		B	B	B	B	B	B	B	V	v	v	B		v	
Histrionicus histrionicus					v										
Melanitta fusca				v	b?				v			v			
Melanitta nigra		b		b			v								
Somateria mollissima		B	B	B	B	B	B	B	B	B	B	B	B	B	B
Somateria spectabilis		v	B	B	B	v	B	V	v	v		b		v	
Mergus merganser		v									v				
Anser anser	O														
Anser fabalis	O														
Anser f. brachyrhynchus		V	B	B	B	B	B	B	B	B		B		v?	V
Anser hyperboreus	O														
Branta b. bernicla	O														
Branta b. hrota		V	B	B	B	B	B	B	B	b	B	B		V	V
Branta leucopsis			B	b	B		v		b?		v				
Cygnus cygnus						v									
Cygnus bewickii		v?			v?						v				
Falco rusticolus islandus	O														
Falco rusticolus candicans			v	v	v				v	v					
Falco columbarius aesalon	v														
Falco tinnunculus	v														

Name	Sections													
The birds for which there are no distinct localities are put down in the column marked Spitsbergen. Here the birds which have never been found in the area are put down with an O. B common breeder b rare breeder V visitor v rare visitor O never found		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
	Spitsbergen	Bjørnøya	Hornsund	Bellsund	Isfjorden	Prins Karls Forland	Kongsfjorden	NW Spitsbergen	Wijdefjorden	Hinlopen	Nordaustlandet	Storfjorden	Kvitøya	Kong Karls Land	Hopen
Lagopus mutus hyperboreus		b	B	B	B	B	B	B	B	B	B	B			**v**
Rallus aquaticus			v												
Haematopus ostralegus		v			v										
Vanellus vanellus		v													
Pluvialis a. altifrons		v	v	v	v										
Eudromias morinellus												v			
Charadrius hiaticula		v	v	v	b	v	b	b	v	v	b			v	
Arenaria interpres		V	v	v	B	v	B	B	v		v	v			**v**
Gallinago media						v									
Scolopax rusticola				v	v										
Numenius phaeopus		v		v	v			v							
Tringa totanus		v			v										
Actitis hypoleucos	O														
Actitis macularia	v														
Calidris canutus					v			b				v			
Calidris maritima		B	B	B	B	B	B	B	B	B	B	B		B	**B**
Calidris minuta	O														
Calidris alpina		v	v		b	v	v					v			
Crocethia alba			v	v	b	b	v	b	v		v	v			
Phalaropus fulicarius		B	B	B	B	B	B	B	V	V	B			v	
Phalaropus lobatus					b										
Catharacta skua		v	v	v			v		v		v			v	
Stercorarius pomarinus		v	v	v	v	v	v	v		v	v	v		v	**v**
Stercorarius parasiticus		B	B	B	B	B	B	B	B	B	B	B	v	B	**B**
Stercorarius longicaudus		v	v	V	B	v	b	v	V	v	v	v	v	v	
Larus hyperboreus		B	B	B	B	B	B	B	B	B	B	B	V	B	**B**
Larus marinus		b	b	b?	v	b									
Larus fuscus		v													
Larus argentatus		b	b?												
Larus glaucoides	O														
Larus canus		v													
Xema sabini			v		v	v	b		v?		b?	v			
Rhodostethia rosea					v										
Pagophila eburnea		V	b	V	b	V	V	b	V	b	B	b	B	B	**v**
Rissa tridactyla		B	B	B	B	B	B	B	B	B	B	B	V	B	**B**
Sterna hirundo	O														
Sterna paradisaea		B	B	B	B	B	B	B	B	B	B	B	B	B	

Name	Sections													
The birds for which there are no distinct localities are put down in the column marked Spitsbergen. Here the birds which have never been found in the area are put down with an O. B common breeder b rare breeder V visitor v rare visitor O never found	I	II	III	IV	V	VI	VII	VIII	IX	X	IX	XII	XIII	XIV
	Spitsbergen	Bjørnøya	Hornsund	Bellsund	Isfjorden	Prins Karls Forland	Kongsfjorden	NW Spitsbergen	Wijdefjorden	Hinlopen	Nordaustlandet	Storfjorden	Kvitøya	Kong Karls Land	Hopen
Alca torda pica		b			v	b?								
Alca impennis	O													
Plautus alle		B	B	B	B	B	B	B	B	B	B	B	v	v	B
Uria aalge aalge	O													
Uria aalge hyperborea		B												
Uria lomvia		B	B	B	B	B	B	B	V	B	B	B		V	B
Cepphus grylle atlantis	O													
Cepphus grylle mandtii		B	B	B	B	B	B	B	B	B	B	B	v	B	B
Fratercula a. arctica		B													
Fratercula a. naumanni		v	B	B	B	B	B	B	V	B	B	V			V
Columba palumbus		v													
Nyctea scandiaca			v	v	v	v	v	v	v		v	v			v
Apus apus	v														
Upupa epops	v														
Eremophila alpestris flava			v		v										
Hirundo rustica		v	v		v										
Delichon urbica		v	v		v?										
Corvus corax		v?			v										
Corvus corone corone	O														
Corvus corone cornix		v	v	v?	v										
Corvus frugilegus			v?												
Turdus pilaris			v	v	v		v					v			
Turdus i. iliacus			v	v	v		v					v			
Turdus i. coburni		v?													
Turdus merula		v			v		v								
Oenanthe oenanthe		v	v	v	b		v								
Anthus spinoletta		v													
Motacilla alba		v													
Sturnus vulgaris		b?					v								
Carduelis flammea		b?													
Carduelis hornemanni								b?							
Loxia curvirostra		v													
Emberiza citrinella		v													
Calcarius lapponicus	O														
Plectrophenax nivalis		B	B	B	B	B	B	B	B	B	B	B		B	B

Procellariiformes: Three species. One is a common breeder and the other two have one record each.

Pelecaniformes: Two species. One has one record, the other has never been found in the area.

Ciconiiformes: One species has been recorded once.

Anseriformes: 23 species and races. For six of them there are no reliable records. Six are regular breeders, three have bred once each, two have probably bred, and the rest are visitors.

Falconiformes: Four species and races. One is a rare visitor, for two there is one record for each, and one has never been found.

Galliformes: One species is a common breeder.

Ralliformes: One species has been recorded once.

Charadriformes: Sub-order Charadrii: 19 species. For two of them there are no reliable records. Two are common breeders, five are rare breeders, one is probably breeding, and nine are more or less rare visitors.

Sub-order: Lari. 16 species. For two of them there are no reliable records. Five are common breeders, four are rare breeders and four species are visitors.

Sub-order Alcae: 10 species and races. For three of them there are no reliable records, and seven are breeders.

Columbiformes: One species has been recorded once.

Strigiformes: One species is a common visitor.

Apodiformes: One species has been recorded once.

Coraciiformes: One species has been recorded once.

Passeriformes: 21 species and races. For two species there are no reliable records. One species is a common breeder, and one is a rare breeder. Two species are probably breeding and the rest are more or less rare visitors.

Of these 93 species and races which have been recorded within the Svalbard area, 45 or a little less than 50 per cent are breeders or probably breeders.

Twenty-six species are common breeders in one or more sections. Five species are supposed breeders, but until now there is no direct proof of breeding, as neither eggs nor young have been obtained for identification.

Of the rest, 14 species, some breed regularly in small numbers and others have been found breeding only once or twice.

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The birds

No. 1. *GAVIA IMMER* (Brünn.)

The Great Northern Diver

Geographical distribution

The species breeds in Iceland, probably on Jan Mayen, in Greenland and in N America. In winter it occurs in the North Sea, and occasionally also in the Baltic and in the Channel, the W Mediterranean and the Atlantic.

The birds found in Svalbard therefore belong to the extreme east of the distribution area.

Occurrence in Svalbard

The species breeds on Bjørnøya. In Spitsbergen it has been observed all along the west coast of Vestspitsbergen up to the NW corner and then along the north coast to Wijdefjorden.

It has never been found breeding there, but it is only a question of time before this will happen.

First records

The first records of the species from Spitsbergen are by Phipps (23 : 187), Pennant (24 : 518), Laing (31 : 114) and Scoresby (40 : 533).

Since Phipps does not mention the Red-throated Diver, which he must most certainly have seen, he probably mistook *Gavia stellata* for the Great Northern Diver. Pennant also fails to mention the Red-throated Diver, and presumably he also made the same mistake. Laing, although he does not mention *G. stellata,* gives a good description of *G. immer.* He concludes by giving its weight as 16 lb., i. e. about 7260 grams, which is far too much, as the bird weighs only about 4000 grams. The smaller species, however, reaches only 1400 grams at the highest; but from the description it seems likely that the bird Laing saw was indeed *Gavia immer.*

Scoresby also mentions only the larger species, but as the Great Northern Diver is a rare bird and the Red-throated Diver is very common, it is likely that he also saw only the smaller species. Malmgren (85 : 122) and le Roi (316 : 270) are also of this opinion.

The first reliable record from the Svalbard area is from Bjørnøya in 1882, and the bird was found breeding there in 1923.

In the Spitsbergen seas it was observed for the first time in 1900, when a specimen was seen on the sea, somewhere west of Hornsund.

Distribution. Sections I–VIII

Section I. Bjørnøya. — On Bjørnøya the Great Northern Diver was observed for the first time in 1882 and it was first found breeding there in 1923. Since that year it has been present in varying numbers, and was still breeding there in 1958.

Section II. Hornsund. — In this district the species has been seen on the sea outside the fjord Hornsund and also on a small lake on the coast just south of the entrance to the fjord.

Section III. Bellsund. — There is one uncertain record for Bellsund from 1882. One specimen was seen on Botnesjøen, N of Storvika on the west coast, S of Kapp Lyell in 1956.

Section IV. Isfjorden. — The bird has been seen in the lake Linnévatnet near the entrance to Isfjorden on two occasions.

Section V. Prins Karls Forland. — There is only one record, from the western shore.

Section VI. Kongsfjorden. — The species has been seen once, in Lilliehöökfjorden, a branch of Krossfjorden.

Section VII. NW Spitsbergen. — The bird was seen at the mouth of Magdalenefjorden in 1910.

Section VIII. Wijdefjorden. — Great Northern Divers have been seen on several occasions in the district between Femmilsjøen and the lakes east of Dirksodden in this fjord.

Biological

General habits. — In the Svalbard area the Great Northern Diver seems to prefer lakes where there are fish. On Bjørnøya there are Arctic Char (*Salvelinus alpinus*) in most of the lakes, but in Spitsbergen only a few of the lakes contain fish. This, and the fact that the lakes on Bjørnøya become ice-free earlier than those in Spitsbergen, may explain why the species is more common on Bjørnøya than in Spitsbergen

For breeding purposes the birds prefer a lake with islands in it; and they very rarely build on the shore. Having found a suitable lake, a pair will remain there from the moment it becomes ice-free until the autumn. During this period they will fly from one place to another, visiting other lakes, but they will always return to their home lake.

During the incubation period they are very shy and it is impossible to approach the nest even from a great distance without the sitting bird leaving it. During the summer of 1958 on Bjørnøya it was impossible to reach a point nearer than 500 metres from the nest. From this distance the sitting bird could be observed through field glasses, but if one attempted to come closer it would at once dive from the nest.

A breeding pair of Great Northern Divers remain absolutely silent when their breeding-ground is approached. This is in contrast to the behaviour of non-breeding birds, which begin to call as soon as intruders near their lake and continue calling for a considerable time. After such a disturbance the birds may fly away to another lake.

The birds on Bjørnøya, which were found far away from the meteorological station, were evidently without fear of man, for they came swimming close to the shore to examine the party which visited their lake.

Later in the summer the birds used to fly out to sea, probably to fish. But then they went singly and not in twos or threes as they did on visiting trips between the lakes.

B r e e d i n g. — The Great Northern Diver was first found breeding in the Svalbard area on 18 July 1923, when Olaf Hansen found a nest with a bird sitting on two large eggs on the shore of a lake on Bjørnøya. The nest was built of moss, and the eggs were of a dark grey colour (393 : 254). Johnsen says that only one egg was taken, and this is now in the possession of the University in Bergen. According to Johnsen the lake is called Lomvatnet (505 : 14).

Bertram and Lack found one pair with a newly hatched chick on one of the central lakes on 20 July 1932. The nest was situated on an islet. Another pair was seen on a big lake on 22 June. In this lake there were no islands and the nest was found on an islet in an adjacent pond, this pond being only thirty-five yards in diameter and six feet deep. The young hatched on 30–31 July (488 : 294).

There is no concrete evidence that the Great Northern Diver has ever bred in Spitsbergen, although in one or two instances there is circumstantial evidence that it may have done so.

On the south side of Hornsund and not far from Camp Erna, Kristoffersen found a lake with an islet, and on this lake a Great Northern Diver was observed throughout the autumn of 1923. Kristoffersen thought it probable that there was a pair of birds in the area which had their nest on the islet (432 : 190).

Longstaff saw three birds on a lake near Dirksodden in Wijdefjorden on 16 August 1923. They behaved as a family and he judged the smallest bird to be in its second year (407 : 484). As the Great Northern Divers have been found on lakes in this district on several occasions it is very likely that they have bred here, or will do so in the future.

Løvenskiold found two pairs of divers on Bjørnøya in 1958. One pair which arrived on Laksevatnet shortly after the ice had disappeared on 23 June, consisted of a male Great Northern Diver and a female Black-throated Diver (*Gavia arcticus*). The other pair was found in Holmevatnet, south of Laksevatnet, but no nest was found (1958, 633).

On 2 July the female Black-throated Diver began to build on the eastern of the two islets in Laksevatnet. Although she was assisted by the male, the female seemed to do most of the work. On the 6th the male bird was seen sitting, and after about 15 minutes he was relieved by the female. Only one egg was laid and since it was known not to have been present on the 3rd it must have been laid on the 4th or the 5th. On the 11th a fox waded over to the nest and ate the egg, and no new nest was made.

F o o d. — In one instance Bertram and Lack found a beak-marked Arctic Char close to a diver's nest on Bjørnøya (488 : 294).

Summerhayes and Elton say that the diver presumably fishes for the Arctic Char in the lakes near Dirksodden in Wijdefjorden. One would expect, however, that the bird would fish principally in the sea, as does the Red-throated Diver (450 : 237).

GAVIA ADAMSI (Gray)

The White-billed Northern Diver

This species is said to occur in Spitsbergen by Pennant (24 : Vol. 2, 518).

Cocks saw a large diver in Spitsbergen in the autumn 1882 (151 : 399, 400), and Saunders, in a footnote to Trevor-Battye's paper, says that this bird was probably *G. adamsi* (203 : 600).

Zedlitz thought that he saw a specimen on the sea near the island Amsterdamøya on 5 August 1910, but he was not able to get closer than 150 metres to the bird (319 : 300). To see the colour of the bill at that distance would be very difficult.

There is thus no really reliable record of *G. adamsi* from the Svalbard area, and the records quoted here probably refer to the Great Northern Diver.

No. 2. *GAVIA ARCTICA ARCTICA* (L.)

The Black-throated Diver

In 1860 Walker stated that the Black-throated Diver was an inhabitant of Spitsbergen, but at that time there was no proof of the bird having been found there (75 : 66).

Cocks thought that he saw one pair of Black-throated Divers in Grønfjorden on 8 September 1882 (151 : 399, 400, 408), and (153 : 15) another pair some days later in Sassenfjorden but as he did not shoot any of the birds, there is no real proof of their identity. Nevertheless, his observation may have been correct, for Mr. Klerk, Sheriff of Elvenes in Sørvaranger, told him in the summer of 1883 that some years previously he had shot a specimen of this bird in Spitsbergen.

In 1921, on 30 June, Jourdain saw a Black-throated Diver on Richardlaguna, Prins Karls Forland. The bird remained for 20 minutes before flying off. It was also watched by S. Gordon, D. Brown and H. Paget Wilkes, using powerful field-glasses (381 : 168).

In this case there seems to be no doubt of the identity of the bird, and this therefore must be counted as the first record for Spitsbergen.

In 1948 Duffey and Sergeant saw an adult Black-throated Diver in summer plumage near Rifleodden on Bjørnøya on 10 August (586 : 558). This is the first record for Bjørnøya.

In 1958 Løvenskiold found a female *Gavia arcticus* mated to a *G. immer* in Laksevatnet on Bjørnøya. The pair built a nest and one egg was laid but was not hatched (see *G. immer*) (1958, 633).

No. 3. *GAVIA STELLATA* (Pontopp.)[1]

The Red-throated Diver

Geographical distribution

The Red-throated Diver breeds in Iceland, (not on Jan Mayen), the Færoe Islands, Svalbard, Franz Josef Land, Norway, Sweden, Finland, N Russia, Kolguev and Novaya Zemlya, in Asia across N Siberia to Kamtschatka and Commander isl., Kurile isl. and Aleutian isl., and in America from Alaska to Labrador and Newfoundland. It also breeds in Greenland.

Occurrence in Svalbard

The species breeds in all districts of the Svalbard area, with exception of Kvitøya, where it has never been found. Neither does it breed on Hopen, but there it has been seen twice.

First records

Although Captain Phipps mentions only *Gavia immer* as occurring in Spitsbergen and does not mention *G. stellata* at all (23 : 187), the bird he saw there was probably the Red-throated Diver, for the Great Northern Diver is very rare in the area.

Parry includes *G. stellata* in his list of Spitsbergen birds, but does not say where and when he saw the species (46 : 197).

Distribution. Sections I–XIV

Section I. Bjørnøya. — The Red-throated Diver was first recorded from the island in 1827 and was found breeding there in 1891. It is now a common breeder in the northern part of Bjørnøya.

Section II. Hornsund. — In the Hornsund district it breeds both on the mainland and on the islands Sørkappøya, Tokrossøya, Dunøyane, and Isøyane.

Section III. Bellsund. — The species breeds in several places south of Bellsund, from Storvika to Kapp Lyell, also on Akseløya and on the many tarns and lakes at Kapp Martin.

Section IV. Isfjorden. — The bird has been seen in almost every part of the fjord and in suitable places it has been found breeding. The breeding-places are in Sassendalen, in Gipsdalen, on Gåsøyane, in Dicksonfjorden, Ekmanfjorden, on Bohemanneset and on Hermansenøya in Forlandsundet.

Section V. Prins Karls Forland. — The bird breeds both on Forlandet and on Forlandsøyane.

Section VI. Kongsfjorden. — The Red-throated Diver breeds in and near Ny-Ålesund, but not on the islands Lovénøyane and Gerdøya, where there are no tarns. It breeds on Blomstrandhalvøya on the north side of the fjord and at Kapp Guissez at the entrance to Krossfjorden. Inside Krossfjorden

[1] Contour map showing distribution, see backflap. (On the map *Colymbus stellatus*)

it is known to breed on the string of lakes between Signehamna and Dieset-vatnet on the coast north of Kapp Mitra.

Section VII. NW Spitsbergen. — In the NW corner of Spitsbergen the species has been observed in a great many places, but no nests have been found west of Biskayerhuken, though it must obviously breed somewhere in this area. It breeds on Jermaktangen, in Breibogen and probably on the northern part of Reinsdyrflya. In Liefdefjorden there are many breeding pairs both on the mainland and on the islands, and the bird also breeds in Bockfjorden. Other breeding-places are the island Moffen, and Gråhuken between Liefdefjorden and Wijdefjorden.

Section VIII. Wijdefjorden. — The species breeds on Bjørnnes-holmen, on the lakes in the vicinity of Dirksodden and the lagoon in Mosselbukta as well as on the lakes and tarns around this bay. In 1957 Red-throated Divers were seen at Austfjordnes and on one of Gyllensköldholmane.

Section IX. Hinlopen .— The species breeds in Sorgfjorden and on the islands in the strait.

Section X. Nordaustlandet. — Where the coast is ice-free in summer the species has been seen in many places on Nordaustlandet, and scattered pairs also breed there. The breeding-places are Oxfordhalvøya in Wahlenbergfjorden, Wahlenbergøya, Sparreneset in the western part of the island, the islands in Murchisonfjorden, the head of Rijpfjorden, and on Storøya.

Section XI. Storfjorden. — In this district the bird breeds in the following places: In Ginevrabotn, in many of the freshwater tarns on Edgeøya, on the island Delitschøya in Tjuvfjorden, on Halvmåneøya, Tusenøyane and on Ryke Yseøyane.

Section XIII. Kong Karls Land. — The bird breeds on Kongsøya.

Section XIV. Hopen. — One bird has been shot on the island, and another was seen there in June 1956.

Biological

Migration. — The Red-throated Divers arrive in Spitsbergen during the second half of May, the first record being for the 18th. If at that time snow still covers the ground, and the lakes and ponds are frozen, their arrival is delayed and frequently the birds are not able to move into their breeding-grounds until the middle of June.

The available records of the spring migration are as follows: The trapper Normann Andersen saw the first diver of the year on 18 May 1937 on the NE side of Prins Karls Forland (1936/37, 634). The trapper Arthur Oxaas saw the divers at Kapp Wijk in Dicksonfjorden (Isfjord) on 22 May 1938 (1937/38, 643). Kristoffersen states that in 1930 the spring migration at Sørkapp (south point of Spitsbergen) began on 25 May and lasted for about a week (472 : 257). Peder Åm, caretaker for the Kings Bay Kull Company, saw the first diver in Kongsfjorden on 26 May 1937 (1936/37, 646). Glen relates that in 1936 the first divers arrived at Russøyane in Murchisonfjorden, Nordaustlandet on 2 June (520 : 299). In 1927 the trapper Alfred Svendsen heard the first diver at Verlegenhuken (between Wijdefjorden and Hinlopenstretet) on

30 May, and he first saw one on 12 June (1926/27, 644). Walter says that in 1889, the first diver of the year arrived at Kraussbukta on 31 May. The bird was alone until 2 June, when a female bird arrived and settled in the same place (169 : 243). The trapper Arthur Oxaas records that in 1926 the divers arrived at Flathuken at the entrance to Raudfjord on 31 May (1925/26, 643). The trapper Mikael Olsen saw the first diver in Bellsund on 4 June 1918 (1917/18, 642 b). Kristoffersen states that in 1924 the first diver arrived in Hornsund very late. The lakes remained ice-covered for a long time and the first diver was not heard until 17 June (432 : 190). The trapper Børre Trøhaug shot a diver on Hopen on 18 June 1935 (1934/35, 645).

The Red-throated Diver usually remains in the Svalbard area far into the autumn, being driven away in many instances only when the ice begins to cover the sea. Most of the birds usually begin to move away southwards in September, but they may stay until the first days of October. Montague says that in Wahlenbergfjorden on Nordaustlandet many divers had already migrated by the beginning of September (433 : 141).

Jung found that the autumn migration took place at the beginning of September in the NW corner of Spitsbergen in 1936 (539 : 127). The trapper Georg Bjørnnes saw some divers on 2 September 1927 at Austfjordnes in Wijdefjorden (1927/28, 636). Cocks shot one diver in Grønfjorden on 9 September 1882, and relates that Lieutenant Stjernspetz shot one at Kapp Thordsen in Isfjorden the following day (151 : 400). Munsterhjelm relates that on 15 September 1910 he saw the last divers of the year in Recherchefjorden in Bellsund (313 : 37). Heuglin says that the divers left Zieglerøya in Tjuvfjorden (Edgeøya) in the days before 5 September, 1870. On the 10th he saw a young diver which was still unable to fly, although it was fully feathered (123 : 254). Kristoffersen relates that the last divers disappeared from Hornsund in the first days of October, 1923 (432 : 190).

G e n e r a l h a b i t s. — If the lakes and tarns are still frozen when the birds arrive in the Svalbard area, they remain on the sea until the ice on their nestingplaces has at least begun to thaw.

If conditions are favourable for them, the Red-throated Divers will nest almost anywhere in the Svalbard area. They prefer to nest on stretches of open flat land with lakes, tarns, and ponds.

This kind of landscape is found on the low, flat islands along the shores. In many places there are also low forelands of considerable size between the coast and the mountains, and in several of the big valleys.

The divers are sometimes found on the larger lakes and on tidal lagoons, several of which are very large, but for their nesting habitat they seem to prefer small tarns and ponds.

In most cases the birds breed in isolated pairs, but on lakes several pairs may breed quite close together. In Spitsbergen, however, the birds have never been observed to form a large colony, although this has been known to happen in Norway. Collett, for example, saw such a colony on Store Tamsø in Porsangerfjorden (Finnmark), where there were 15 nests in 1873 (142 : 220).

Løvenskiold relates that the Red-throated Diver is usually a very shy bird,

and will almost always leave its nest when it is approached. Sometimes, however, the bird will flatten on the nest with its neck and head stretched low and far out. Under these conditions it will not leave the nest until the intruder is very close (615 : 48).

The behaviour of the bird in Spitsbergen is described by van Oordt and Huxley. Once one of them went up to a diver covering on its nest, and pushed the bird with his foot. The bird then attacked his boot in the most furious manner (386 : 34–46).

Montague records a very singular piece of behaviour by a Red-throated Diver. In Liefdefjorden the bodies of seventeen Little Auks were thrown overboard and drifted away on the tide, whereupon a diver mounted guard over them and without attempting to eat them itself, drove off every Fulmar, Gull, or other scavenger which came near (433 : 141).

The Red-throated Diver is even capable of diving directly from the air into the water (Løvenskiold 615 : 50).

Since there are no fish in the tarns and ponds on which they nest, they have to go to sea to feed.

The birds have been noted as staying in Spitsbergen until the lakes and even the fjords are frozen. Munsterhjelm, who was staying in Recherchefjorden in the autumn of 1910, saw the divers fly out towards the sea and disappear on 15 September, when the ice covered the innermost part of the fjord (313 : 37).

B r e e d i n g. — The Red-throated Diver gives a conspicuous courtship display. Among papers on this subject from the Svalbard area, that of Huxley is the most important. He studied the divers on Prins Karls Forland in 1921, and describes both pre-mating and post-mating activities (394 : 253–292).

Løvenskiold describes a post-nuptial display which took place as late as 6 August (615 : 51). Van Oordt has described the behaviour at the nest (459 : 227).

Divers nesting on small ponds and tarns usually breed separately, one pair on each pond. On lakes several pairs can nest together, but each pair has its own territory, containing both the new nest and several old ones.

A nest built on the shore is often very shallow, and it may be nothing more than a depression in the turf, placed so near to the water's edge that the bird can glide into the water. If, on the other hand, it is placed at some distance from the shore in the shallow water, it is, as a rule, a much higher structure, built up from the bottom of the pond with pieces of peat and moss. The nest then resembles a cut-off cone, often of a considerable height.

Sometimes it happens that the nest is built when the pond is filled to overflowing with water from spring thaw, so that when the water-level falls, the nest is left high and dry. Under such circumstances the bird will have to walk some distance to reach the nest, and for a diver this is a very difficult task.

Periodically, as with many other arctic species, the divers will go through a season without breeding. It seems, however, that when they fail to nest in one district, they continue to breed in normal numbers in another not far away.

There is of course the danger of mistaking belated egg-laying for a non-breeding period. When Kolthoff visited Forlandsøyane on 26–28 June 1900,

none of the divers had eggs in their nests, but this was because the ponds were frozen and egg-laying correspondingly belated (250 : 63). On Kong Karls Land, however, in the summer of 1898, no nests were found, although there were many divers present (261 : 78).

On Bjørnøya in 1900 the lakes were frozen until the end of July. Hencking, who stayed there in July–August, saw single birds during the first few days of August, but there were no pairs there and he found no nests (249 : 75). Glen says that in 1936 divers bred in normal numbers around Murchisonfjorden on Nordaustlandet, although other birds, including Brent Geese and Eiders, were not breeding (520 : 201) and (521 : 304).

In 1950 Løvenskiold found a large number of divers on Sørkapplandet south of Hornsund, but from 14 July until 2 August no nest with eggs was found and not a single young bird was seen. On Dunøyane north of Hornsund, which were visited on 5 August, the divers were breeding in normal numbers (615 : 49).

Since the nesting of the Red-throated Diver depends on climatic conditions (how long tarns and lakes are frozen), the egg-laying season covers a considerable span of time.

The earliest record of egg-laying is for 16 June. At least 13 nests with eggs have been recorded in June, 32 in July and only 5 in August.

Under these circumstances breeding therefore can begin as early as the second half of June and in years when the spring is late, be delayed until the beginning of July. The Red-throated Diver can also lay very late in the year. A single egg in a nest found on 1 August (Løvenskiold 615) was taken by an Arctic Skua, and the remains in the shell (after the bird was chased away) showed that it had not been very near hatching. Presumably, therefore, it could not have been laid much earlier than 15 July. In a nest found by Zeppelin on 20 August 1891, one egg was addled, the other on the point of hatching. These eggs may therefore have been laid as late as 25 July (179 : 156).

At Kapp Martin in Bellsund on 20 August 1948 Løvenskiold found a diver sitting on a nest which contained a roundish stone (615 : 51).

The earliest date for hatching is about the middle of July. Two broods of chicks, perhaps 8 days old, have been found on the 14th. The date of egg-laying being very variable, there is a corresponding degree of variability for the date of hatching, which sometimes does not occur until autumn; a newly hatched chick was once seen as late as 20 August.

Between these dates, 14 July and 20 August, there are, in all, 38 records of broods with one, two and, in one instance, three chicks, varying in age from newly hatched to young birds some weeks old. Of these records 18 are from July and 20 from August.

In addition there are some records without any dates: Chydenius found the species breeding in Wijdefjorden in 1861 (89 : 317). Römer and Schaudin found breeding divers on Bjørnøya, Kong Karls Land and on Storøya in 1898 (245 : 80). Dalgety et coll. found them breeding on Reinsdyrflya and in Liefdefjorden in 1930 (470 : 248). Longstaff found breeding divers on the island Moffen in July 1921 (597 : 256), and Glen on Nordaustlandet in 1936 (521 : 304).

Table 5

Egg-laying

Date	No. of nests	No. of eggs	Condition	Place	Author
16 June 1930	many	many	fresh	Sørkapp Land	Kristoffersen (472: 257)
17 June 1921	many	many	fresh	Bjørnøya	Summerhayes and Elton (397: 224)
21 June 1936	1	1	fresh	Nordaustlandet	Keith (523: 73)
23 June 1931	many	many	fresh	Isfjorden	Tomkinson (485: 84)
23 June 1936	1	1	fresh	Nordaustlandet	Godfrey (529: 170)
26 June 1907	1	1	fresh	Forlandsøyane	Le Roi (316: 267)
26 June 1908	1	1	fresh	Dunøyane	Le Roi –»–
27 June 1908	1	2	fresh	Dunøyane	Le Roi –»–
27 June 1898	1	?		Bellsund	Kolthoff (261: 79)
28 June 1954	1	2	fresh	Sassendalen	Løvenskiold (1954, 633)
29 June 1930	1	1	fresh	Sørkappøya	Kristoffersen (472: 257)
29 June 1954	1	2	fresh	Sassendalen	Løvenskiold (1954, 633)
29 June 1956	1	1	fresh	Kongsfjorden	Løvenskiold (1956, 633)
30 June 1921	1	1	fresh	Isfjorden	Van Oordt (370: 149)
30 June 1931	1	2		Liefdefjorden	Tomkinson (485: 85)
1 July 1930	1	1		Sørkappøya	Kristoffersen (472: 257)
1 July 1954	1	2		Isfjorden	Løvenskiold (1954, 633)
3 July 1908	1	1		Bjørnøya	Le Roi (316: 267)
3 July 1910	4	2	fresh	Forlandsøyane	Munsterhjelm (313: 37)
3 July 1910	1	2	slightly incubated	Forlandsøyane	Munsterhjelm –»–
3 July 1931	many	?		Isfjorden	Tomkinson (485: 85)
4 July 1954	1	2		Isfjorden	Løvenskiold (1954, 633)
5 July 1891	1	1		Forlandet	Feilden (189: 89)
9 July 1906	1	2		Isfjorden	Dietrich (269: 132)
9 July 1954	1	2		Wijdefjorden	Løvenskiold (1954, 633)
15 July 1899	1	1		Sørkappøya	Bianchi (253: 329)
15 July 1869	1	?		Halvmåneøya	Lamont (139: 336)
16 July 1952	1	1		Dunøyane	Løvenskiold (615: 50)
16 July 1952	1	2		Dunøyane	Løvenskiold –»–
17 July 1896	2	not laid		Isfjorden	Trevor-Battye (203: 600)
17 July 1907	1	2		Bjørnøya	Le Roi (316: 267)
21 July 1948	1	2		Isfjorden	Løvenskiold (615: 52)
21 July 1949	3	2		Liefdefjorden	Løvenskiold –»–
21 July 1956	1	1		Kongsfjorden	Løvenskiold (1956, 633)
25 July 1950	1	1		Sørkappøya	Løvenskiold (615: 49)
27 July 1949	1	2		Bockfjorden	Løvenskiold (615: 53)
29 July 1956	1	1		Forlandsøyane	Løvenskiold (1956, 633)
30 July 1948	1	1		Bjørnøya	Duffey and Sergeant (586: 558)
30 July 1898	1	2		Bjørnøya	Richard (244: 68)
31 July 1923	1	1		Hinlopen	Longstaff (407: 484)
6 Aug. 1882	1	2	well incubated	Forlandsøyane	Cocks (153: 18)
10 Aug. 1923	1	2		Nordaustlandet	Longstaff (407: 484)
10 Aug. 1948	1	2	slightly incubated	Isfjorden	Løvenskiold (615: 52)
20 Aug. 1892	1	2	pt. of hatching	Kongsfjorden	Zeppelin (179: 156)

Table 6
Hatching

Date	No. of chicks	Age	Place	Author
14 July 1956	4	about 8 days	Forlandsøyane	Løvenskiold (1956, 633)
16 July 1930	2	just hatched	Tokrossøya	Kristoffersen (472: 257)
16 July 1952	2	just hatched	Dunøyane	Løvenskiold (615: 50)
17 July 1921	2		Sassendalen	Jourdain (381: 169)
19 July 1870	2	just hatched	Isøyane	Heuglin (132: 156)
22 July 1948	1	just hatched	Bjørnøya	Duffey and Sergeant (586: 558)
24 July 1956	7	just hatched	Hermansenøya	Løvenskiold (1956, 633)
27 July 1954	5	just hatched	Mosselbukta	Løvenskiold (1954, 633)
27 July 1911	2	about 14 days	Krossfjorden	Mathey-Dupraz (333: 109)
28 July 1956	2	just hatched	Forlandet	Løvenskiold (1956, 633)
29 July 1956	4	4–6 days	Forlandsøyane	Løvenskiold –»–
30 July 1889	1	big as a Moor-hen	Ryke Yseøyane	Walter (169: 243)
30 July 1952	1	just hatched	Dunøyane	Løvenskiold (615: 50)
31 July 1927	1	a few days old	Edgeøya	Dalgety (442: 28)
1 August 1864	2	just hatched		Malmgren (92: 402)
1 August 1921	1	just hatched	Isfjorden	Van Oordt (370: 150)
4 August 1899	4	2–3 days	Bjørnøya	Swenander (247: 32)
4 August 1899	2	8 days	Bjørnøya	Swenander –»–
5 August 1952	6 single	from half-grown to almost grown	Dunøyane	Løvenskiold (615: 50)
8 August 1864	1		Storfjorden	Newton (96: 517)
8 August 1891	2	several weeks	Bjørnøya	Zeppelin (179: 57)
8 August 1910	0	none hatched	Kongsfjorden	Zedlitz (319: 301)
11 August 1949	1	2 days	Bellsund	Løvenskiold (615: 48)
12 August 1923	2		Nordaustlandet	Longstaff (407: 484)
13 August 1927	many	just hatched	Wijdefjorden	Bjørnnes (1927/28, 636)
15 August 1936	3, one brood	in down	Wijdefjorden	Jung (539: 127)
17 August 1899	2		Storfjorden	Birula (298: 170)
19 August 1948	1		Bellsund	Løvenskiold (615: 51)
20 August 1952	1	just hatched	Kapp Borthen	Løvenskiold –»–
24 August 1882	2	almost fledged	Isfjorden	Nathorst (155: 63)
24 August 1927	1	fledged	Edgeøya	Dalgety (442: 140)

Römer and Schaudin say that the clutch-size of the Red-throated Diver is 2–3. This has been denied by competent ornithologists. Normally there are not more than 1 or 2 eggs in a clutch, but it cannot be completely denied that clutches of 3 do occur. Jung found an adult bird with 3 young in 1936, and he writes: "In the middle of August an adult diver with 3 downy young swam on a small lake near the entrance to Wijdefjorden" (539 : 129).

According to The Handbook of British Birds, there are normally 2 eggs. Exceptionally and in late laying there is only 1, and 3 are recorded only rarely (583 Vol. IV : 126).

F o o d. — In Spitsbergen and on Bjørnøya there are some lakes which are so deep that they do not freeze to the bottom in winter-time. Provided they are not too high above sea level, the Arctic Char (*Salvelinus alpinus*) will go up the rivers and become inhabitants of these lakes.

When the Red-throated Diver is nesting on or near such a lake, it will of course fish there, but such deep lakes are not common in the Svalbard area. Thus the main source of food for the divers is the sea, where they regularly go fishing.

Very little is known of the food of the species in the area. Heuglin was of the opinion that they lived mainly on freshwater *Crustacea* (117 : 105). Walter found freshwater algae in the stomach of young in down on Ryke Yseøyane (169 : 241). Swenander found the remains of fish and freshwater algae in the stomachs of adult birds on Bjørnøya in 1899. Two young in down had eaten only freshwater algae, possibly, he says, to get at the small *Crustacea* living among them (247 : 33).

Apart from small stones, Römer and Schaudin found only the remains of *Crustacea* and fish bones in the divers' stomachs (245 : 80). They are of the opinion that in this species the parent birds lack the impulse to feed their young and they suggest that the young birds seek their own food when they are able to dive, soon after hatching. The young birds then feed on small freshwater *Crustacea* and larvae of mosquitoes.

On Storøya, E of Nordaustlandet, they found only algae in the stomachs of young birds.

Jung does not agree with the supposition that the Red-throated Diver does not feed its young. He shot a young bird on Gråhuken at the entrance to Wijdefjorden in 1936. The bird disgorged a fish of about 20 cm (s p a n n e n l a n g), and Jung says: "Since the fish could only have been caught in the fjord 5 km away the adult bird must have fed the young one" (539 : 127).

Le Roi found numerous small stones, the size of a pea, in the divers' stomachs, together with bones of small fishes and fragments of *Mollusca* (316 : 269). Zedlitz says that they feed in the sea, going there in the forenoon, and returning to the freshwater ponds when their crops are full (319 : 301). Van Oordt also is of the opinion that the divers seek their food in the sea (370 : 149).

Summerhayes and Elton studied the birds on Bjørnøya in 1921, and say: "They evidently fed on the fish in Ella Lake since they eat *Salvelinus alpinus* in Greenland" (397 : 230).

Bertram and Lack, who also stayed on Bjørnøya, say: "One pair was seen feeding young on the Arctic Char, but many of the frequented lakes did not contain fish, and the birds were repeatedly seen flying out to sea and feeding there" (488 : 295).

No. 4. *PODICEPS GRISEIGENA* subsp.?

The Red-necked Grebe

In 1868 Finsch acquired the remains of a Red-necked Grebe from Mr. Sengstacke, coxswain on Koldeway's expedition, who brought the bird back with him from Spitsbergen (131 : 218).

Witherby thinks that the specimen belongs to the race *Podiceps g. holboelli* Reinhardt (583 Vol. 4 : 96). This bird breeds in NE Asia and in N America. It has been found as a casual visitor in Greenland (Lehn Schiøler 310 : 147), once in Iceland and four times in Norway. The nominate race *Podiceps g. griseigena* (Bodd.), however, has been found up to latitude 70° 25′ N in Norway and it would by no means be difficult for the bird to reach Spitsbergen.

In my opinion it is absolutely impossible to tell which race the Spitsbergen specimen belongs to.

No. 5. *DIOMEDEA MELANOPHRIS* Temm.

The Black-browed Albatross

This species has been found only once in the Spitsbergen seas. Harvie Brown saw the specimen in the Arbuthnot Museum in Peterhead, Scotland, and it was labelled as follows: "This specimen was killed June 15th 1878 at 80° 11′ N, 4° E, and was presented to the Museum at Peterhead by Capt. David Gray of the steam-whaler *Eclipse*." (185 : 337).

No. 6. *FULMARUS GLACIALIS GLACIALIS* (*L.*)[1]

The Fulmar Petrel

Geographical distribution

The Fulmar is an Atlantic and arctic species. It breeds in N America from Melville isl. and Baffin Land to the east and west coasts of Greenland. In Europe breeding populations are found on Jan Mayen and Iceland, the Færoe Islands, the British Isles, Norway, Svalbard, Franz Josef Land and Novaya Zemlya. East of this there is only one known breeding locality, on the Lonely isl. in the Kara Sea.

In the N Pacific *F. g. glacialis* is replaced by the race *F. g. rodgersii* Cassin. The nominate form wanders south to about latitude 42° N in the W Atlantic, to 40° N in Mid-Atlantic, and then NE to seas west of the English Channel.

The Fulmar has occurred inland in several European countries. Two more recent records from central Europe are mentioned by Schneider (372 : 41) and Michel and Reiser (410 : 99).

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[1] Contour map showing distribution, see backflap.

Occurrence in Svalbard

The species breeds on Bjørnøya, along the whole of the west coast of Vestspitsbergen, both on the open sea-coasts and in the fjords and also in several places on the nunataks of the interior.

It has been found breeding on the north coast in Liefdefjorden and in Wijdefjorden. On Nordaustlandet there are at least two colonies, and in Storfjorden it breeds on Edgeøya and on Tusenøyane. There are breeding colonies on the island of Hopen. The Fulmar has been observed but not found breeding in Hinlopenstretet, on Kvitøya and on Kong Karls Land.

Colour phases

The majority of the Spitsbergen Fulmars have a more or less uniform grey plumage. Light birds comprise about 10 % of the population on the west coast of the islands and the proportion on the east side is smaller. The extremely dark birds are mostly found in the east, where they form about 5–10 % of the population.

In Svalbard the light birds with a white head and a white underside are rarely, if ever, as white as those on the west coast of Norway or in England. Some of the grey birds vary very much in coloration and almost all intermediate plumages between light and dark may be found. The majority, however, are uniformly grey. The dark birds can be very dark indeed, and on the coasts of Storfjorden birds of a deep slate-blue colour have been observed. In these the wings and the tail were even darker than the rest of the body.

At Bjørnøya there are more light birds than in Spitsbergen. Martens saw the species in Spitsbergen in 1671 and says: "They are not always of the same colour, some are quite grey, which we take to be the oldest, others are grey on their backs and wings, but their head and belly are white, which are the young ones. This is generally thought, but I am of the opinion that this difference of colour proceeds rather from a difference in kind than from a difference in age, for the grey ones I saw only about Spitsbergen, but they grey and white ones, although I have seen some few of them at Spitsbergen, yet we saw abundance more about the North Cape, and also about Hitland and England." (Translated from German) (12 : 68)

Malmgren saw the species on Bjørnøya in 1861. Here dark and light birds were seen. Both, he says, are numerous in Spitsbergen, the birds in the dark plumage being simply young birds (85 : 103). Cocks says that of all the thousands of Fulmars seen by him in 1881, there was not one light bird. "We did not observe one adult, all I believe, without exception, being in a state of plumage intermediate between that of the adult and young in its second summer as described by Yarrell" (149 : 412).

Chapman writes about the Fulmars he saw in Spitsbergen during the summer of 1881: "The summer plumage of the Fulmars differed considerably from that usually depicted. The head, neck and under parts were of a dull smoky grey, which above the ash-blue feathers were much dappled with deeper shades, and with a dirty brown. The whole plumage, in fact, presented a dusky mottled appearance, and on the wing a white band at the base of the primaries was

conspicuous" (152 : 156). Trevor-Battye relates that he did not see any bird of the pure light phase in Spitsbergen in 1896. He did not see any Fulmar whose breast was "white as a gull's is white", and describes the white colour of the bird as a "dirty white shade" (203 : 596). Kolthoff and Jägerskiöld say that Malmgren was of the opinion that the grey Fulmars were young birds. This they found to be incorrect, as members of the 1898 Swedish expedition found the grey birds breeding. Probably, they say, the Fulmar occurs in two colour phases, just as does the Arctic Skua (209 : 319). Kolthoff saw a few Fulmars at Hopen in 1898, and all of these were dark. He found the dark birds to be in the majority at Bjørnøya and Spitsbergen, especially to the east of these islands. Birds with a white head and a white neck were so rare that he did not see one in a thousand. The farther west he came from Spitsbergen, the more common the light birds became (261 : 75). Swenander found the dark phase more common than the light on Bjørnøya in 1899. Between the extremes he found all intermediate shades. He could also tell at an early stage to which phase the bird belonged, for the downy chicks were either white-grey or dark-grey in colour (247 : 28). Le Roi found conspicuously light-coloured birds in Spitsbergen, together with quite slate-coloured dark birds. Between these extremes most of the birds had a uniformly grey plumage and the majority of them tended to the dark phase (316 : 204). Munsterhjelm relates that when they had caught a Bottlenose (*Hyperoodon ampulatus*) in the open sea west of Spitsbergen and were surrounded by hundreds of Fulmars, he did not see more than a couple of white ones among them. He also found the light birds to be very rare in Spitsbergen. When he left at the beginning of October, he saw more light birds than he had seen during the whole summer (313 : 36). In contrast to Swenander's observations at Bjørnøya, Zedlitz saw more light than dark birds there in 1910. The same year, in the middle of July he saw numbers of dark birds in Grønfjorden (Isfjorden) but light Fulmars were also present (319 : 316). Van Oordt states that in Spitsbergen and the Arctic, whereas the dark form predominates, pale-coloured specimens with white heads are frequently met with, but their breasts are never so white as those of a gull. All transitional stages between the two forms are found in Spitsbergen (370 : 148). Longstaff, who visited the eastern parts of Spitsbergen in 1923, could not say which form predominated, the majority being of a neutral shade (407 : 483). Montague saw two undoubted specimens of the light form in July 1924, one in Liefdefjorden, the other in Wahlenbergfjorden. The light plumage was observed in all birds in N and NE Spitsbergen about the end of August 1924. When he went south at the beginning of September, the Fulmars in S and SW Spitsbergen were all in the dark plumage.

His observations farther south were as follows: "While crossing Barents Sea, we saw several compact flocks of light-coloured birds going slowly south, and especially to be distinguished from the many unattached dark birds which were feeding all around. I formed a strong impression that the light form is simply a bird on which, for some reason, the normal winter plumage persists through the summer" (433 : 141).

Olivier visited Spitsbergen in 1931. He found the light birds to be far more

rare in the north (Magdalenefjorden and Kongsfjorden) than in the south (Sørkapp and Bjørnøya) (493 : 61). Bertram and Lack visited Bjørnøya in 1932. They found both phases abundant and say that they interbred freely. Many birds showed some intermediate phase (488 : 294). Fisher says that the maximal preponderance of dark forms seems to extend from the Iceland seas, via east Greenland to Vestspitsbergen. Towards Bjørnøya there is a slight diminution in the proportion (536 : 941). Duffey and Sergeant visited Bjørnøya in 1948. They found that 10 % of the birds were as white as the English Fulmars, 15 % were grey, and the rest intermediate (586 : 558). Løvenskiold found relatively more light birds on the west coast of Spitsbergen than in the east. On 14 August 1948, large numbers of Fulmars were seen in Agardhbukta, Storfjorden. These birds were dark and among them were some which were of a dark slate-blue colour (615 : 44). In Wijdefjorden a great number was seen on 9 July 1954. All of these were dark, and in some the dorsal surface was a dark slate-blue (1954, 633). During the summer of 1958 a relatively large number of light birds was seen on Bjørnøya. Many of them were so light that they came very near to the pure light phase. Relatively few dark birds were seen, and the majority of the birds were in an intermediate grey plumage. There were many more light birds than are usually seen in Spitsbergen (1958, 633). Pennie and Andrew visited Sassenfjorden in 1955, but they did not see a single light bird there (623 : 51). Bateson stayed in Raudfjorden during the summer of 1957. Here he found about 10 % light birds, but none of them as light as those in England. The dark birds varied considerably, but none were very dark (1957, 650). Fisher includes a long chapter on colour phases in his book on the Fulmar, and concludes that there are about 60 % of dark birds at Bjørnøya and 95 % in Spitsbergen (602 : 282).

Birds in aberrant plumage

Heuglin relates that a white bird was obtained in Ginevrabotnen between Barentsøya and the mainland (on 22 August 1870) (118 : 206). Since all the soft parts of the above bird were normally coloured, it was obviously not an albino (132 : 200). Le Roi reports that in 1907 a pure white bird was seen in Sassenfjorden on 27 June. Another white bird was shot in Trygghamna on 17 June 1908. This was an adult female, pure white, with a yellow bill, legs and feet pale flesh, and yellow iris (316 : 205). Munsterhjelm saw a pure white bird west of Bjørnøya on 16 May 1910 (313 : 36). Løvenskiold saw a pure white bird near Gåsøyane in Isfjorden on 10 August 1948 (615 : 46).

Of the above five birds, two were shot and they were obviously not albinos. The three remaining specimens were seen at a distance and therefore it is impossible to say whether they were albinos or not. Bertram and Lack visited Bjørnøya in 1932. Here they saw two birds which were almost white on the back and on the wings (488 : 294). Zedlitz saw birds with a red underside in Kongsfjorden in 1910 (319 : 317). Other birds (Ivory Gulls and Puffins) from the same area have also been recorded as having rose-coloured undersides. All these birds are known to breed on ledges in rose-coloured sandstone and this explains the red colouring of the birds' ventral feathers.

First records

Martens saw the bird in Spitsbergen and he also has published an illustration of a Fulmar which was taken in the ice west of the islands on 1 June 1671 (12 : 70). Martin caught some Fulmars in Spitsbergen on 7 June 1758. He found them up to 80° N and states that the Fulmar breeds in Spitsbergen. He also speaks of an island, the "Mallemoecken-eyland", which is named after the bird (18 : 94–99, 109, 125). Phipps found the species on the coasts of Spitsbergen (23 : 186). Bacstrom, who visited the islands in 1780, saw the species there (28 : 617). Pennant relates that the bird is abundant in Spitsbergen (24. Vol. II : 534). Leach includes the Fulmar from Spitsbergen in a letter to Dr. Thomson with a list of birds received from the "Northern Expeditions" (37 : 61). Laing mentions that the bird is found in very great abundance in the sea around Spitsbergen, especially in the whaling season (33 : 81). Köhler saw the species in Spitsbergen in 1801 (38 : 43). Mandt saw the species in Spitsbergen in 1821 (42 : 9). Faber mentions the bird as an inhabitant of Spitsbergen (45 Vol. I : II).

Records without any distinct locality

Sundevall, who visited Spitsbergen in July–August 1838, saw the bird only out at sea (52 : 126). Gray relates that a specimen from Spitsbergen, presented by the Admiralty, is contained in the collections of the British Museum (Nat. Hist.) (58 : 162). Torell denies that the species breeds in Spitsbergen, but states that it does breed on Bjørnøya (73 : 44). Quennerstedt found it highly improbable that the Fulmar should not breed in the islands, but he had many reports from travellers who asserted that the species did not breed there (81 : 24). Sluiter saw Fulmars in Spitsbergen in 1878 (144 : XLIV). Salvadori states that five specimens, shot in Spitsbergen in 1898, are included in the collections of the Museum of Torino (252 : 4).

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — The species breeds on the steep cliff-walls all around the island, in some places, especially to the south, in enormous numbers. On islands and some isolated cliff-tops, and in other places inaccessible to foxes, the birds also breed on level ground. The first record of breeding dates from 1827.

S e c t i o n II. H o r n s u n d. — The birds have been seen all around the coasts of the district. They breed on Keilhaufjellet in the extreme south, on Hilmarfjellet, on a cliff somewhere near Hornsundtind, on Sofiakammen on the north side of Hornsund and on Havhestflåget east of Kapp Borthen.

S e c t i o n III. B e l l s u n d. — In the old days when whales were caught here, there were enormous numbers of Fulmars to be seen, especially in Recherchefjorden. Now there are not many birds in this district. They can be seen along the seashores and in the fjords Bellsund, Recherchefjorden, Van Keulenfjorden and Van Mijenfjorden, but rarely in numbers except near the breeding-places. The number of breeding-places is small. The species breeds

on Observatoriefjellet in Recherchefjorden, on Midterhuken between Van Keulenfjorden and Van Mijenfjorden, and there is also a colony to the NE of Braganzavågen. Probably the birds also breed on the mountain Ingeborgfjellet to the NW of Akseløya, but so far there is no definite record of this.

Section IV. Isfjorden. — In this fjord the birds can be seen everywhere, but no longer in such numbers as when whales were caught here.

The Fulmars probably breed in several places near the summit of the mountains on the south side of the fjord, but none of these places seem to have been investigated. In fact, there is no known breeding-colony before the head of Sassenfjorden, where there is a colony not far from the house of the trapper Hilmar Nøis. Then there are colonies on the mountain Tempelfjellet and one near Gipshuken. In Billefjorden there is a colony on the east side, and several on the nunataks on the big glaciers to the NE, and on Wordiekammen to the E of this fjord. A great number of Fulmars breed in Skansbukta. Then there is a colony between Dicksonfjorden and Ekmanfjorden, one colony in Trygghamna and another on Alkhornet.

Section V. Prins Karls Forland. — The birds can be seen flying all around the coasts and also crossing the island. There are breeding colonies at Fuglehuken in the extreme north, at Dawespynten and on the mountain Methuenfjellet, north of Forlandsletta.

Section VI. Kongsfjorden. — The species can be seen in numbers both in Kongsfjorden and in Krossfjorden. There are breeding colonies at Kvadehuken and on the nunataks on the big glaciers at the head of Kongsfjorden. In 1956 about a hundred pairs nested at the entrance to Blomstrandhamna on the north side of this fjord.

Section VII. NW Spitsbergen. — Fulmars can be seen on the wing all along the coast from Magdalenefjorden and east to Velkomstpynten, in Liefdefjorden, Bockfjorden, Woodfjorden and as far as Gråhuken. There are breeding colonies in Magdalenefjorden, and in the interior to the east of this fjord, at Flathuken at the entrance to Raudfjorden, on the west side of this fjord, at Jermaktangen and west of Bockfjorden.

Section VIII. Wijdefjorden. — The birds are seen all along the fjord down to Mittag-Lefflerbreen where they have a feeding-ground. They have also been seen crossing the area between Wijdefjorden and Billefjorden. There are several colonies on the nunataks in the interior to the SE of the fjord. On the west side of Wijdefjorden there are two colonies in Vestfjorden and one in Kartdalen. On the east side there are 4 small colonies in the valley Reinbokkdalen, one at the glacier Sydbreen, one at Midtbreen and one on the mountain south of Mosselbukta.

Section IX. Hinlopen. — In Hinlopenstretet the bird must be just as common as in other parts of Spitsbergen, but from this district there are very few records. The species has been observed only in Sorgfjorden and in Lomfjorden, where there is a colony at the head of the fjord.

Section X. Nordaustlandet. — In this district the bird is mostly seen along the western and northern coasts where there is open water during the summer-time. Sledging parties crossing the big glaciers have seen Fulmars

flying about in the middle of the island, many miles from the coast. There are two nesting-places, one in Brennevinsfjorden and another at Kapp Lovén.

Section XI. Storfjorden. — The species has been seen everywhere in Storfjorden, on the islands, along the coasts and both in Heleysundet and in Freemansundet. It has also been recorded from the interior of Edgeøya. On this island there are two breeding-places, one on Negerpynten and the other on Kvalpynten. There is also a colony on Tusenøyane.

Section XII. Kvitøya. — The bird has been observed several times around the island, but has never been found breeding there.

Section XIII. Kong Karls Land. — Fulmars have been seen several times flying around the islands, but they have not bred there.

Section XIV. Hopen. — On this island there are colonies of Fulmars, but these are not well known.

Records from the sea around Spitsbergen

The North. — Parry states that the species was one of the very few seen at the northernmost latitude attained by the expedition, 82° 44′ (p. 196). On 26 June 1827 at 81° 17′ N and 21° 17′ E they saw several Fulmars (p. 62). One was seen on 3 July, about 19′ or 34 km farther north (p. 71). Another specimen was seen on the 5th at 81° 45′ N (p. 72). On the 13th one was seen at 82° 17′ N, 21° 40′ E (p. 81). The next day also they saw a Fulmar (p. 84) and another was seen on the 16th (p. 87). The last Fulmar mentioned in the diary was seen on 17 July at 82° 32′ N (46 : 89).

Collett and Nansen relate that the last Fulmar of the year was seen on 14 September 1895 at 85° 5′ N, 79° E, and in 1900 it is said: ". . . this is the highest latitude in which birds have ever been known to be observed". Fulmars appeared in numbers during the summer of 1896 in the ice north of Spitsbergen. The first was seen on 22 May at 83° 45′ N. They were afterwards seen all through the summer, singly or in small flocks, circling above the channels in the ice and occasionally picking up small animals or refuse from the surface of the water. From the middle of June to the beginning of August, when the ship forced her way out of the ice, about 70 specimens were shot by the crew, 15 of them in one day, on 16 July at 83° 14′ N (237 : 50). Andrée saw two Fulmars on 15 July 1897 at 82° 55′ N, 30° E (p. 397). One was seen on the 18th and two on the 20th. Later they were seen on the 23rd, 24th and 31st. In August they were observed on the 5th and on the 24th (p. 398). On 28 August several were seen at 81° 47′ N, 28° 30′ E (p. 430). On 17 September at 81° 45′ N the Fulmars had disappeared. From 9 September and until the 22nd when they were south of Kvitøya, they had seen almost no birds with the exception of Ivory Gulls (461 : 443). See also Lönnberg (473 : 141).

The West. — Fries and Nyström, on 23 September 1868 at 78° 26′ N, 2° 17′ W saw several Fulmars. In the water near the surface there were numerous Copepods and Pteropods (109 : 161). Nathorst saw Fulmars on 28 July 1898 at 78° 1′ N, 4° 9′ E (243 : 195). Kolthoff states that the Fulmars will fly about 222 km west out to sea from Spitsbergen to feed. Farther west these birds are not so numerous (251 : 99, 100). During the breeding season they

do not go far away from Spitsbergen. None of the specimens killed in an area more than 185–277 km west of the islands, had any brood-patches, nor were their sexual organs developed. Of 63 specimens shot on 10 July 1898 at 76° 40′ N, 2° E, not one had been breeding that year. However, all birds shot near Jan Mayen, Bjørnøya and Spitsbergen, were breeding. Therefore, those which are found far out at sea in summer are either sterile or young birds which are not yet able to breed (261 : 77). Orleans saw Fulmars west of Spitsbergen during the summer of 1905 in the following places: on 13 July at 79° 14′ N, 2° 1′ E, 15 July at 78° 20′ N, 3° 20′ W, 16 July at 78° 4′ N, 5° 20′ W, 17 July at 77° 37′ N, 4° 44′ W, 18 July at 76° 55′ N, 3° 30′ W, 19 July at 76° 47′ N, 4° 15′ W, 20 July at 76° 29′ N, 4° 46′ W, 21 July at 76° 1′ N, 7° 30′ W, 22 July at 75° 35′ N, 10° 23′ W (277 : 341–3).

The South-west. — Quennerstedt, who was on board a sealer from March to June 1863 saw Fulmars out at sea between the latitudes 71° and 74° N and the longitudes 7° 30′ W and 5° E. Where the sea was open, and also where the ice was scattered, the birds were seen in numbers, but in the pack-ice itself they were only seen on the outskirts (106 : 30). Oustalet relates that 3 Fulmars were caught on 2 September 1898, midway between Jan Mayen and Spitsbergen (213 : 304).

The East. — Worsley saw several Fulmars on 11 August 1925 about midway between Kong Karls Land and Franz Josef Land, and to the south of Viktoriaøya. On 20 August, still farther south, they were accompanied by 3 Fulmars (441 : 98, 107). On 9 September at 79° 7′ N, 40° 2′ E, which is almost due east of Kong Karls Land, they saw Fulmars in large numbers.

Biological

Migration. — When the sea is open, the Fulmar will stay in Spitsbergen even during the darkest period of the winter, and the trappers have recorded in their diaries that they heard the birds crying from the ledges on the mountains when it was too dark to see them.

Arthur Oxaas has given this information: "Throughout the winter one can hear the Fulmars on the bird-cliffs where they keep to the highest ledges near the tops of the mountains" (personal communication 1952). Particularly in Isfjorden this seems to be a relatively common occurrence. When the wind blows from the south or from the west the Fulmars will visit the mountains as far inland as Kapp Nathorst in Dicksonfjorden and Gipshuken at the entrance to Billefjorden.

If the sea and the fjords are ice-covered, they will keep away, but when the light returns, the Fulmars return as soon as there are channels in the ice near land or a shore lead where they can find food.

In this case therefore there is little of what one can call a regular migration; the birds will probably stay out at sea as long as they are hindered by the ice from coming close to land.

Primarily of course this is a question of food. Mr. Richter, the librarian of Norsk Polarinstitutt, wintered on Jan Mayen during World War II. When the sea was open, the Fulmars would come in midwinter and settle on their nesting

sites on the bird-cliffs. Mr. Richter and his men used to shoot them for food, and usually had Fulmars for dinner every second day. He said that when the birds had just arrived, they were plump and the great muscles on both sides of the sternum were well developed. Birds which had stayed for about 8 days on the cliffs were still in a relatively good condition, but after a fortnight they became very thin. When the island was surrounded by ice, they were absent, but as soon as a shore lead opened up, they arrived in numbers. There is no reason to believe that the conditions in Spitsbergen are very much different from those on Jan Mayen.

The dates for the first arrivals in the Svalbard area are noted below:

Dates in January	16	20	25	26	29										
No. of observations	2	1	1	2	1										
Dates in February	1	3	5	6	7	8	11	12	14	15	16	18	20	22	27
No. of observations	2	1	2	1	1	1	1	2	2	3	2	1	2	2	1
Dates in March	4	5	8	16	17	20									
No. of observations	1	1	1	1	1	1									
Dates in April	3	7	23	28											
No. of observations	1	1	1	1											

Although the majority of arrivals occur in February, it would not be correct to say that this is the time for the spring migration. It seems, however, that in this month there is often open water along the sea-coast and in the fjords, and for this reason the birds can stay in the area for a shorter or longer time. It is known that even in summer the Fulmars will leave a fjord or a bay which is suddenly filled with ice. Chydenius relates that on 13 June 1861 this happened in Sorgfjorden, and in consequence all the Fulmars left the district (89 : 92).

There are also a few observations from the autumn. In September the species has been seen on the 15th, 21st, 22nd, 25th and on the 30th. In October single birds have been seen on the 4th, 5th, 10th, 20th and 26th, and there are also records for both November and December.

Just as there is no regular spring migration of Fulmars, there is no regular autumn migration. The birds will probably stay until they are driven away by the ice, or when it becomes so dark that it is impossible for them to find food.

G e n e r a l h a b i t s. — The Fulmar breeds in great numbers in the Svalbard area, but it seems that there has been a decrease in their numbers since whaling had to stop because of the almost complete extermination of the whales. Almost all authors writing about birds in the time when the whaling flourished, speak of thousands of Fulmars assembling around the carcass of whales to feast on blubber or meat, fresh or rotten.

Even though there are still a great many Fulmars in Spitsbergen, they are not present in such numbers as can be seen in photographs of the old whaling stations.

The Fulmar comes to land to breed, but it will also visit its nesting sites in almost every month of the year, if there is open water. However, the birds also come near land to find food, especially in the feeding-zones just outside several of the big glaciers.

In Spitsbergen the bird can be seen everywhere along the coast either on the wing or resting on the sea, where they are very fond of bathing and preening.

Both on the sea-coast and in the fjords they have a habit of resting on the water just outside their colonies. Løvenskiold has found a number of colonies by looking for such resting-places near to the shore, among them a colony on Hilmarfjellet on Sørkapp Land (615 : 45) and another in Wijdefjorden on 18 July 1954 (1954, 633).

Single birds or small companies will also fly long distances overland. They have repeatedly been seen thus in the interior of the islands, flying over mountains, dry level ground and the inner part of the big glaciers.

In one place they seem to have a highway from the west to the east and in the opposite direction. This is from Sassenfjorden along the valley Sassendalen, Fulmardalen and Agardhdalen to Agardhbukta in Storfjorden. They have been recorded from here by several authors. Conway saw them passing through Fulmardalen on 15 July 1896 (196 : 166). Trevor-Battye confirms Conway's statement (203 : 596), and Albert Ier saw the same thing in August 1898 (205 : 300). When Løvenskiold stayed in Sassendalen between 15 and 25 August 1950, enormous numbers were going up and down the valley throughout the day and night (615 : 46). But when he came back there on 28 June 1954, almost none were seen.

It has not been possible to discover whether the birds do actually nest in Fulmardalen, but it is highly probable that they do. The species has been observed in numbers all the way between the two fjords and they probably cross this way, even if they nest in Fulmardalen. The fact that the ice breaks up late in Storfjorden and the birds do not go there until there is open water, probably explains why almost no birds were seen in the valley in June 1954.

One might think that the Fulmar would be relatively harmless to other birds, but this is not so. A Fulmar flying over a tern colony is relentlessly pursued and certainly not without reason. There is, however, one exception. Marshall found that when the terns were asleep on their nests, the Fulmars were allowed to pass undisturbed. Marshall also found that the Fulmars had no period of quiescence themselves (533 : 248).

Fulmars have several times been seen plundering the nests of other birds. The first record of this from Spitsbergen comes from Lovén who saw them plundering the nests of Kittiwakes in Isfjorden on 10 July 1837 (51 : 34). Chydenius saw them doing this at Flathuken on 20 July 1861 (89 : 329). Cocks shot an Ivory Gull which fell into the sea, and he found it hard to keep the Fulmars off it (149 : 330). Munsterhjelm relates how a Fulmar swallowed a Snow Bunting which fell into the sea (313 : 3).

Assembled around meat, they will usually succeed in driving away other birds, such as Glaucous Gulls and Ivory Gulls, by threatening to vomit. On the other hand they can themselves be driven away by much smaller birds. Congreve saw a Turnstone driving away a Fulmar in Gipsdalen on 9 July 1922 (599 b : 21).

They are not especially good at diving, but Longstaff saw them dive a foot under the surface for a piece of sinking meat (407 : 483).

Over land or along the coast they usually fly against the wind. Kristoffersen relates that they were daily seen flying past Sørkappøya in February 1930 when the temperature was higher than 8° C below zero. The wind was coming from the east and on days with a temperature of 4° below zero a continuous stream of birds came past the island in that direction (472 : 250).

The Fulmar is an excellent flier. Trevor-Battye relates how in a very severe gale in July 1896 the Kittiwakes were sitting on the shore, afraid of the weather. Only the Fulmars could fly against it (203 : 596). Kristoffersen observed them circling about very high up for hours at a time. Their altitude was so great that they could be seen against the sky only as minute spots (432 : 185).

It is a well-known fact that when there is no wind, Fulmars have to run for quite a distance on the water in order to rise from the surface. On 7 August 1897, Conway saw a Fulmar sitting on a glacier at the head of Kongsfjorden. It sat quite still until he approached within two yards. "Then he flapped his wings and ran, gradually rising into the air and helping himself up by beating the ground with his feet, the action used by the Fulmars when they rise from the water" (208 : 133).

On the wing the Fulmar is an absolutely silent bird. Its voice is heard at the breeding places and it is a sort of croaking noise. When they finght over meat or other food they croak in the same way.

Much has been written from Spitsbergen concerning their habit of spitting. Duffey, who also studied these birds in England, came to the conclusion that a newly-hatched chick would spit at anything which moved, including its own parents. It would continue to do this until it was more than two weeks old. From that time on, the parent bird would be recognized by the chick (600 : 240). Williamson states, however, that the chick does not spit until it is at least 4 to 5 days old (605 : 165). Løvenskiold found numbers of newly hatched chicks on Bjørnøya on 20 July 1958, but did not observe the spitting reaction in any of them (1958, 633).

B r e e d i n g. — From Spitsbergen not much is known about the breeding of the Fulmar. This is because almost all the colonies are situated on inaccessible cliff-walls which are frequently very high up on the sides of the mountains. These mountains are as a rule very dangerous to climb because of the disintegration of the stones, and it is only rarely that one can find a place from which it is possible to look down on the ledges where the birds breed.

On Bjørnøya the conditions for studying the bird are far more favourable. Here the birds often breed on the flat tops of islands or on the level ground of mountain tops where the surrounding cliffs are so steep that the birds are inaccessible to foxes. The Fulmar also breeds on the ledges of cliffs facing the sea all around the island, and in the northern part, where the cliffs are rarely more than 40 m high, one can in many places stand on the top and look down into the nests.

From Bjørnøya where nests could easily be reached and where hundreds of Fulmar's eggs were taken yearly, there are several records of the egg-laying. But there are not more than two records of eggs having been taken in Spitsbergen.

We have the following breeding records from the Svalbard area: Keilhau saw half-grown young in the nests on Bjørnøya on 19 August 1827 (48 : 120). Malmgren found almost fully fledged young birds on Bjørnøya on 19 June 1864 (92 : 393). These were fed by the parents. He also found some well incubated eggs and some which were only slightly incubated. Wolley refers to an egg taken at Alkhornet in Isfjorden on 15 July 1864 (88 : 441). Holmgren saw downy chicks in the nests on Bjørnøya on 23 July 1868 (110 : 5). Walter states that the Fulmars had left their breeding-places at Kvalpynten on Edgeøya on 18 August 1889 (169 : 246). Zeppelin saw downy chicks in the nests on Bjørnøya on 7 August 1891 (179 : 54). Römer and Schaudin found fresh eggs and young in down on Bjørnøya on 14 July 1898 (245 : 81).

Swenander relates that at the end of June 1899 the eggs on Bjørnøya were well incubated. At the beginning of July, newly hatched chicks were seen here and there, but on 31 July almost all the birds had young. Some of the young were large, but well incubated eggs were also found. On 30 June 50 eggs were collected; since the embryos of all these eggs were of a uniform size, he concluded that all the birds lay at the same time. As long as there is an egg in the nest, the adult will sit very close, but as soon as the young is hatched, the parent bird will leave when approached. As late as 19 August 1899 no fully fledged bird was seen (247 : 28).

In a colony at Bjørnøya Kolthoff found newly laid eggs and slightly incubated ones on 13 June 1898. In this colony the young were still present on 3 September. Both sexes incubated and both male and female had a brood patch (261 : 76).

Koenig found an incubating Fulmar sitting on two eggs on Bjørnøya on 16 June 1907. One of the eggs was addled (286 : 130). In the middle of June 1907 all the eggs found by le Roi on Bjørnøya were fresh. In 1908 the eggs taken at the same time were rather well incubated. In both instances, all the eggs examined were in the same stage of incubation. The two eggs found in one nest on 16 June 1907 were probably laid by different females (316 : 206). The same can probably be said about the two eggs found by Sluiter on Bjørnøya in 1878 (144 : XLIV). Mathey-Dupraz saw hundreds of Fulmars in Tryggham̃na in Isfjorden on 4 August 1911. The young birds of the year were easily distinguishable by the presence of down on the head and neck, and their plumage was also darker than that of the adult birds (333 : 109). Isachsen quotes the diary of the Norwegian skipper, Mr. Tobiesen, who wintered on Bjørnøya in 1865/66. He found the first eggs on 23 May 1866. The birds had laid them on a sheet of ice on a mountain top. On 1 June 32 eggs were found. One bird had got a foot frozen to the ice and had to be freed. The egg had rolled down into a water-filled hole in the ice. On the 2nd they found 40 eggs and the next day 100. On 4 June they collected 43 eggs and on the 7th they found in all 188 eggs of Fulmars, gulls and guillemots (probably about one-third, or 60 eggs, of the Fulmar). On 8 June they found 600 eggs of the same species as on the preceding day (probably 200 Fulmars) (446 : 66). Kristoffersen found the first egg on the mountain Keilhaufjellet on Sørkapp Land on 3 June 1930 (472 : 250). Duffey and Sergeant state that

most of the birds in a colony on Bjørnøya had eggs on 18 July 1948, but a few newly-hatched chicks were also seen. By 25 July all the eggs seemed to have hatched (586 : 557). Løvenskiold visited Skansbukta in Isfjorden on 4 September 1948. Here Fulmars were seen in great numbers on the ledges of the bird-cliffs, and as far as could be discovered, no young birds had left the colony. On 20 August 1950 a colony at the head of Sassenfjorden was visited. Here big, blue-grey, downy chicks were seen on the ledges. All of them seemed to be of a uniform size. It was obvious that it would be a relatively long time before these young birds could leave the colony (615 : 46). On 20 July 1958 numbers of eggs on the point of hatching were seen on Måkeholmen in Sørhamna on Bjørnøya. There were also a number of newly hatched chicks, the oldest of which was not more than 2 or 3 days old. On 8 August fairly big, blue-grey, downy chicks were seen on the ledges at Teltvika and on 31 August the young birds in the nests near Herwighamna had not left the colony (1958, 633).

Some of the records on young birds require discussion. Malmgren reports having seen almost fully fledged birds in the nests on Bjørnøya on 19 June. If we reckon the average period for incubating and fledging at 99 days, these eggs must have been laid on 20 March, and if we take the minimum period of 81 days, the day of laying would be 7 April. Since both of these dates are impossible it must be presumed that Malmgren was mistaken.

Walter relates that all Fulmars had left the colony on Kvalpynten, Edgeøya, by 18 August. Here the eggs must have been laid between 11 and 29 May, which seems to be very early for Spitsbergen. The earliest date for an egg from Bjørnøya is 23 May and in Bjørnøya the conditions are far more favourable than in Spitsbergen, where at that time of the year snow and ice usually cover the ledges where the birds breed.

Mathey-Dupraz saw fully-fledged young birds which had left the nests in Trygghamna in Isfjorden on 4 August, in which case the eggs must have been laid between 11 and 29 May, which seems to be very early. It is also said that the young birds were darker in plumage than the adults and that they had down on the head and the neck. Now it is a fact that the young birds which leave the nests are so like the adults that it is very difficult to distinguish them from their parent. It is of course not impossible that the young might have left the colony at that early date, but it seems to be at least a little dubious.

The earliest record of eggs from Bjørnøya is from 23 May, but on 1 June an egg was found in a hole in the ice. This shows that the breeding-places are covered by ice or snow at that time of the year and when it is like this at Bjørnøya where the conditions are more favourable than in Spitsbergen one would suppose that the time for egg-laying must be later there than on Bjørnøya.

On Bjørnøya most of the finds of newly laid eggs are from the first half of June, and this is probably the normal time for laying on the island. Most of the chicks would then be hatched in the last half of July, and by about the middle of September they would be fully fledged and ready to leave the nest. From Spitsbergen there are very few records, so few indeed that it is impossible to generalize, but here it is possible that the birds are from 8 days to a fortnight

later than on Bjørnøya. The only certain method of finding out anything in Spitsbergen is to watch the ledges where the bird breeds, and find out when the young birds leave the colonies. To come to Spitsbergen and to reach these places when the eggs are laid is very difficult, particularly as most of the scientific expeditions do not arrive until at least 20 June.

F o o d. — The first author to mention the Fulmar in connection with the whaling in Spitsbergen is Martens, who saw great numbers around dead whales there in 1671 (12 : 69).

Scoresby says: "The Fulmar is the constant companion of the whale-fisher. It joins his ship immediately on passing the Shetland Islands, and accompanies it through the trackless ocean to the highest accessible latitudes. It keeps an eager watch for anything thrown over-board; the smallest particle of fatty substance can scarcely escape it. . . . Fulmars are extremely greedy of the fat of the whale. Though few should be seen when a whale is about captured, yet, as soon as the flensing process commences, they rush in from all quarters and frequently accumulate to many thousands in number. . . . They cannot make much impression on the dead whale, until some more powerful animal tears away the skin: the epidermis and rete muscorum they entirely remove, but the true skin is too tough for them to make way through it" (40 : 528–31). This is a sober rendering of facts, and it is therefore the more astonishing to see the physician Dr. Mandt, who visited Spitsbergen in 1821, repeating the fable about the bird's ability to tear pieces of blubber out of the living whale (42 : 9). See also Martens (12 : 69). Köhler, who visited the islands in 1801, is the first, as far as can be seen, to have put this story in print, but he adds that he has not seen the birds do this himself (38 : 43).

From the early nineteenth century until whaling stopped, almost every author who visited the area mentions the enormous numbers of Fulmars assembling around the dead whales. These records are so numerous that it is not possible to repeat even a fraction of them here. However, the capturing of the White Whale (*Delphinapterus leucas*) has subsequently been taken up again in Spitsbergen, and where these whales are captured it is once more possible to see, although probably to a somewhat lesser degree, sights similar to those of the old whaling period. Malmgren states that the Fulmars eat seal and walrus blubber, but that they also take *Limacina arctica* (85 : 106). Fries and Nyström saw Fulmars take *Copepoda* and *Pteropoda* (109 : 161). Oustalet relates that one bird, when caught, regurgitated an amphipod (*Euryporeia gryllus*) (213 : 304). Swenander found remains of fishes, fish-roe and single *Crustacea* in Fulmar stomachs (247 : 30). Kolthoff states that the Fulmar eats meat, blubber, fish, *Crustacea, Pteropoda* and other lower animals (261 : 77). Munsterhjelm reports having seen a Fulmar seize and swallow a Snow-Bunting which had fallen into the sea. When they were out at sea, and had caught a Bottlenose Whale (*Hyperoodon ampulatus*), the Fulmars came in hundreds around the ship. Their main food, however, was *Crustacea* (313 : 35). Van Oordt relates that they mainly lived on garbage and sea-animals. In many cases he found hundreds of large *Mysis*-eyes in their stomachs (370 : 149). Worsley mentions that one day when they were to the east of Kong Karls Land,

they threw some blubber from a bear overboard. Apparently from nowhere, hundreds of Fulmars appeared and fought for it (441 : 160). Hartley found that the feeding zone outside the glacier Nordenskiöldbreen in Billefjorden was visited daily by between 500 and 700 Fulmars in 1930. During July and August the numbers varied considerably. Stomach analysis revealed that the basic food was *Thysanoëssa inermis* (502 : 128). The Fulmars, being surface feeders, were dependent on *Thysanoëssa.* In the latter part of September, when the swarm of *Thysanoëssa* disappeared, a limited number of Fulmars were still able to maintain themselves on floating refuse, jellyfish and less plentiful forms of the major plankton (503 : 166). Hartley and Fisher state that the food of the Fulmar in Billefjorden was: *Thysanoëssa inermis, Mysis oculata, Euthemisto libellula, Pseudalibrotus littoralis, Hyperoche kröyeri, Sagitta elegans arctica,* cephalopod sp., unidentified fish, vegetable matter and offal (513 : 388).

Duffey and Sergeant examined several specimens of food and found: *Cephalopod* (beaks) — 15 in 12 stomachs; *Polychaeta* (jaws) — 197 pairs in 11 stomachs; fish — 25 in 8 stomachs. There were fish and offal in one and grit in one (586 : 558).

P a r a s i t e s. — Waterston found the mallophagous *Estiopterum nigrolimbatum* on three female Fulmars obtained on Bjørnøya on 16 June 1921 (388 : 253). See also Summerhayes and Elton (397 : 218).

No. 7. *PUFFINUS GRISEUS* (Gm.)

The Sooty Shearwater

This species has been seen once in the sea west of Bjørnøya. Duffey says: "On August 11th, 25 miles due west of Bear Island, at 74° 40′ [18° 23′ E] a Sooty Shearwater (*Puffinus griseus*) was seen among a large flock of Fulmars (*Fulmarus glacialis*) which were feeding on discarded fish remains. The Fulmars would not tolerate the shearwater near them and made frequent lunges at it. On one occasion it dived and swam under water for a short distance. It followed the ship for two hours before disappearing." Duffey says that, from its nearest breeding place, probably the islands near Cape Horn, the distance to Bjørnøya would be approximately 9,500 miles (17,694 km) (595 : 179).

The species has been recorded from several places on the European coasts.

No. 8. *SULA BASSANA* (L.)

The Gannet

As early as 1671 Martens wrote of a bird in the Spitsbergen seas, which could only have been a Gannet. To quote: "Then there is a bird that I have only seen flying/ a handsome bird with broad feet called Johan van Gent/ is of the same size as a stork/ and has the same feathers/ sails in the air like a stork and moves his wings but very little/ coming to the ice he turns back again.

He dives from the air and must have a very sharp eyesight/ because he dives into the sea from a great height . . . He is to be found in the Spanish Sea and all

over the North Sea/ most numerously they will assemble uninvited where herrings are caught" (12 : 71).

"Jan van Gent" is an old name for the Gannet, much used by sailors.

When Faber states that the species is very rare near Spitsbergen, he is perhaps referring to the above quotation from Martens (45 : 13).

Apart from the two papers already cited, there is no other record of this species from the Svalbard area prior to Bertram and Lack: "The skipper and one of the crew of our trawler assured us that they saw a Gannet 30 miles off Bear Island in the earlier part of this year (1932). They knew the species very well, and watched the bird diving. They said that it was the first they had seen here.

Since the species breeds in Iceland, and has wandered to Greenland, there is no reason why it should not also occur off Bear Island occasionally" (488 : 293).

I am of the same opinion as Bertram and Lack. I have myself seen the bird several times when travelling with a coal-steamer to Spitsbergen, though I have never seen it so far north as in the vicinity of Bjørnøya.

PHALACROCORAX CARBO CARBO (L.)

The Cormorant

The Cormorant has twice been reported as occurring in Spitsbergen. It is first mentioned by Finsch in a list of birds found in the area (131 : 180), and Lausberg claimed to have shot the bird in Colesbukta (332 : 431).

There is, however, no reliable record of the Cormorant in the Svalbard area.

No. 9. *ARDEA CINEREA CINEREA* L.

The Heron

This bird has been seen only once in Spitsbergen. On September 7th 1922, a Heron was shot by Dr. A. K. Orvin in Grønfjorden (Wollebæk 392 : 380).

No. 10. *ANAS P. PLATHYRHYNCHOS* L.

The Mallard

The Mallard was observed once by Glen on Nordaustlandet, when a single bird was seen in Brennevinsfjorden in April 1936 (521 : 296).

No. 11. *ANAS CRECCA CRECCA* L.

The Teal

On 28 May 1900, Dr. Bunge saw a pair of small ducks in Gåshamna, Hornsund. He was, however, unable to determine the species, but thought them to be either *A. crecca* or *A. querquedula* (Bianchi 253 : 326). *A. crecca* has been

found several times in the area, but *A. querquedula* has not occurred so far north, so it is almost certain it was a pair of Teal that Dr. Bunge saw.

Schalow states that Kapitänleutnant Bauendahl obtained a Teal in Spitsbergen (258 : 126). In the publication "Fauna Arctica" (by Römer and Schaudin), Schalow states that this bird was shot in Hornsund at the end of March 1901 (271 : 160). This is the first absolutely reliable record of the Teal from Spitsbergen.

Le Roi says that on 5 August 1907, three Teal were shot on a pond in the SE part of Bjørnøya. Professor Koenig obtained one of these birds, a female, for his museum from a member of the hunting party, a Mr. Stolley from Flensburg (317 : 226).

Dalgety et coll. relate that a flock of five Teal was seen in Isfjorden on 26 June 1930 (470 : 247).

It seems, however, that other people have had the same difficulties as Dr. Bunge. Olivier, who visited Spitsbergen between 4 and 9 August 1931, writes: "*Anas* (*crecca* or *querquedula*), the Teal or the Garganey. Going along the beach in Kings Bay we raised a Teal, but owing to the distance we could not say if it belonged to the one species or to the other" (493 : 67). As the Teal was found breeding in Kongsfjorden some years afterwards, it is almost certain it was a Teal that Mr. Olivier saw.

The first record of a breeding Teal originates from McNeile who says: "In June 1930 we had seen a party of six Teal (*Anas c. crecca*) flying along the shore of Sassen Bay in Spitsbergen, and again in June 1935, on one of the Anser Islands in the Ice Fjord, my companion, Mr. E. S. Steward, put up two small ducks which he thought were almost certainly Teal . . . In 1938 . . . on July 1st, when we were searching the rubbish-tip at Ny-Ålesund in Kings Bay for Snow-Buntings' nests, a Teal duck suddenly fluttered off her nest right at my feet. The down was decidedly greyer than Teal down usually is, but I got a perfect view of the bird, and the flank feathers in the nest were typical. Her eight slightly incubated eggs were snugly hidden in a tussock of light yellowish grass, close to a small stream that passes the edge of that part of the refuse dump" (540 : 13).

Since 1938, there has been no new record of a Teal in Spitsbergen or the Svalbard area.

No. 12. *ANAS PENELOPE* L.

The Wigeon

According to Le Roi this duck was found for the first time in Spitsbergen on 8 July 1907, when a single drake was seen among a flock of Eiders on one of the Gåsøyane in Isfjorden (316 : 226).

On 18 June 1921 a flock of nine ducks was seen on Bjørnøya by Jourdain. The previous day Mr. H. L. Powell had seen a duck at Kvalrossbukta that was almost certainly the same species (381 : 166). In this publication Jourdain states that: "On 27 June, 1921, four Ducks were seen by Messrs. Brown and Wilkes at the same place, which must have been Wigeon." By "the same place" is here meant Gåsøyane in Isfjorden.

No. 13. *ANAS ACUTA* L.

The Pintail

The first record of the Pintail from Spitsbergen was published by Kolthoff, who saw a drake in full breeding-plumage and a female on 13 June 1898 in Recherchefjorden (261 : 56, 97).

Exactly a month later, on 13 July, Kolthoff and Jägerskiöld saw a flock in Bellsund. In fact they say: "A flock was seen by one of us" (256 : 6). As two birds are not a flock, these were perhaps two different observations.

On 15 July 1898, a female was observed by Kolthoff on a pond on Bjørnøya (261 : 56). This observation is referred to by Jourdain (381 : 166), who must have misunderstood Kolthoff, since he says that the bird was a male.

A very interesting fact is that the Pintail has been found breeding in Spitsbergen. On 7 July 1935, McNeile found a nest with four hard-set eggs near the mining town Ny-Ålesund in Kongsfjorden. The site of the nest was a curious one. It was found "among a litter of packing-straw strewn alongside a couple of cases, half-full of large, rusty bolts and nuts, that were lying abandoned on the floor of the great derelict air-ship hangar erected in 1928 for Nobile's ill-fated *Italia*" (540 : 15).

ANAS QUERQUEDULA L.

The Garganey

This species has never been observed in Spitsbergen. Bianchi says that Dr. Bunge saw a pair of either *Anas crecca* or *Anas querquedula* in Hornsund on 16 May 1900, but what he saw must have been Teal, which have been found in the area on several occasions (253 : 326).

No. 14. *AYTHYA FULIGULA* (L.)

The Tufted Duck

A pair of Tufted Ducks was seen by Bertram and Lack on a tarn on Bjørnøya near Tunheim in 1932. The drake was seen from 22 June to the end of their stay on 10 August. The female was not seen from 27 June to 16 July, and about this the authors say: "Presumably the female laid and incubated, but her eggs or brood must have met with disaster, for when she rejoined her mate she had no young with her" (488 : 291).

This is the first record for the Svalbard area.

No. 15. *AYTHYA MARILA MARILA* (L.)

The Scaup-Duck

A female was observed by Bertram and Lack on a tarn near Tunheim on Bjørnøya on 2 July 1932 (488 : 291). This is the first record for the Svalbard area.

Løvenskiold saw a female Scaup-Duck with four ducklings at Calypsobyen in Bellsund on 19 August 1948. The broad white band around the base of the bill was unmistakable. When the birds were recognized, they were close inshore, but they disappeared out to sea and could not be found again. Further evidence is therefore lacking (615 : 30).

Bertram and Lack's record makes it more probable that the second record could be valid.

No. 16. *CLANGULA HYEMALIS* (L.)[1]

The Long-tailed Duck

Geographical distribution

In Europe the species breeds in Iceland, in Norway from 60° to 71° N, in Sweden, Finland, Svalbard and Russia including Kolguev, Waigatz and Novaya Zemlya; in Siberia east to Kamtschatka and Commander Islands. In America from Alaska to Labrador, and in Greenland from the south to the extreme north. In Europe it winters south to the Færoe Islands, the coast of the Baltic, N France, Holland, Belgium and the Black Sea.

Occurrence in Svalbard

The species breeds on Bjørnøya, all along the west coast of Spitsbergen and on the north coast up to Reinsdyrflya.

Without doubt it also breeds in Wijdefjorden, although there is no record of breeding from this district. It possibly also breeds farther east. It has been observed in Hinlopenstretet, Nordaustlandet and on Kong Karls Land, but there are no records from Kvitøya or Hopen. It breeds in Storfjorden.

First records

On 25 June 1607, when the ship of Henry Hudson was in latitude 75° N, and as far as can be determined, a little to the NW of Bjørnøya, he saw: "small flockes of Birds with blacke Backes and white Bellies, and long speare Tayles" (3 : 300). These can only have been Long-tailed Ducks and here we have the first record for Svalbard.

The species was found breeding for the first time in Spitsbergen in 1864, when Malmgren saw a family of five on 1 August on Dunøyane north of Hornsund (92 : 399).

Distribution sections I–XIV

Section I. Bjørnøya. — On this island the birds have been found breeding in small numbers since 1900 and up to recent times. In 1932, Bertram and Lack found a population of about 70 individuals there.

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[1] Contour map showing distribution, see backflap.

Section II. Hornsund. — The Long-tailed Duck is found all along the west coast of this district, on the sea-shore as well as in the fjord Hornsund. It has been found breeding in a few places on the mainland, but its real breeding grounds are on the islands along the coasts, where it breeds in company with the Eiders.

Section III. Bellsund. — The species is fairly numerous along the west coast from Storvika to Kapp Lyell. It is found on the sea and on the lakes and it breeds in this district. The bird has bred in Recherchefjorden and has been observed in Van Keulenfjorden and in Van Mijenfjorden. It has been found breeding at Kapp Martin.

Section IV. Isfjorden. — In Isfjorden the birds have been found breeding at Kapp Linné, in Grønfjorden, on Gåsøyane and on Bohemanneset. They have been seen in Colesbukta, in Sassenfjorden, at Kapp Wijk, on Coraholmen in Ekmanfjorden and at Tvillingholmane near Bohemanneset.

Section V. Prins Karls Forland. — The species breeds on Forlandet itself and also on the islands Forlandsøyane.

Section VI. Kongsfjorden. — In this district the Long-tailed Duck breeds at Ny-Ålesund, on Gerdøya, in "London" on the north side of the fjord, and probably also on some of the islands in the group Lovénøyane.

Section VII. NW Spitsbergen. — The species has been found breeding on Reinsdyrflya and on islands in Liefdefjorden. They have been observed in Danskegattet, in Kobbefjorden on Danskøya, at Smeerenburgodden, Raudfjorden, Breibogen and Vesle Raudfjorden.

Section VIII. Wijdefjorden. — Long-tailed Ducks have been observed in different places on both sides of the fjord, but there is no record of breeding.

Section IX. Hinlopen. — The species has been seen in Sorgfjorden and in Lomfjorden.

Section X. Nordaustlandet. — Long-tailed Ducks have been seen a few times on some of the islands to the north and also along the north coast. As late as in 1957, the species was observed in Bodleybukta at the head of Wahlenbergfjorden.

Section XI. Storfjorden. — The bird breeds on Zieglerøya in Tjuvfjorden and in Kraussbukta on Edgeøya, but it will probably also be found to breed on several of the many small islands in this fjord. It has been seen at Negerpynten, in Tjuvfjorden, in Ekrollhamna, in Kraussbukta on Edgeøya, in Andersonbukta on Barentsøya, but there are apparently no records from the west side of the fjord.

Section XIII. Kong Karls Land. — The bird has not been found breeding on these islands, but it has been seen here on a few occasions.

Biological

Migration. — When there is open water, the Long-tailed Duck can stay in the Svalbard area during the winter. Fries and Nyström relate that the Norwegian Mr. Tobiesen had seen this bird all through the winter 1865/66 on Bjørnøya (109 : 38). But Isachsen says that Mr. Tobiesen saw the species on 6 December 1865 and on 10 January 1866 (446 : 51, 53).

In 1910 the species was seen on Prins Karls Forland on 12 February. This was told to Munsterhjelm by the trapper Svendsen (313 : 22). In 1938 it appeared here on 23 February according to the trapper Normann Andersen (1937/38, 634), and in Sassenfjorden the trapper Hilmar Nøis saw two birds on 26 February (1938/39, 642 a). To the wintering birds must also be added those appearing in the month of March, which come in to the coast as soon as the ice breaks up, and cannot therefore be regarded as ordinarily migrating birds arriving from the south. On 5 March 1938, Normann Andersen saw a great many of them on Prins Karls Forland (1937/38, 634), and on 10 March 1937, the caretaker in Ny-Ålesund (Kongsfjorden), Peder Åm, saw five Long-tailed Ducks there (1936/37, 646).

There are no records for April, but Lønø, who wintered on Edgeøya 1954/55, says that the spring migration took place there in April/May (1955, 647).

The birds which arrive in May must be assumed to be real migrants. There are six records from this month. Kristoffersen saw the first at Sørkapp 23 May 1930 (472 : 256). In 1889, Long-tailed Ducks were found by Walter on Edgeøya on 29 May (169 : 243). On the same date they also appeared at Negerpynten on Edgeøya where they were seen by Mr. Pike (Chapman 195 : 350). At Kapp Wijk in Dicksonfjorden (Isfjorden) the trapper Oxaas saw a flock on 27 May 1938 (1937/38, 643).

In 1861, Malmgren saw a pair of Long-tailed Ducks in Kobbefjorden on Danskøya on 28 May (85 : 108), and on this date, Kristoffersen saw four males in Hornsund in 1924 (432 : 190).

When the ice breaks up late, the birds will be late in reaching their breeding-places. In the summer of 1930, the trapper Alfred Svendsen, who had wintered on Edgeøya, saw the first birds there on 8 June (1929/30, 644).

In 1932 Bertram and Lack, who visited Bjørnøya, say that "Migration was still in progress in the last week of June" (488 : 292).

There are only a few records concerning the autumn migration. In 1899, Dr. Bunge shot a specimen in Gåshamna in Hornsund on 15 October (253 : 326). Mr. Pike shot a Long-tailed Duck in Danskegattet on 5 October 1888 (195 : 344), and Kristoffersen saw big flocks in Hornsund in October/November 1923 (432 : 190).

From the above records it will be evident that the Long-tailed Duck can winter in the Svalbard area when there is open water along the coasts. Birds seen during the month of March must also be regarded as wintering in the area. The spring migration will begin in April if conditions are favourable, the main body of birds coming in May. If the ice breaks up late, the spring migration will persist until the last half of June.

The autumn migration seems to begin late in the year, birds having been shot in the first days of October and big flocks having been seen as late as November.

G e n e r a l h a b i t s. — The Long-tailed Duck breeds in isolated pairs distributed along the west coast of Spitsbergen, both on the sea-shores and in the fjords. In the Svalbard area, unlike Greenland, the birds are never found nesting in colonies.

The species is mostly found breeding on islands along the coast, but also on

the mainland. In both cases the birds seem to prefer to breed in tern colonies where they are well protected during incubation.

Provided that there is fresh water near the breeding-ground, other features of the surroundings do not matter very much. Wet, boggy land is used for nesting as well as heath or dry stony ground.

When the incubation begins, the drakes leave the nesting area and are seldom seen with the ducks. They assemble in certain districts where they remain throughout the moulting period. They prefer places with shallow water where food is plentiful and in such places several hundreds can be found. Such a place is Stormbukta on Sørkapplandet, where numerous flocks were seen by Løvenskiold from 12 July to 12 August 1950 (615 : 27). In these flocks the drakes were in the majority, but several ducks were also present. Some of them may have been non-breeding birds. Similar conditions were found on the west coast of Dunøyane and also at Nebbodden, near Kapp Borthen (north of Dunøyane), where a flock of more than 200 birds was seen on 19 August 1950.

All along the coast in this area, or at least in many places, there are Sea-slugs (holothurians) and in Stormbukta both species of eiders and the Glaucous Gull feed on them. Probably the Long-tailed Duck does the same.

In May and June the drakes will be in their dark spring plumage. Kristoffersen saw 4 males in this plumage in Hornsund on 28 May 1923 (432 : 190), and Blurton Jones relates (in litt.) that a drake in full breeding plumage was seen sleeping on the sea near the shore at Mr. Nøis's house in Sassen on 14 July 1957. In Stormbukta the birds kept their dark feathers until 17 July, but on the 22nd several white heads were seen. At this time they also began to lose their primaries. In Liefdefjorden 4 ducks were seen by Løvenskiold on 24 July 1949, and none of them could fly (615 : 29). Such a bird was caught by Birula on 7 August on Barentsøya in 1899 (298 : 169).

The moult can last for a long time, for Walter saw ducks on 21 August 1889 on Edgeøya which had not completed their moult (169 : 245). Le Roi devotes much attention to this subject, but gives few dates. One male bird shot on 14 July had already a perfect summer-plumage, but it had lost all the primaries. He obtained females in more or less perfect summer-plumage on 10 and 14 July 1907 (316 : 228).

B r e e d i n g. — There is only one record of the courtship of the species. On 28 June and on 1 July 1921, a few birds were seen by van Oordt at Bohemanneset in Isfjorden. The drakes were courting and often held their long tails vertically when swimming (370 : 142).

Løvenskiold says that the nest is often placed on small islets in lakes and ponds, sometimes on the wet tundra, under stones, on the open beach etc., but as a rule not far from fresh water. If possible, the duck prefers to place her nest within a colony of the Arctic Tern (615 : 73). In Greenland the species also seems to prefer to breed in tern colonies. Salomonsen says: "It breeds on coastal islands preferably in company with Arctic Terns. As these are absent in Holsteinborg District and in the greater part of Julianehaab District this may account for the absence of the Long-tailed Duck here" (588 : 109).

The nest is a scrape in the ground, more or less thickly lined with down.

This is very dark, almost black with definite light centres. Olivier, however, describes a nest with down that was chestnut with lighter centres (493 : 67). In all the nests I have seen both in Spitsbergen and in Norway, the down has always been at least sooty brown, almost black, and never of a colour that could be called chestnut.

The number of eggs varies from four to eight. The egg-laying period varies a great deal, but ordinarily it will last from the last week of June to the first half of July. In years when the snow melts early, breeding begins at an early date, but when there is much snow in June and even in July, it will be correspondingly late and may not take place at all. In the latter case, of course, large numbers of non-breeding birds will be observed. The earliest date when eggs have been found is 20 June and the latest 7 August. Hatching has been observed on the following dates: In July, on the 16th, 20th, 24th, and 26th; in August on the 8th and the 16th.

Løvenskiold states that as soon as the ducklings are dry, they leave the nest and follow the duck to the nearest pond or lake with fresh water. Here they stay, but how long it is before they leave for the sea is not known. In one instance they stayed on a pond for more than a month. On Dunøyane they seem to leave the fresh-water lakes and ponds immediately and even quite small ducklings are taken out to sea. On 5 August 1950, a great number of flocks were seen on the sea on the west coast of the islands. In the flocks, the ducks that had ducklings with them were very numerous (615 : 27).

Bertram and Lack, who visited Bjørnøya in 1932, say: "As with Eiders, the females with young disappeared from the lakes, presumably going to sea." (488 : 292)

The trapper Alfred Svendsen, who had wintered on Edgeøya, found the two first eggs of 1930 on 20 June near Ekrollhamna (on the western shore of Edgeøya) (1929/30, 644).

Tomkinson found several nests of the Long-tailed Duck on Bohemanneset in Isfjorden on 23 and 24 June 1931, and two days later he also found many nests in Grønfjorden (485 : 84).

On the island Sørkappøya Kristoffersen found a nest with seven eggs on 27 June 1930. This nest was well hidden among the stones on the beach (472 : 256).

On 27 June 1949 Løvenskiold was shown a single egg of this duck in Ny-Ålesund, Kongsfjorden. The egg had been found the same day (615 : 29).

Le Roi relates that on 27 June 1908, on Dunøyane, north of Hornsund, a duck was shot which had a fully developed egg in its oviduct (316 : 230). Munsterhjelm found a nest with one egg on 28 June and another with seven eggs on 1 July 1910, on Prins Karls Forland. The seven eggs were not hard set (313 : 22). In 1932 Bertram and Lack found not less than seven nests on Bjørnøya, on islets in the bigger lakes. One bird completed her clutch of seven eggs on 30 June, and they hatched on 24 July. The incubation period was therefore 24 days. Another clutch hatched four days earlier, but the other five not until 8 August, and one hatched as late as the 16th (448 : 291).

On 29 June 1956 Løvenskiold found a nest with five eggs close to the hut where he lived in "London" in Kongsfjorden (1956, 633). The duck began

incubating on 1 July and the young were hatched on 25 July. Strijbos (personal communication) states that the incubation period is 24 days.

Dalgety found several nests in Liefdefjorden on 3 July 1930. On one island seven nests were found and he says that many more must have been overlooked. Some of the nests were placed on the open tundra, while others were found underneath large rocks. The usual number of eggs in the clutches was seven, but one nest was found with eight eggs. On 3 July some of the eggs were quite fresh, while others had been incubated for about two weeks. The first ducklings were seen in Liefdefjorden on 16 July (470 : 247). On 8 July 1899, Swenander shot a duck on Bjørnøya. This bird had a nearly fully developed egg in the oviduct (247 : 30). A nest with five eggs was found by Dietrich on Gåsøyane (Anser Islands) in Isfjorden on 10 July 1906 (269 : 130). On 10 July 1950, Løvenskiold found a duck sitting very close to her nest at Kapp Linné (Isfjorden). As a Greenland dog was running loose, however, the duck could not be put off her eggs and therefore these were not counted (615 : 28). On Bohemanneset in Isfjorden a nest was found by van Oordt on 12 July 1921. This nest was placed in a very wet spot on the tundra and it contained six eggs. The nest was built of lichen and down (370 : 142). On 13 July 1907, a nest with two eggs was found by le Roi on Bjørnøya. Two more eggs were lying in a nearby Eider's nest which also contained two of the Eider's own eggs (316 : 230).

Two nests were found at Kapp Martin in Bellsund by Løvenskiold on 5 August 1949. One nest contained two eggs, the other six. On the 9th, the two-egg nest was deserted, but the other nest hatched on the 11th. This clutch must therefore have been completed on 19 July, because the incubation period is 24 days (615 : 28).

Olivier found a nest with five eggs on 7 August 1932 not far from the beach in Kongsfjorden. The female flew up close to his feet and joined her mate on a little pond. The eggs were resting on a thick layer of down, chestnut with lighter centres (493 : 67). Ducklings were seen by Dalgety in Liefdefjorden on 16 July 1930. These were the first ducklings hatched there that year (470 : 247).

On 26 July 1948, Løvenskiold saw a duck with sixteen small ducklings on a pond in Ny-Ålesund in Kongsfjorden. These ducklings could not have been more than two days old. On the same pond there was also a pair (♂ & ♀) of this species, but these birds were not interested in the ducklings. The ducklings must nevertheless have come from two different clutches (615 : 29).

On 27 July 1952, Løvenskiold found a duck with four small ducklings, about eight days old, on a pond near Hytteviken, east of Dunøyane. Until 27 July, only the male bird had frequented the pond. The family stayed there for a month, leaving on 27 August (615 : 28).

On 1 August 1861, Malmgren found a family of five on Dunøyane north of Hornsund (92 : 399).

Between 18 and 19 August 1889, Walter saw one brood of three and another of four almost fully fledged young ducks near Kraussbukta, Edgeøya (169 : 245).

F o o d. — Römer and Schaudin say that the food is mainly *Mollusca* (245 : 83).

Swenander found in the ventricle of specimens obtained on Bjørnøya the remains of vegetable matter and pieces of mollusc shells. On bird shot on the sea was full of *Gammaridae* (247 : 30).

Le Roi states that in the stomachs of seven specimens shot on freshwater lakes on Bjørnøya, there were small stones the size of hemp-seed, the remains of bivalves, but chiefly vegetable matter such as roots, moss and especially algae. The birds from Spitsbergen had, besides stones, mostly taken animal matter such as *Mollusca, Pteropoda,* larvae of *Diptera,* and in a single instance, bits of sea-weed (316 : 231).

In 1950 Løvenskiold saw hundreds of Long-tailed Ducks along the coasts of SW Spitsbergen. Here in the shallow sea on the reefs, both species of Eider and the Glaucous Gull were feeding on holothurians, and there is every reason to believe that the Long-tailed Ducks did the same (615 : 32).

No. 17. *HISTRIONICUS H. HISTRIONICUS* (L.)

The Harlequin Duck

Heuglin thought that he saw a Harlequin Duck in Hornsund in the summer 1870, but as he does not repeat this observation in later publications, he cannot have been very certain about it (116 : 61).

The only reliable record from the Spitsbergen area comes from Mathey-Dupraz. He says "A fine pair was shot in Advent Bay at the end of July 1906" (311 : 47).

No. 18. *MELANITTA FUSCA FUSCA* (L.)

The Velvet Scoter

On 6 August 1870 Heuglin saw Velvet Scoters in Mohnbukta on the west side of Storfjorden and three days later others were seen at Kapp Lee, the NW point of Edgeøya (123 : 160) and (132 : 147).

Cocks saw a pair of ducks with a duckling on 14 September 1882 on the beach near the head of Sassenfjorden, and thought them to be *Melanitta fusca* (151 : 407).

Le Roi is sceptical about these records, and writes that there is no proof of the bird being found in Spitsbergen. He expresses the opinion that both Mr. Heuglin and Mr. Cocks may have mistaken Eider drakes in summer plumage for Velvet Scoters (316 : 232).

The first absolutely reliable record originates from Mathey-Dupraz who shot a pair (♂ & ♀) in Recherchefjorden on July 18th 1906, and another in Adventfjorden two days later (311 : 47).

A very long time elapsed before another record was obtained. On August 8th 1936 Jung saw two or three black ducks with a white speculum and a

white patch under the eye, just outside the estuary of the river from Purpurdalen in Wijdefjorden. No birds were shot, but Jung was sure they were Velvet Scoters (539 : 124).

In 1954 Løvenskiold saw a drake of this species on July 24th in the lagoon at the head of Mosselbukta at the mouth of Wijdefjorden. The bird was seen every day from July 24th to the 28th. It mostly kept to a small lake, about 1 km east of the lagoon in the valley of the river which comes into the lagoon from the east. Here it kept company with a female duck, a very light-coloured bird, that could only have been a female Eider. The shape of the birds was very different, and the female was certainly not a Velvet Scoter (1954, 633).

Seeing the two birds together and the difference in their shapes when swimming, I cannot imagine that good ornithologists like Mr. Heuglin and Mr. Cocks could mistake Eiders for Velvet Scoters. Le Roi had not seen Mathey-Dupraz's paper, and therefore did not know that the Velvet Scoter had been collected in the area. I personally believe that all records referred to here are valid.

No. 19. *MELANITTA NIGRA NIGRA* (L.)

The Common Scoter

Geographical distribution

The Common Scoter breeds in Iceland, Norway, Sweden, Finland, and Russia including Waigatz and Novaya Zemlya. It has bred in the Svalbard area. In Asia it goes east to Taimyr. In Eastern Asia and North America there is another race *M. n. americana* Swains. In Greenland the Common Scoter is a casual visitor.

Occurrence in Svalbard

The species has bred on Bjørnøya and in Bellsund. It has been observed in Isfjorden and in Kongsfjorden.

First records

The species was found for the first time in Spitsbergen by Sluiter during the summer of 1878 (144 : XLV). It was found breeding by Professor Koenig in 1905. On Bjørnøya the first record of breeding was in 1932, but the bird was seen there for the first time in 1907.

Distributions. Sections I–VI

Section I. Bjørnøya. — One pair was seen on the west coast on 20 June 1907. The birds flew past the ship near Kapp Ruth. On a lake near Kapp Ruth, three pairs were seen on 2 July 1908, and two of the females were shot. The following day, one pair and a single female were obtained. Besides these birds, another pair was seen on the sea. All the birds obtained were adults with well developed gonads, but they had not yet begun to breed (Le Roi, 316 : 231).

In the summer of 1921, Summerhayes and Elton observed the species in small numbers on Bjørnøya (397 : 230).

In the summer of 1932, not less than fifteen pairs were seen by Bertram and Lack in the NE quarter of the island. Three pairs seemed to be breeding, but there was no time to search for the nests. One dropped egg was found (488 : 293).

Duffey and Sergeant saw a single bird at sea between Kapp Levin and Rifleodden in 1948 (586 : 557).

Section III. Bellsund. — On 8 July 1898 Kolthoff saw a flock of ten birds, four males and six females, in Recherchefjorden (261 : 56).

Le Roi relates that on the island Reinholmen (which he names "Training Squadron-Insel"), Professor Koenig found a bird which had a nest with six eggs on 15 July 1905. The bird, an adult duck with a brood-patch, was shot (316 : 231).

Mathey-Dupraz saw a single bird in Recherchefjorden and another in Bellsund in July 1906 (311 : 48).

Section IV. Isfjorden. — Le Roi reports a flock of black ducks, seen in Adventfjorden on 30 June 1907, but he is not absolutely certain they were Common Scoters (316 : 231).

On 25 and 26 June 1958 Bateson saw and photographed a pair (♂ & ♀) in Adventfjorden (1959, 651).

Section VI. Kongsfjorden. — Mathey-Dupraz saw six black ducks in a sound between two islands in the Lovén-group in Kongsfjorden on 1 August 1911. They proved to be *Melanitta nigra* (333 : 101).

Biological

Food. — Le Roi states that in birds from Bjørnøya only small stones and small marine molluscs (*Margarita helicina*) were found (316 : 232).

No. 20. *SOMATERIA M. MOLLISSIMA* ≷ *MOLLISSIMA BOREALIS*[1]

The Eider

Geographical distribution

Johansen says that there are two separate groups of Eiders, one Atlantic and one Pacific. The Atlantic group is divided into west-atlantic and east-atlantic birds. The west-atlantic birds are found in N America and in Greenland, *S. m. borealis* (Brehm) occurring in the north of Greenland and the race *S. m. dresseri* Sharpe further south. On the coasts of the Hudson Bay, *S. m. sedentaria* Snyder is resident. The nominate form *mollissima* belongs to the east-atlantic population and is found in Great Britain, Denmark, the Scandinavian Peninsula, the Baltic, Finland and N Russia to Novaya Zemlya. A small isolated form *S. m. faeroensis* is found on the Faeroe Islands.

[1] Contour map showing distributions, see backflap.

Intermediate populations are found in Iceland, S Greenland, N Norway and in the Svalbard area (629 : 68). The paper of le Roi on this subject is also of interest (326 : 65).

Professor Johansen, who has examined large series of skins, says that to call the Spitsbergen birds either *borealis* or *mollissima* is wrong. One should either use the name *S. m. islandica* Schiøler (1926) for all intermediate populations, or use the more complicated name *mollissima* $\gtrless$ *borealis*. The latter name has been used for the birds from Svalbard.

The Pacific birds are known as *S. m. v-nigrum* (Gray), and are distributed on both sides of the Bering Sea.

Occurrence in Svalbard

The Eider has been found breeding in all parts of the Svalbard area.

Birds in aberrant plumage

On 15 July 1898 Nathorst saw, near Ahlstrandodden in Van Keulenfjorden, a white-yellow duck, which he tried to obtain, but without success (243 : 156).

Isachsen relates that a Mr. Følstad shot a completely white duck in Spitsbergen in 1921. The bird was shot sitting on its nest on one of Fosterøyane in Hinlopenstretet. Isachsen who saw the skin, says that the feathers had a faint yellow tinge. The bill was yellow-brown, but more on the yellow side (367 : 347).

Roth shot a duck in arrhenoid plumage in Forlandsundet on 9 July 1900. Although it looked exactly like a drake, it had perfectly developed ovaries (257 : 130).

First records

Gerritszoon van Assum mentions among the birds in Spitsbergen, ducks which produce big eggs (". . . des Oisons et Canards lequels y pondent fort grands oeufs"). These "Canards" must have been Eiders (7 : 19).

Fotherby relates that he saw "Cuthbert Ducks", i. e. Eiders, in Spitsbergen in 1622 (8 : 33). Bacstrom, who visited Spitsbergen in 1780, reports having seen Eiders there (28 : 617).

Pennant says that the Eider is found in Spitsbergen (24 Vol. I : xc).

Laing says the species is sometimes found on the coast of Spitsbergen in vast numbers, especially in winter (31 : 113). Temminck states that the bird is an inhabitant of Spitsbergen (32 : 551). (See also 41 Vol. II : 850)

Leach sent to Dr. Thomson a list of birds and mammals received from the Northern Expeditions and sent to the British Museum by the Admiralty. "23. *Somateria Mollissima* (Cuthbert's Eider) Baffins Bay, Spitsbergen" (name of the bay now unknown (37 : 61).

Mandt saw the species in Spitsbergen during the summer of 1821 (42 : 3).

Records without any distinct locality

Gray states that a specimen obtained in Spitsbergen was presented to the British Museum by the Admiralty (58 : 141). Newton found the species numerous all around Spitsbergen during the summer of 1864 (96 : 515). Malmgren relates that the *S. spectabilis* of Beechey (from 1843) is nothing but the common Eider 94 : 338). (See also 85 : 110, footnote)

Martins, who visited Spitsbergen in 1838 and 1839, found the Eider breeding there (95 : 110). See also p. 113)

Grad found breeding Eiders in Spitsbergen in 1866 (97 : 101). Holmgren visited the Svalbard area in 1868 and saw the species there. He is, however, of the opinion that these Eiders must belong to another race, because they were smaller than the Scandinavian ones (100 : 1102).

Bowden says that this bird was formerly very common in Spitsbergen, but it had been so persecuted there for the last twenty years, that its numbers had greatly decreased (107 : 195).

Finsch states that the Eider in Spitsbergen is neither a new species nor a local form (131 : 211).

Palmén states that the species is common on the coast, even farther north than 80° N lat. (159 : 443).

Dittmer mentions that eider-down is collected by Norwegian trappers and hunters. He also states that more Eiders are found on the west coasts than on the east (248 : 83, 288).

Salvadori says that four specimens from Spitsbergen, two adults and two ducklings, are included in the collections of the Museum in Torino (252 : 4).

Miethe and Hergesell found the Eider breeding in Spitsbergen in 1910 (312 : 109, 110, 223).

Distribution. Sections I–XIV

Section I. Bjørnøya. — On Bjørnøya the Eiders are found mostly on the northern part of the island where the main body of the birds breed on islands in the freshwater lakes. A few nests may also be found in scattered positions, especially along the coast. In a few instances the birds have been found breeding on the very low skerries along the north coast. Since there are no Eiderholms in this area, the birds have to use the islands in the lakes to protect themselves against the Arctic Foxes, but they still remain vulnerable to the attacks of the Glaucous Gulls and the Arctic Skuas.

Section II. Hornsund. — The birds breed in isolated pairs all along the west coast of Hornsund and also in some places in the fjord itself. Eiders nest in small numbers on islets close to the shore, but the real breeding-grounds are Sørkappøya, Tokrossøya, Dunøyane and Isøyane. In each of these places thousands of birds used to breed, but today one will not find more than a few hundred pairs breeding there.

Section III. Bellsund. — The birds breed in colonies on islets and in small numbers on the mainland all along the coast from Storvika up to Kapp Lyell and from here to Recherchefjorden where there used to be a colony on

Reinholmen. In Van Keulenfjorden they breed on the islands at Ahlstrandodden, but especially on Eholmen on the north side of the fjord. In Van Mijenfjorden the islands Akseløya and Mariaholmen are known for the enormous number of Eiders which used to breed there. In Bellsund itself the species breeds on Reiniusøyane and likewise on islets along the shore between Kapp Martin and Kapp Linné. As in all other places in Spitsbergen, isolated nests may be found here and there along the coast wherever there are suitable nesting sites.

Section IV. Isfjorden. — Here there is the same sparse distribution on the mainland as in the other places. In this fjord there are very few islands and therefore there are only a few Eider colonies to be found. Such places are Gåsøyane near Gipshuken, Coraholmen in Ekmanfjorden, Tvillingholmane and other islets outside Bohemanneset and an island in Trygghamna. There are also about a hundred Eiders breeding on an island in a lagoon at Kapp Linné. Hermansenøya in Forlandsundet also belongs to this district and here great numbers of Eiders used to breed. There are still several pairs here.

Section V. Prins Karls Forland. — On Forlandet there is the usual scattering of nests along the coast of the island itself. Quite a number of birds also nest on islets along the western shore, especially in the extreme south. But the big colonies, where formerly up to 10,000 Eiders nested, were found on Forlandsøyane, where only a few hundred birds breed today.

Section VI. Kongsfjorden. — In Kongsfjorden the group of islands, Lovénøyane and the island Gerdøya, have long been known for the great numbers of birds which used to breed there. Now there are not so many left, but one can still find numbers of nests there. On a little skerry north of Storholmen, Eskjeret, the birds are protected by the miners in Ny-Ålesund. Here the density of Eider's nests is very high because they are not disturbed at all. The small islands close to the mining town also have a fair population of Eiders and on the plain to the SE of the colliery, there are many nests inside the vast colony of Arctic Terns. The Eiders also breed on a small island just outside Kapp Guissez and on Kohnøya in Krossfjorden.

Section VII. NW Spitsbergen. — A few pairs breed here and there on the mainland of this district, and scattered pairs also nest on the big islands, Danskøya, Amsterdamøya, Fuglesangen, Fugløya, Klovningen and both of the Norskøyane. In years when there are no foxes present on these islands, however, the Eiders may breed there in colonies.

Colonies of varying size are found in the following places: on islands in Magdalenefjorden, Moseøya in Sørgattet, Albertøya at the NE corner of Danskøya, Ytterholmane W of Amsterdamøya, the islets in Fuglefjorden, Cummingøya and Steggholmen SW of Indre Norskøya, Ørneøya N of Fuglesangen, Risen N of Klovningen; a few pairs sometimes breed together on the mainland along Raudfjorden and on Biskayerhuken, the islands in Liefdefjorden, viz. Stasjonsøyane, Andøyane, Måkeøyane and Lernerøyane, and there is also a small colony on some islets just N of Gråhuken.

Section VIII. Wijdefjorden. — Scattered pairs of Eiders breed along the coasts of the fjord, and colonies are found on Ræstadholmen at

Krosspynten, Gyllensköldholmane, Bjørnnesholmen, on an island in Mosselbukta and also on an islet in the lagoon in the bay.

Section IX. Hinlopen. — In this strait the birds have been found breeding on islets in Sorgfjorden, on Tommeløyane S of the entrance to Lomfjorden and on most of the other islands in the district.

Section X. Nordaustlandet. — In years when the ground is snow-free in June, the birds may be found breeding in low-lying areas on Nordaustlandet. One may assume that the birds breed on most of the many islands and islets surrounding the mainland, but so far there are reports of breeding from the following places only: Franzøya, Fosterøyane, Gyldénøyane in Wahlenbergfjorden, the islands in Murchisonfjorden, islets N of Langgrunnodden, Pentavika, Lågøya, Zeipelbukta, Waldenøya, Vesle Tavleøya, Rossøya, Scoresbyøya, Karl XII Øyane, Storøya and Isispynten.

Section XI. Storfjorden. — In Storfjorden there are numbers of small islands where the Eiders may possibly breed, but there are reports from only a few of these places. In the far east they breed on Ryke Yseøyane to the E of Edgeøya. Around this island they breed on Abbotøyane, Halvmåneøya, Tusenøyane, Kong Ludvigøyane, Zieglerøya and islets near Ekrollhamna in Tjuvfjorden, Kraushamna, Kvalpynten and at Kapp Lee. They also breed on Barentsøya and in Ginevrabotn.

Section XII. Kvitøya. — The only time the Eider has been found breeding on Kvitøya was on 14 July 1931.

Section XIII. Kong Karls Land. — There are records of breeding from both Svenskøya and Abeløya, but not from the largest of the islands, Kongsøya, which lies between the two others. It is therefore likely that the birds do also breed on Kongsøya.

Section XIV. Hopen. — In 1898 ducks and ducklings were seen on Hopen, but trappers and other people do not think that the Eiders breed here.

Records from the area around Svalbard

The North. — Collett and Nansen record that on 19 June 1896, two Eiders (♂ & ♀) were obtained north of Spitsbergen in latitude 82° 55′ N. They were flying from the south and alighted on one of the channels in the ice. Both of these specimens were adult birds in full nuptial plumage. No other specimens were seen in the ice (237 : 46).

The South. — Munsterhjelm records two drakes and three ducks which flew past the ship towards the east on 4 May 1910 at 74° 37′ N, 12° 24′ E. After that, flocks and single birds were seen every day, flying towards either Spitsbergen or Bjørnøya (313 : 25).

Biological

Migration. — In the autumn the majority of the Eiders apparently leave the Svalbard area and go south, to an unknown destination. Not all of them leave Spitsbergen, however, because on several occasions they have been found both around the sea-coasts and in the fjords during the winter.

Isachsen quotes the diary of the Norwegian skipper Tobiesen who wintered on Bjørnøya in 1865/66. He said that during the period 3 January to 11 February, the Eiders always came close inshore as soon as there was open water (446 : 53).

Kristoffersen states that the birds were absent in Hornsund from November 1923, when the sea froze, until December 8th, when a storm broke the ice, and he saw 20 birds there (432 : 186). Glen quotes the trapper Georg Bjørnnes who told him that in several winters he had found the birds in the open water behind "Polhem Island" and on the shore lead in Mosselbukta (503 : 203). Ingstad found open water in Mosselbukta on which there were a few Eiders during the winter 1933/34 (514 : 9).

It seems that during winter at least some of the Eiders will stay as close to the shore as the ice allows. As soon as the ice breaks up and they can find open water, these birds will come closer inshore even in mid-winter.

The arrival in spring is of course dependent on the occurrence of open water in exactly the same way. A look at Table 7 will show that in at least 5 instances Eiders have arrived during March, but these birds must be regarded as wintering birds. The normal time for them to arrive is April/May, and the majority probably arrive between 15 April and 15 May.

Before 1929 the ice often disappeared from Spitsbergen much later in the summer than it does now, and in 1929 the coal steamers could not get in to Longyearbyen in Isfjorden until after 14 August. Even if this is exceptional, there have been other years in which the ice has broken up late and the birds have been correspondingly retarded. Under such conditions they have in fact arrived very late, for example on 20 May 1889, 10 June 1929, 11 June 1873 and 20 June 1912.

In the autumn the birds begin to assemble in flocks in the latter half of August. These are mainly females and young birds. The drakes, which have kept to themselves during the moult, remain together and only join the others when their remiges are fully developed. At this time one may find flocks consisting of males only, others with females and young, and also of course mixed parties.

The main body of the Eiders will go south in about the middle of September, when they have been seen in very large numbers between Spitsbergen and Bjørnøya and also between Bjørnøya and Norway. However, big flocks have been observed in Spitsbergen in the latter half of September and the first half of October, and small flocks and single individuals as late as the latter half of November.

There must be some birds which, unlike the majority of Eiders, tend to stay in the area as long as they possibly can. These birds are only driven away when the ice covers the fjords and the sea.

On the autumn migration the Eiders usually follow the coastline, crossing the mouths of the fjords when going south. Birds which have been staying inside the fjords will go out to the entrance and then south. This they do even if, as is the case in Wijdefjorden, they have to go first north, then west and only then south. This fjord is 120 km long and goes straight N-S, and in this

area a rather interesting observation was made by the trapper Georg Bjørnnes. He had his headquarters on Austfjordnes in Wijdefjorden. On 12 October 1933, he saw Eiders flying in circles high up in the air, until all at once the whole party went south across the glacier Mittag-Lefflerbreen at the head of the fjord. From here to Isfjorden is only 25 km as the crow flies, and in crossing the glacier the birds spared themselves several hundred km of unnecessary flying. Bjørnnes was accustomed to seeing the Eiders going north on their first stage of the autumn migration.

Table 7
Arrival

First seen	Main body arr.	Year	Place	Author
1 March	5 April	1889	Danskegattet	Chapman (195: 346)
17 »	17 March	1926	Raudfjorden	Arthur Oxaas (1925/26, 643)
19 »	13 May	1939	Isfjorden	Arthur Oxaas (1938/39, 643)
25 »		1927	Verlegenhuken	Alfred Svendsen (1926/27, 644)
25 »	26 April	1939	Storfjorden	Hilmar Nøis (1938/39, 642 a)
	5 »	1930	Sørkapp	Kristoffersen (472: 256)
7 April	29 »	1928	Verlegenhuken	Alfred Svendsen (1927/28, 644)
8 »	12 »	1938	Forlandet	Normann Andersen (1937/38, 634)
	11 »	1931	Kongsfjorden	Peder Åm (1930/31, 646)
	14 »	1910	Forlandet	Munsterhjelm (313: 26)
	20 »	1937	Kongsfjorden	Peder Åm (1936/37, 646)
	25 »	1930	Sørgattet	Børre Trøhaug (1929/30, 645)
	28 »	1932	Wijdefjorden	Georg Bjørnnes (1931/32, 636)
	30 »	1907	Danskegattet	Paul Bjørvik (1906/07, 637)
	5 May	1922	Wijdefjorden	Arthur Oxaas (1921/22, 643)
	5 »	1935	Kongsfjorden	Peder Åm (1934/35, 646)
	10 »	1936	Nordaustlandet	Glen (520: 299)
April	13 »	1938	Isfjorden	Arthur Oxaas (1937/38, 643)
	14 »	1889	Betw. Spitsb.-Bjørnøya	Walter (169: 238)
	14 »	1921	Wijdefjorden	Arthur Oxaas (1920/21, 643)
	17 »	1900	Hornsund	Bianchi (253: 327)
	20 »	1889	Magdalenefjorden	Walter (169: 238)
	10 June	1929	Lomfjorden, Hinlopen	Alfred Svendsen (1928/29, 644)
	11 »	1873	Wijdefjorden	Kjellman (135: 268)
	20 »	1912	Isfjorden	Mathey-Dupraz (333: 103)

General habits. — Apart from places where cliffs drop more or less steeply down into the sea or where the glaciers reach the sea-shore, one will meet the Eiders everywhere from Bjørnøya in the south to Rossøya in the north and from Prins Karls Forland in the west to Abeløya in the east.

The birds prefer to breed on low grass- or moss-clad islands both along the sea-shore and in the fjords. Where such islands cannot be found, as on Bjørnøya, they breed on similar islands in freshwater lakes, or on level ground on

Table 7b
Departure

Flocks seen	Last seen	Year	Place	Author
16 Sept.	Oct.	1938	Isfjorden	Arthur Oxaas (1938/39, 643)
17 »		1923	Hornsund	Kristoffersen (432: 186)
20 »		1925	Nordaustlandet	Worsley (441: 184)
	7 Oct.	1925	Grønfjorden	Worsley (441, 212)
23 Sept.	14 »	1925	Nordaustlandet	Mikael Olsen (1925/26, 642 b)
23 »		1923	Edgeøya	Alfred Svendsen (1923/24, 644)
25 »		1868	Sørgattet	Fries och Nyström (109: 163)
	5 Oct.	1868	Kongsfjorden	Fries och Nyström (109, 163)
	14 »	1868	Sørkapp	Fries och Nyström (109, 179)
26 Sept.	5 »	1937	Isfjorden	Arthur Oxaas (1937/38, 643)
29 »	11 »	1928	Storfjorden	Georg Bjørnnes (1928/29, 636)
	5 »	1929	Edgeøya	Georg Bjørnnes (1929/30, 636)
5 Oct.	10 Nov.	1936	Svenskegattet	Waldemar Krämer (1936/37, 640)
	7 Oct.	1924	Wijdefjorden	Georg Bjørnnes (1924/25, 636)
7 Oct.	25 »	1872	Wijdefjorden	Kjellman (135: 148)
	8 »	1921	Wijdefjorden	Arthur Oxaas (1921/22, 643)
8 Oct.	20 Nov.	1938	Isfjorden	Hilmar Nøis (1938/39, 642 a)
17 »	23 »	1933	Wijdefjorden	Georg Bjørnnes (1933/34, 636)
12 »	3 »	1937	Forlandet	Normann Andersen (1937/38, 634)
12 »		1939	Isfjorden	Arthur Oxaas (1939/40, 643)
13 »	3 Nov.	1888	Danskegattet	Chapman (195: 344)
15 »	5 »	1900	Hornsund	Bianchi (253: 327)
16 »		1926	Verlegenhuken	Alfred Svendsen (1926/27, 644)
	19 Oct.	1924	Wijdefjorden	Arthur Oxaas (1924/25, 643)
	29 »	1927	Wijdefjorden	Georg Bjørnnes (1927/28, 636)
	31 »	1937	Isfjorden	Hilmar Nøis (1937/38, 642 a)
	5 Nov.	1929	Sørkapp	Kristoffersen (472: 256)
11 Novbr.	30 »	1925	Raudfjorden	Arthur Oxaas (1925/26, 643)
	12 »	1865	Bjørnøya	Isachsen (446: 49)
	20 »	1938	Isfjorden	Hilmar Nøis (1938/39, 642 a)

the mainland. Here, however, the nests are mostly isolated and at very different distances from the shore. They are well hidden and are normally found only by accident. In a few instances colonies are also found on the mainland, but then they are always among terns.

Both on the mainland and on the islands the Eiders often breed among terns to protect themselves against the big gulls. This fact is frequently mentioned in the literature on Spitsbergen birds and has been known for many years. Faber describes how the Icelandic birds sought protection against the skuas in the tern-colonies (45 : 70). See also Chydenius (89 : 321) and Løvenskiold (615 : 31).

During the breeding season the drakes stay close to the nests and protect the ducks until the moult begins. Then they leave and go to the outermost skerries

Table 7c
Wintering

Date	Year	Place	Author
8 Dec.	1923	Hornsund	Kristoffersen (432: 186)
28 »	1934	Sørgattet	Børre Trøhaug (1934/35, 645)
3 Jan.	1866	Bjørnøya	Isachsen (446: 53)
11 Feb.	1866	–»–	–»– –»–
4 Jan.	1939	Isfjorden	Hilmar Nøis (1938/39, 642 a)
25 Feb.	1939	–»–	–»– –»–
8 Jan.	1940	Isfjorden	Arthur Oxaas (1939/40, 643)
11 »	1889	Danskegattet	Chapman (195: 346)
25 »	1931	Sørgattet	Alfred Johansen (1930/31, 639)
29 »	1910	Forlandet	Munsterhjelm (313: 26)
29 »	1933	Kongsfjorden	Peder Åm (1932/33, 646)
1 Feb.	1938	Forlandet	Normann Andersen (1937/38, 634)
5	1925	Wijdefjorden	Georg Bjørnnes (1924/25, 636)
5 »	1931	Kongsfjorden	Peder Åm (1930/31, 646)
8 »	1938	Isfjorden	Arthur Oxaas (1937/38, 643)
15 »	1900	Hornsund	Bianchi (253: 327)
21 »	1937	Forlandet	Normann Andersen (1936/37, 634)

or to places along the coast where the water is shallow and food abundant. In such places they will stay until the moult is completed, when they begin to assemble for the autumn migration. (See Quennerstedt 81 : 26)

It is of course quite obvious that since he takes no part in the incubation, the drake will not provide any down for the nest. As a curiosity it may be mentioned that to determine whether or not the drakes did contribute down to the nest, Eaton shot a number of male Eiders in Wijdefjorden during the summer of 1873, but he found all their down intact (130 : 3816).

During the incubation period the ducks will often steal each other's eggs and sometimes as many as 10 eggs have been found in one nest. In most cases when more than 5–6 eggs are found, the surplus number have been stolen. It also happens that when they are breeding alongside the Brent Geese, the ducks also steal their eggs. But as the geese also steal the eiders' eggs, none of them are any better off than they should be. (See Nathorst 155 : 16)

After hatching the young are usually taken down to the sea as soon as they are dry, but they may stay in the nest as long as 48 hours. On the sea the duck keeps her brood close beside her, and in only one instance has she been seen to carry the ducklings on her back. This was observed by Birula on 12 July 1899 in Hornsund (298 : 199).

Marshall, who visited Spitsbergen in 1933, found that the birds underwent a distinct period of quiescence for about two hours around 1 a. m. each day (533 : 248). In this connection it may be of interest that Roth saw numbers of drakes passing his ship in Forlandssundet between 11 p. m. and 1 a. m. on 9 July 1902 (257 : 130).

E n e m i e s. — M a n. Until recently the collection of eider-down and partly also taking of eggs, were activities of economic importance in the Svalbard area. The game laws permit collecting of down and eggs until 10 June, but from this date until 20 August the birds are protected, and no one is allowed to disturb them in any way.[1]

Unfortunately protection without supervision is more or less useless, and nowhere is this better shown than in the Svalbard area. Here the game laws are made ridiculous in a way which is almost unbelievable. It must, however, be said that usually it is not the population of the mining towns, or the trappers, who infringe these laws, but the sailors and fishermen from smacks going up to Spitsbergen in summer for different purposes. Not least among these purposes was unlawful collecting of down and eggs, as long as these were there for taking, and also the forbidden shooting of Reindeer.

Some of the facts on this topic mentioned in papers and books on Spitsbergen are quoted below.

Such ruthless plundering has reduced the Eider population in a way which is almost unbelievable. On Forlandsøyane, where Kolthoff found more than 10,000 occupied nests in 1900, there were not more than 200 to 300 nests in 1956.

The primary reason for the decrease is of course the plundering, but there is also another factor which must be considered. In Spitsbergen the role of the predatory bird has been taken over by the Glaucous Gull, and this bird takes a heavy toll of eggs and ducklings on the Eider-holms.

As long as the population is sufficiently large the depredations of the gulls are relatively unimportant. But as soon as the number of Eiders decreases the danger becomes evident. Now that the extermination of these birds through ruthless plundering has reduced the population to its present low level, the gulls are able to complete the process begun by man. In fact, on Forlandsøyane in 1956, all the young were caught by the gulls long before they reached the shore, and not a single duck succeeded in getting her young down to the sea.

Thus the great Eider-holms of Spitsbergen, where tens of thousands of birds used to breed, no longer exist and the only way to repopulate the islands is to stop the plundering.

Malmgren relates that Norwegian sailors plundered the Eider-holms of Spitsbergen in a barbaric manner (92 : 399). Bowden states that the birds had been very severely persecuted for the previous 20 years and their numbers had greatly decreased (107 : 195). Fries and Nyström say that on the breeding-places, great numbers of duck were shot and all the eggs taken (109 : 63). Zeppelin also speaks of the decrease of the Eider population because of the robbing of nests and the shooting of females (179 : 92). Barry relates that Norwegian sailors would shoot as many ducks as they could and take all the eggs, incubated as well as fresh. The incubated eggs were thrown overboard when they were found to be useless for food (180 : 45).

Kolthoff also speaks of the plundering by Norwegian sailors (226 : 307).

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[1] From 10 May 1963 the Common Eider is protected in Svalbard all the year.

Heuglin mentions the plundering and also the shooting of the ducks on the nest and the consequent decrease of the Eider population (132 : 141). Mathey-Dupraz met, on 28 July 1911, two Norwegians who had collected 11 sacks of eider-down and taken 1,600 eggs on islands in Kongsfjorden (346 : 14).

Van Oordt says that the number of Eiders seemed to be decreasing as a result of persecution and egg robbing. Jourdain told him that the Oxford Expedition of 1921 had met a ship coming from the Edinburgh Islands (Forlandsøyane) where 15,000 eggs had been taken (370 : 142).

Congreve visited Lovénøyane in Kongsfjorden on 25 June 1922, and found that these islands had been recently robbed (599 a · 17). Binney was of the opinion that the species would be exterminated in Spitsbergen because of the uncontrolled robbing (413 : 62). Dalgety visited Storfjorden during the summer of 1927. He saw only a few broods, for almost all the eggs had been taken by Norwegian sailors (442 : 28).

Jung says that although the eggs on the islets in Fuglefjorden were well incubated, they were taken by two Norwegians on 11 July 1936 (539 : 125).

Cott mentions that the species is used as an egg-bird in Spitsbergen, where the eggs are collected for their commercial value (609 : 425). Løvenskiold found that in the big colony on Gåsøyane in Isfjorden, all the eggs had been taken when he visited the place on 10 August 1948. Although many ducks were seen, none had any offspring with them. In 1949, the colliery at Ny-Ålesund in Kongsfjorden was visited by three Norwegian destroyers, and the crews took all the eggs in the colony near by. They probably also plundered Lovénøyane, where there were almost no eggs to be found the day after the ships had left. It was obvious also that the island Moseøya in Sørgattet had been plundered at least once before 29 June 1949, on which date a Norwegian smack, marked T. 58 G., landed some men on the island, who took all the eggs which remained there (615 : 37, 38). On 6 July 1954 the island Ræstadholmen in Wijdefjorden was found to have been recently plundered (1954, 633). Karl J. Bengtson states that Kong Ludvigøyane were completely plundered during the summer of 1905 (1905/06, 635). Normann Andersen says that all the eggs on Forlandsøyane were taken by the crews of two Norwegian smacks on 7 June 1938. But as this happened before 10 June, it could not be prevented (1937/38, 634). See also Werenskiold (398 : 35).

The Arctic Fox. Where it can reach the Eider's nest the Arctic Fox will of course take all the eggs it can get. It will also devour all the ducklings it encounters.

Sometimes the animal will visit an island surrounded by landbound ice, and when the ice breaks up and the fox is unaware of the fact, it will have to remain on the island. Occasionally, however, a marooned fox has been known to swim back to the mainland.

When a fox has been left stranded on an Eider-holm, not a single Eider will breed there, and as long as the nesting ground is surrounded by land-bound ice, they will keep away.

It may also happen that the sound between an Eider colony and the main-

land is blocked during the summer by drift-ice. Should the foxes find their way there under these circumstances, they will destroy every nest before they leave again.

As mentioned before, not a few Eiders breed in isolated sites scattered over the vast area on the level ground between the mountains and the sea. Not infrequently these nests are found by foxes, especially when they have been discovered by man and visited repeatedly afterwards. The fox will often follow the tracks of humans, and is in this way led to the nest.

Torell says that Eiders always breed on islands inaccessible to foxes (73 : 45).

Chydenius visited an island near Langgrunnodden on Nordaustlandet on 11 July 1861, where a fox had taken all the eggs of both the terns and the Eiders (89 : 213).

Kjellmann found foxes on Norskøyane on 7 August 1872, and no birds were breeding there (135 : 56).

Schlegel found Eiders breeding on both of Norskøyane in 1881, and says that they do not breed on the mainland because of the foxes (148 : 2).

Nathorst found foxes on Akseløya in Bellsund on 1 July 1882, and no birds were breeding there. There were, however, many nests on Mariaholmen to the south of Akseløya (155 : 27).

Roth visited Lovénøyane in Kongsfjorden on 21 June 1900. On one of the islands a fox was found and not a single Eider was breeding there (257 : 92).

Werenskiold states that a pair of foxes had found their way to Sørkappøya in 1921, and there were no birds breeding there (398 : 34).

Jung found a nest with eggs in Woodfjorden in 1936. It was situated about 90 m above sea-level, and it was eventually plundered by a fox (539 : 125).

Arthur Oxaas visited Indre Norskøya several times in June 1926. Here the foxes took the Eiders' eggs as fast as the birds could lay (1925/26, 643).

Georg Bjørnnes visited Hermansenøya in Forlandsundet on 21 June 1927. The island was surrounded by land-bound ice, and no birds were breeding there (1927/28, 636).

Løvenskiold visited Sørkappøya in 1950. There was at least one fox on the island and not a single breeding Eider could be found. On 31 July 1948 not a single occupied nest was found on Akseløya in Bellsund, but a litter of fox-cubs was seen there (615 : 31. 36). On the same island Tomkinson found countless nests on 16 June 1931 (485 : 81). On 28 June, not a single occupied nest was seen on Gerdøya in Kongsfjorden, but the fact that the island was surrounded by land-bound ice, had made it possible for the foxes to come over from the mainland.

T h e P o l a r B e a r. The Polar Bear is known to have ravaged Eiders' nests on many islands, but this does not happen very often. The Polar Bear belongs to the pack-ice and almost all of them leave Spitsbergen for the north as soon as the ice breaks up. Thus only a few individuals, if any, are left on the islands during the summer-time. If they happen to find an Eider-holm, the Polar Bears are, of course, very destructive.

Lamont saw a bear plundering Eiders' nests on one of Tusenøyane on

18 July 1859, where "thousands" of Eiders and other birds were breeding (74 : 432) and (76 : 89). About 12 August 1871 he visited Halvmåneøya where a bear had taken most of the Eiders' eggs (139 : 336).

Roth found a bear on one of Lovénøyane in Kongsfjorden on 21 June 1900. The animal had visited two of the islands and had taken all the eggs (257 : 92).

Arthur Oxaas relates that in June 1926, two or three bears had plundered an Eider-holm near Flathuken at the entrance to Raudfjorden (1925/26, 643).

The Ringed Seal. One would not think that this small seal could be dangerous to Eiders, but there is at least one piece of evidence pointing in this direction. In the autumn of 1956, Løvenskiold saw a duck with three small ducklings in Signehamna in Krossfjorden. The sea was like a mirror and at some distance from the birds a seal put its head up and dived again. Then suddenly there was a tremendous splash where the birds were, and the duck flew to the shore. She returned immediately, but there were now only two ducklings left (1956, 633).

The Greenland Shark. Georg Bjørnnes states that a friend of his, the trapper Mr. Ritter (an ex-Austrian cavalry officer) wintered on Krosspynten in Wijdefjorden. On 5 December 1925, he shot a big Greenland Shark which swam into shallow water with a part of its back showing above the surface. In its stomach Ritter found two adult Eiders (1925/26, 636).

The Cold. As mentioned under "Breeding", the extensive plundering of the 1st, the 2nd and even the 3rd clutch of eggs inevitably puts the whole breeding cycle out of balance. Quite small ducklings are sometimes found so late in the autumn that the fjords may freeze before they are able to fly. In such cases they are abandoned by their mothers. Even though the maternal instinct is strong, the instinct of self-preservation is still stronger and, at least at this time of the year, will override the parental instinct.

Ducklings or young birds abandoned in such circumstances will, of course, either freeze to death or fall an easy prey to the fox or the Glaucous Gull. Munsterhjelm relates that in 1910 Recherchefjorden became ice-covered towards the end of September and because of this several small ducklings were abandoned by their mothers and died. Other birds, a little older, were running about on the ice seeking open water and these also eventually froze to death (313 : 28). Mikael Olsen found some young Eiders frozen to the ice in Van Keulenfjorden on 8 October 1917 (1917/19, 642 b). Løvenskiold found a half-grown Eider frozen to death outside the camp in Signehamna in Krossfjorden on 29 August 1956 (1956, 633).

The Glaucous Gull and the Arctic Skua. Next to man, the worst enemy of the Eider are the big gulls. Since the Arctic Skua operates in the same way as the gull, albeit on a somewhat reduced scale, these two species can be dealt with together.

On all Eider-holms and on small islets where Eiders breed, the Glaucous Gull also nests, and during the breeding season these gulls live more or less exclu-

sively, depending of course on the size of the duck colony, on eggs and ducklings.

The gulls often eject pellets, which, though these may be distributed over a wide area, are usually concentrated, sometimes in numbers, around their nests. In June and July, these pellets consist mainly of the downy feathers of ducklings and the membranes of eggs.

The number of eggs and young birds the gulls will eat during a season has to be seen to be believed.

Where man has reduced the Eider population by plundering, the gulls will take such a heavy toll of the eggs and young that the Eiders are virtually exterminated. To help the Eiders, the population of Glaucous Gulls should be decimated, for there are far too many of them. Even if a large number of them were killed, they would be in no danger of extermination.

The Arctic Skua is also a bad egg-thief and will quickly rob an unprotected nest. It also takes small ducklings but it is less dangerous than the gull because it cannot kill growing youngsters. The Skuas do not usually breed on the Eiderholms, but they will almost always visit these places during the breeding season, sometimes in quite large numbers. They are of course a great nuisance to the Eiders.

Fries and Nyström state that the Arctic Skua will plunder the Eiders' nests to eat the eggs (109 : 67). Torell says that the Glaucous Gull can swallow ducklings whole when they are still in down (112 : 266). Heuglin saw how the big gulls tried to take ducklings in Hornsund in 1870 (116 : 58). Nathorst relates that on 28 June 1898, as many as 16 Arctic Skuas were shot on Eholmen in Van Keulenfjorden. After these were killed other skuas continued to come. He also saw several big gulls on the island (243 : 93). Orleans, on 28 June 1905, saw how the Eiders defended their eggs and young against both of these marauders (277 : 89). Kristoffersen visited Dunøyane north of Hornsund on 10 June 1924. Here skuas and gulls lived to a great extent on Eiders' egg. As long as the drake remained near the nests they defended their ducks, and once a drake took hold of the wing of a big gull and drew it away from the nest, in such a way that it was impossible for the gull to get loose (432 : 186). During the summer of 1930, he saw at Sørkapp how a duck with 12 ducklings was attacked by 20 gulls which eventually got 7 ducklings (472 : 256). Løvenskiold saw, on 28 June 1949, how the gulls were stealing eggs on Lovénøyane in Kongsfjorden. During the summer, ducklings were attacked by gulls in Liefdefjorden. On 19 July 1950, Glaucous Gulls, Great Black-backed Gulls and Arctic Skuas took great numbers of eggs and ducklings on Tokrossøya close to the south point of the mainland. Some of the ducks were incubating among terns and these were safe as long as they sat on the nests. But as soon as they led their young on to the sea, the ducklings were taken by both species of gulls (615 : 30).

T h e M o u l t. — After the duck has begun to incubate, it is often seen that the drake will keep her company and sit beside the nest for longer or shorter periods throughout the 24 hours.

When the time arrives for the drakes to shed their remiges, they leave the

females and go out to sea. This beginning of the moult seems to start not earlier than the middle of July and this has been confirmed by the observations of several authors, among them Zedlitz (319 : 318), Bateson (1957, 650) and Løvenskiold (615 : 36). The latter found in 1948 that the moult did not begin until 25 July and in 1956 it began on the 26th. Jung found drakes in nuptial plumage at the nests near Gråhuken as late as the middle of August 1936 (539 : 125).

During August most of the birds will be in full moult, as stated by Mathey-Dupraz (333 : 102), Montague (433 : 139), Bertram and Lack (488 : 293), Duffey and Sergeant (586 : 557) and Løvenskiold. But the moult can be completed much earlier and also much later than this. Bateson saw newly-moulted drakes flying about on 10 August (1957, 650), and on 26 August, 1898, Kolthoff shot a drake and a duck which had shed all their primaries and wing-coverts (261 : 60).

B r e e d i n g. — As soon as the ice and snow have disappeared from the breeding area and the soil has dried out a little, the breeding grounds will be occupied by the Eiders. The main part of the population used to breed on low, level islands covered with grass and moss, along the coasts and in some of the fjords. The biggest colonies were found on Sørkappøya in the extreme south, Dunøyane, Akseløya, Forlandsøyane, Moseøya, the islands in "Fair Haven", Moffen and several other places.

All of these islands, however, have been so frequently plundered throughout the breeding season that there are now relatively few pairs nesting there.

It seems, however, that some of the birds have taken refuge in places seldom visited by man, while others breed on small islets and skerries along the coast. In these places there are so few Eiders nesting that it is not worth while for anyone to go there to collect eggs and down. In addition quite a number of Eiders breed in isolated pairs scattered over the vast forelands between the mountains and the coast. In other places great numbers of nests can be found on the mainland in tern colonies.

Not a few Eiders breed on islands in lagoons and freshwater lakes, and on Bjørnøya, where there are almost no suitable nesting places along the coast, the entire population, with very few exceptions, breed on such islands.

On the old breeding grounds there are so many scrapes, that one cannot tread between them. Most birds use the old scrapes, which can be quite deep. Sometimes, however, the bird will build a new nest, and then it will often use plant material such as stalks of *Saxifraga oppositifolia* and moss as nesting material. Kolthoff found nests constructed in this way on Forlandsøyane in 1900, but he also saw nests built of moss on blocks of ice stranded on the shore. On a small islet with no vegetation at all, he found a nest built of small flattish stones. These were so finely joined that the surface of the cup was quite smooth (226 : 506). In most of the nests there is a certain amount of moss which is used, before the down is shed, to cover the eggs when the duck leaves the nest. To begin with there is very little down in the nest, but more and more appears as the incubation goes on.

In the Svalbard area the season for egg-laying is normally June to July, and

whether it begins early or late depends mainly on two factors. The first is the presence of open water along the shore, and the second is whether or not the breeding ground is covered with ice and snow. On the islands off the coast, the tops of the hills are often snow-free, while the rest of the ground is covered. These bare patches are immediately occupied by breeding birds, while the rest of the population has to wait on the water around the island for the area to be uncovered.

If the snow disappears in early spring, the egg-laying may begin in May and this has been observed in six different instances.

If we assume the incubation period to be 28 days, the dates for fresh eggs can be lumped with those for "Eggs presumably laid" from both tables to give about 115 records from the months of June and July. It then appears that more than 75 % of the eggs are laid between 9 June and 7 July. Such a long egg-laying period, however, is by no means normal for the Eider, but because of the extensive plundering mentioned above, the ducks lay a second and even a third clutch, and their breeding cycle is correspondingly thrown out of balance. In most years under normal conditions the egg-laying would be concentrated around the middle of June.

If we take only the first date on which eggs were found in each of the years in the tables we obtain the following distribution:

Dates in May	20	26	27	29	31																
No. of observ.	2	1	1	1	1																
Dates in June	1	2	4	6	8	9	10	13	15	16	17	19	20	21	22	23	24	25	26	29	
No. of observ.	1	1	1	3	1	2	2	2	3	1	1	1	2	1	1	2	3	2	1	1	
Dates in July	1	2	3	10																	
No. of observ.	1	1	1	1																	

From this it seems that about 65 % of the eggs are laid between 6 and 25 June. The peak hatching time should therefore be between 3 and 22 July.

The number of eggs in a nest is usually between 3 and 5. In places where the birds are absolutely undisturbed, there are sometimes 5 eggs in all the nests; 6 and 7 eggs are only occasionally found, but up to 10 have been recorded. However, since the birds often steal eggs from each other, numbers exceeding 6 are probably stolen.

From the hatching it is about 2½ months or 75 days before the young can fly tolerably well. Thus a bird hatched on 6 July will not be able to fly until about 18 September, but ducklings hatched on 3 August will not fly until about 16 October. The consequences of this have been discussed already. (See under "Enemies, The cold")

After the mother has taken her brood down to the sea, she is often surrounded by ducks which have no ducklings. These help her to defend and care for the young, and one may see as many as 6 ducks with only 6 ducklings.

On the other hand, single ducks with as many as 12 young have been seen on several occasions, for in a certain period of early youth, the duckling will attach itself to another individual, which is usually the mother. If there are many ducks and ducklings about it can happen that some ducklings will attach them-

Table 8

Egg-laying

Date	No. of nests	No. of eggs	Condition	Eggs presumably laid	Place	Author
20 May 1913			fresh	20 May	Spitsbergen	W. Kramer (1936/37, 640)
27 » 1922		9	fresh	27 »	Wijdefjorden	A. Oxaas (1921/22, 643)
29 » 1936			fresh	29 »	Kongsfjorden	P. Åm (1935/36, 646)
3 June 1937		30	fresh	3 June	Kongsfjorden	P. Åm (1936/37, 646)
5 » 1936		100	fresh	5 »	Kongsfjorden	P. Åm (1935/36. 646)
5 » 1938	many	1	fresh	5 »	Forlandsøyane	N. Andersen (1937/38, 634)
6 » 1930			fresh	6 »	Sørkapp	Kristoffersen (472: 256)
6 » 1918		a few	fresh	6 »	Bellsund	M. Olsen (1917/18, 642 b)
6 » 1925		100	fresh	6 »	Raudfjorden	A. Oxaas (1924/25, 643)
7 » 1939		2	fresh	7 »	Forlandsøyane	N. Andersen (1936/37, 634)
9 » 1900	a few		fresh	9 »	Forlandsøyane	Kolthoff (250: 26)
10 » 1924			fresh	10 »	Dunøyane	Kristoffersen (432: 186)
12 » 1937		a few	fresh	12 »	Svenskegattet	W. Kramer (1936/37, 640)
13 » 1873			fresh	13 »	Mosselbukta	Kjellmann (135: 271)
13 » 1910	many	many	fresh	13 »	Forlandsøyane	Munsterhjelm (313: 25)
14 » 1900	many	2–6	fresh	14 »	Hornsund	Bianchi (253: 327)
15 » 1858	many		fresh	15 »	Norskøyane	Quennerstedt (81: 26)
15 » 1890			fresh	15 »	Dunøyane	Klinckowström (172: 39)
16 » 1939		19	fresh	16 »	Isfjorden	A. Oxaas (1938/39, 643)
17 » 1900	many	2–5	fresh	17 »	Forlandsundet	Roth (257: 74.77)
17 » 1922		7	fresh	17 »	Wijdefjorden	A. Oxaas (1921/22, 643)
18 » 1899	1	3	fresh	18 »	Hornsund	Birula (298: 199)
18 » 1922	many	500	fresh	18 »	Svenskegattet	W. Kramer (1936/37, 640)
20 » 1928			fresh	20 »	Verlegenhuken	A. Svendsen (1927/28, 644)
20 » 1930		11	fresh	20 »	Edgeøya	G. Bjørnnes (1929/30, 636)
20 » 1930		9	fresh	20 »	Edgeøya	A. Svendsen (1929/30, 644)
21 » 1936			fresh	21 »	Nordaustlandet	Glen (520: 300)
22 » 1926		25	fresh	22 »	Norskøyane	A. Oxaas (1925/26, 643)
23 » 1898	many	3–6	fresh	23 »	Kong Ludvigøyane	Römer und Schaudin (246: 166)
24 » 1907	many		fresh	24 »	Forlandet	Le Roi (316: 246)
24 » 1949	1	5	fresh	20 »	Isfjorden	Løvenskiold (615: 36)
28 » 1949	100	5	fresh	22 »	Kongsfjorden	Løvenskiold (615: 38)
25 » 1927		2	fresh	25 »	Verlegenhuken	A. Svendsen (1926/27, 644)
26 » 1900	several 1000	5	fresh	26 »	Forlandsøyane	Kolthoff (250: 61)
26 » 1900	several 1000	3–4	fresh	26 »	Forlandsøyane	Kolthoff (250: 61)
26 » 1907	many		fresh	26 »	Forlandsøyane	Le Roi (316: 242)
26 » 1908	many		fresh	26 »	Dunøyane	Le Roi (316: 242)
26 » 1929			fresh	26 »	Verlegenhuken	A. Svendsen (1928/29, 644)
27 » 1900	many		fresh	26 »	Forlandsøyane	Kolthoff (226: 505)
27 » 1908	many		pt. of hatching	1 »	Dunøyane	Le Roi (316: 242)
28 » 1905			well incubated		Raudfjorden	Orleans (277: 89)
28 » 1932			fresh	28 »	Bjørnøya	Bertram and Lack (488: 292)

Date	No. of nests	No. of eggs	Condition	Eggs presumably laid	Place	Author
30 June 1899	1	3	fresh	30 »	Hornsund	Birula (298: 199)
30 » 1922	1	4	fresh	30 »	Isfjorden	Congreve (599 a: 51)
30 » 1956	200	5	fresh	30 »	Kongsfjorden	Løvenskiold (1956, 633)
1 July 1758	1000	4	fresh	1 July	Forlandsøyane	Martin (17: 130)
1 » 1899	1	5	well incubated		Hornsund	Bianchi (253: 327)
1 » 1950	1	5	fresh	1 »	Isfjorden	Løvenskiold (615: 37)
1 » 1949	200	3–5	fresh	1 »	Smeerenburgfj.	Løvenskiold (615: 39)
3 » 1950	1	6	fresh	3 »	Isfjorden	Løvenskiold (615: 37)
3 » 1950	1	7	fresh	3 »	Isfjorden	Løvenskiold (615: 37)
5 » 1930			fresh	5 »	Nordaustlandet	Dalgety (470: 247)
5 » 1936			fresh	5 »	Nordaustlandet	Godfrey (529: 170)
6 » 1910	many		fresh	6 »	Van Keulenfj.	Munsterhjelm (313: 25)
6 » 1954	100	1–4	pt. of hatching	8 June	Wijdefjorden	Løvenskiold (1954, 633)
7 » 1922	1	5	well incubated		Isfjorden	Congreve (599 b: 1)
8 » 1952	30	3–5	pt. of hatching	10 »	Isfjorden	Løvenskiold (615: 37)
9 » 1891		100	fresh	9 July	Isfjorden	Barry (180: 45)
9 » 1954	500	4–5	all st. of incub.		Wijdefjorden	Løvenskiold (1954, 633)
10 » 1906	200	1–4			Isfjorden	Dietrich (269: 130)
10 » 1907		1			Isfjorden	Le Roi (316: 242)
10 » 1922	many	1–5	well incubated		Isfjorden	Congreve (599 b: 36)
10 » 1950	2	2–5			Isfjorden	Løvenskiold (615: 36)
10 » 1940		2	fresh	10 »	Wijdefjorden	G. Bjørnnes (1939/40, 636)
13 » 1907			fresh	13 »	Bjørnøya	Le Roi (316: 242)
14 » 1952	many	2–5	pt. of hatching	16 June	Dunøyane	Løvenskiold (615: 34)
16 » 1873		40	fresh	16 July	Recherchefj.	Drasche-Wartinberg (129: 19)
16 » 1898			fresh	16 »	Bjørnøya	Nathorst (243: 54)
16 » 1930	many		fresh	16 »	Sørkappøya	Kristoffersen (472: 256)
16 » 1930	many		pt. of hatching	18 June	Sørkappøya	Kristoffersen (472: 256)
16 » 1954	200	4–5	pt. of hatching	18 »	Wijdefjorden	Løvenskiold (1954, 633)
17 » 1861	many		fresh	17 July	Hinlopen	Chydenius (89: 199)
17 » 1921	many	4–5	pt. of hatching	19 June	Isfjorden	Van Oordt (370: 142)
18 » 1924	many		fresh	18 July	Nordaustlandet	Binney (413: 105)
19 » 1900	1	7			Bjørnøya	Kolthoff (261: 58)
19 » 1950	200	2–4	pt. of hatching	21 June	Tokrossøya	Løvenskiold (615: 32)
22 » 1948	1	5	pt. of	24 »	Isfjorden	Løvenskiold (615: 36)
22 » 1949	1	4			Liefdefjorden	Løvenskiold (615: 36)
26 » 1906	1				Norskøyane	Mathey-Dupraz (311: 48)
26 » 1952	a few	2–3	well incubated		Dunøyane	Løvenskiold (615: 34)

Date	No. of nests	No. of eggs	Condition	Eggs presumably laid	Place	Author
26 July 1948	40	2–3	pt. of hatching	28 June	Kongsfjorden	Løvenskiold (615: 37)
27 » 1911	3	4	pt. of hatching	29 »	NW Spitsbergen	Mathey-Dupraz (333: 102)
29 » 1910	1		slightly incubated		Van Keulenfj.	Munsterhjelm (313: 25)
29 » 1923	many	1–5			Hinlopen	Longstaff (407: 483)
29 » 1948	1	3	fresh	1 July	Bellsund	Løvenskiold (615: 35)
29 » 1956	many	2–5	pt. of hatching	1 »	Forlandsøy N	Løvenskiold (1956, 633)
31 » 1956	many	2–5	pt. of hatching	3 »	Forlandsøy S	Løvenskiold (1956, 633)
1 Aug. 1952	many	4–5	pt. of hatching	4 »	Isøyane	Løvenskiold (615: 35)
2 » 1898	many		fresh	2 Aug.	Kong Karls Land	Römer und Schaudin (246: 166)
4 » 1950	many	2–5	pt. of hatching	7 July	Dunøyane	Løvenskiold (615: 30)
8 » 1954	8	2–5			Wijdefjorden	Løvenskiold (1954, 633)
9 » 1891	1	3	well incubated		Van Keulenfj.	Zeppelin (179: 72)
10 » 1932	a few	5			Bjørnøya	Bertram and Lack (488: 292)
19 » 1891	1	3			Kongsfjorden	Zeppelin (179: 151)
21 » 1891	1				Kongsfjorden	Zeppelin (179: 160)

selves to other ducklings instead of to an adult. In this way it is perhaps possible to explain how a single duck can acquire so many more ducklings than she can have hatched.

F o o d. — The stomach contents of a duck shot by Walter on 18 June 1889 included unidentifiable remains of *Mollusca,* pellets containing nothing but the remains of digested grass, and small stones the size of peas (169 : 241). The stomach of a drake shot on the sea near Bjørnøya in 1899 contained shells of *Mollusca* and small stones. The remains in the stomach of birds shot on freshwater lakes could not be identified (Swenander, 247 : 31). Mathey-Dupraz says that in a female shot in Smeerenburgfjorden 7 *Leptochiton ruber* and 2 *Margarita cinerea* were found. In other birds there were *Mollusca* remains and sand (311 : 47). Le Roi states that the Eiders' main food is various molluscs which the birds obtain by diving. The following species were found: *Cardium groenlandicum, Cardium ciliatum, Neptunea despecta,* var. *borealis, Bela gigantea* and *Mya truncatula.* Also common were pellets of grass and seaweeds, and small quantities of downy feathers. Small stones up to 2–3 mm in diameter were also present (316 : 243). Montague visited Nordaustlandet during the summer of 1923, and he writes as follows about the food of the Eider: "A large number of stomach examinations showed that the usual food during the summer is a species of *Chiton.* Other molluscs, e. g. *Maia* and *Conus,*

Table 9
Hatching

Date	Eggs presumably laid	Place	Author
16 June 1937	20 May	Kongsfjorden	P. Åm (1936/37, 646)
22 » 1910	26 »	Forlandsøyane	Munsterhjelm (313: 25)
27 » 1898	31 »	Isøyane	Nathorst (243: 84)
29 » 1930	2 June	Isfjorden	Dalgety (470: 247)
29 » 1949	2 »	Sørgattet	Løvenskiold (615: 38)
1 July 1898	4 »	Moffen	Römer und Schaudin (246: 166)
1 » 1957	4 »	Raudfjorden	Bateson 1957, 650)
5 » 1954	8 »	Kongsfjorden	Løvenskiold (1954, 633)
6 » 1950	9 »	Isfjorden	Løvenskiold (615: 37)
6 » 1949	9 »	Svenskegattet	Løvenskiold (615: 39)
6 » 1954	9 »	Wijdefjorden	Løvenskiold (1954, 633)
8 » 1930	11 »	Sørkapp	Kristoffersen (472: 256)
9 » 1954	12 »	Wijdefjorden	Løvenskiold (1954, 633)
12 » 1928	15 »	Norskøyane	Heintz (454: 273)
12 » 1952	15 »	Hornsund	Løvenskiold (615: 30)
14 » 1955	17 »	Edgeøya	Lønø (1955, 647)
15 » 1936	18 »	Nordaustlandet	Glen (520: 300)
17 » 1870	20 »	Hornsund	Heuglin (116: 59)
18 » 1956	21 »	Krossfjorden	Løvenskiold (1956, 633)
19 » 1950	22 »	Tokrossøya	Løvenskiold (615: 32)
20 » 1861	23 »	Norskøyane	Torell (112: 264)
20 » 1930	23 »	Nordaustlandet	Dalgety (470: 247)
21 » 1897	24 »	Isfjorden	Conway (208, 64)
21 » 1898	24 »	Nordaustlandet	Carlheim-Gyllensköld (236: 74)
22 » 1932	25 »	Bjørnøya	Bertram and Lack (488: 292)
23 » 1936	26 »	Wijdefjorden	Jung (539: 125)
23 » 1924	26 »	Nordaustlandet	Montague (433: 139)
24 » 1956	27 »	Forlandsundet	Løvenskiold (1956, 633)
25 » 1910	28 »	Amsterdamøya	Mathey–Dupraz (311: 47)
25 » 1949	28 »	Liefdefjorden	Løvenskiold (615: 39)
26 » 1948	29 »	Kongsfjorden	Løvenskiold (615: 38)
26 » 1928	29 »	Wijdefjorden	G. Bjørnnes (1927/28, 636)
29 » 1773	2 July	Nordaustlandet	Phipps (23: 58)
29 » 1950	2 »	Stormbukta	Løvenskiold (615: 33)
29 » 1956	2 »	Forlandsøy N.	Løvenskiold (1956, 633)
30 » 1864	3 »	Dunøyane	Dunér (98: 89)
2 Aug. 1898	5 »	Kong Karls Land	Römer und Schaudin (246: 166)
3 » 1956	6 »	Forlandet	Løvenskiold (1956, 633)
4 » 1899	7 »	Bjørnøya	Swenander (247: 31)
4 » 1898	7 »	Bjørnøya	Oustalet (547: 227)
4 » 1950	7 »	Dunøyane	Løvenskiold (615: 30)
6 » 1932	9 »	Bjørnøya	Bertram and Lack (488: 292)
8 » 1861	11 »	Hinlopen	Malmgren (85: 109)
9 » 1956	12 »	Krossfjorden	Løvenskiold (1956, 633)
10 » 1898	13 »	Kong Karls Land	Kolthoff (261: 60)
24 » 1882	26 »	Isfjorden	Nathorst (155: 63)
1 Sept. 1936	2 Aug.	Wijdefjorden	Jung (539: 125)

are also taken in large numbers. An occasional food earlier in the year is *Lumbricillus aegialites,* an annelid found on the sea-shore" (433 : 139). See also Montague (423 : 144). Kristoffersen shot a duck in Hornsund in August 1923. This bird was thin and its head and neck were bent down and forwards. In its throat was stuck a whole *Echinus* (432 : 186). Hartley failed to find the very abundant *Thysanoëssa* in the stomach of Eiders in Billefjorden in 1923, presumably because the Eiders seek their food on the bottom (502 : 128). Hartley and Fisher examined the stomach contents of 10 specimens. The result was: *Crustacea* in 7, *Mollusca* in 4, fish in 1 and Annelids in 1. *Crustacea: Mysis oculata* in 2, *Gammarus* in 4, *Hyas araneus* (Spider Crab) in 2, *Eupargurus pubescens* (Hermit Crab) in 1, *Pseudolibrotus littoralis* (amphipod) in 1, *Anonyx nugax* (amphipod) in 1, and *Spirontocaris gaimardii* in 1, cephalopod "beaks" in 1. *Mollusca:* lamillibranches in 3, gastropods in 1 (513 : 385). Heuglin found great numbers of *Pecten* shells in the stomach of an Eider duck in 1870 (132 : 141). Løvenskiold found that large numbers of moulting drakes (also a few ducks), distributed along the coast from Stormbukta south of Hornsund, to Sørkappøya, lived mainly on holothurians (sea-slugs). These were abundant in the shallow waters along this coast. In other parts of Spitsbergen they seemed to live to a great extent on crabs, probably the Spider Crab (*Hyas araneus*) (615 : 32).

Parasites. — Montague states that an acanthocephaline worm was obtained from the small intestine of a female Eider shot on Reinsdyrflya on 14 June 1924. It was identified as *Filicollis botulus* (Van Cleave 1916) (423 : 144).

There is one previous record of this same parasite being obtained from a Spitsbergen Eider. (N. Kostylev. "Sur les Acanthocéphales de l'Eider (*S. mollissima* L.), Parasitology, Vol. XIV., 372, 1922).

No. 21. *SOMATERIA SPECTABILIS* (L.)[1]

The King Eider

Geographical distribution

The King Eider breeds in Novaya Zemlya, Kolguev, Waigatz, on the Yamal Peninsula and in Spitsbergen.

In America it is found on the arctic coast of Canada from Labrador, Hudson Bay, and James Bay to Alaska and the Bering Sea. Salomonsen relates that it breeds in Greenland from Thule on the NW coast up to Washington Land, and on the east coast in Scoresby Sound and north to Peary Land (588 : 131).

The European birds winter off the coast of N Norway and N Russia.

Occurrence in Svalbard

The species visits Bjørnøya, but does not breed there. It breeds in small numbers here and there along the coast and in the fjords of Vestspitsbergen up

[1] Contour map showing distribution, see backflap.

to Kongsfjorden, but has never been found with eggs or young north of this fjord.

Otherwise a few specimens have been seen on the NW corner of Spitsbergen, from Magdalenefjorden to Liefdefjorden, and there are two or three observations from Wijdefjorden and Hinlopenstretet. In Storfjorden it has been recorded in several places, but has been found breeding only on Edgeøya. The bird has also been seen on Kong Karls Land, but neither nests nor young have been found there.

First records

The first author to mention the King Eider from Spitsbergen is Temminck (32 :551) and (41 : 852).

Beechey mistook the Common Eider for the King Eider and thought he found it breeding in Spitsbergen in 1818 (56 :100–103). His statement has caused much misunderstanding.

It has not been possible to find out from whom Temminck obtained his information, but reliable records of the bird from Spitsbergen are given by Sundevall (52 : 126).

Professor Lovén, who visited the islands in 1837, told Dr. Malmgren that he had seen the species in Isfjorden. In this paper it is also mentioned that Professor Nordenskiöld had obtained two specimens in Spitsbergen in 1858 (85 : 110). These are possibly the same birds as those mentioned by Quennerstedt, who states that a few females of this species were shot there in 1858 (81 : 26).

Distribution. Sections I–XIII

Section I. Bjørnøya. — On Bjørnøya the King Eider has been found on several occasions, but never breeding.

Section II. Hornsund. — The species has been found all along the west coast from Sørkappøya up to Isøyane and also in the fjord Hornsund. It has bred on the mainland just north of the entrance to Hornsund, on Isøyane and probably also on Dunøyane.

Section III. Bellsund. — The species has been seen in Bellsund, Recherchefjorden, Van Keulenfjorden, Van Mijenfjorden and at Kapp Martin. It has bred several times on Akseløya and Mariaholmen and also once at Kapp Martin.

Section IV. Isfjorden. — The King Eider has been observed at Kapp Linné, in Grønfjorden, Colesbukta, Adventfjorden, Reveneset, Deltaodden, Vindodden in Sassenfjorden, Sassendalen, Tempelfjorden, Gipsdalen, Gåsøyane, Dicksonfjorden, Bohemanneset, Erdmanodden, Trygghamna and on Hermansenøya in Forlandsundet. It has bred in Adventfjorden, Sassendalen, Gipsdalen and on Bohemanneset.

Section V. Prins Karls Forland. — The bird has been found breeding here once and has been seen in Forlandsundet, at Richardlaguna on the NE side of the island, on Forlandsøyane, in Selvågen and in some places southwards to Salpynten, the southernmost point.

Section VI. Kongsfjorden. — The species has been seen on the fjord and has been found breeding on the islands Lovénøyane.

Section VII. NW Spitsbergen. — The birds has been seen in Magdalenefjorden, in Sørgattet, in Raudfjorden and on Måkeøyane in Liefdefjorden.

Section VIII. Wijdefjorden. — There are only two records from this section.

Section IX. Hinlopen. — The species has been seen once, in Lomfjorden.

Section XI. Storfjorden. — The King Eider has bred in Gothabukta near Kvalpynten and in Tjuvfjorden on Edgeøya. It has been seen on Tusenøyane, Kong Ludvigøyane, in Kraussbukta on Edgeøya, in Ginevrabotn and at Agardhpynten.

Section XIII. Kong Karls Land. — The species has been found on Svenskøya.

Biological

Migration. — Records of the migration of the King Eider are very rare in papers on Spitsbergen ornithology. It seems, however, that they follow the spring and autumn movements of the Common Eider.

Kristoffersen states that the King Eider arrived with the Common Eider in April. Then they kept to the open water between the ice and the coast until May when they disappeared (432 : 186, 189). Peder Åm saw 8 drakes in company with Common Eiders in Kongsfjorden on 20 April 1937 (1936/37, 646).

Walter relates that the species arrived in Spitsbergen about 1 June 1889 (169 : 238).

Kristoffersen is the only author to mention the autumn migration of the species. He saw them in the flocks of Common Eiders flying south. In 1924 the migration reached its height on 17 September, and from the middle of September as many as up to 10 young birds (males) were shot on different occasions out of flocks of Common Eiders.

General habits. — In Spitsbergen the King Eider is not nearly as numerous as the Common Eider. As far as can be seen, the bird arrives with the Common Eider in spring and leaves with them in the autumn. But their way of life is different and they choose a breeding-biotope entirely different from that of the Common Eider.

They almost always breed near fresh-water, and the females and young stay on ponds and tarns until the ducklings are grown to a fair size. Not until then do they go to sea.

To begin with the drakes stay with the ducks, sometimes close to the nest. But when the moult begins, the males assemble in larger or smaller flocks and leave for certain districts where they will remain throughout the moult.

Such an area, according to Løvenskiold, is the coast from Hornsund to Sørkappøya. Here in July 1950 there were flocks of King Eider drakes, numbering at least 1,000 birds, and probably more.

In the last half of July, the moult has begun and the birds need food in a generous measure. In the shallow water around the many reefs on this coast,

Sea-slugs (Holothurians) are very abundant, and the birds' stomachs were usually full of them. This may be why so many drakes assembled in this particular area.

Outside this area there are almost no drakes to be seen anywhere in Spitsbergen from the middle of July until the conclusion of the moult. It is therefore likely that this is where the majority of the King Eider drakes from the west coast of Vestspitsbergen congregate.

But of course they may also be present in small numbers in other places. On 17 August a small flock in moult was seen outside the river mouth in Gipsdalen in Isfjorden. There were perhaps 15 birds (mostly drakes) and they had lost all trace of their nuptial plumage (615 : 40).

Very few birds in moult have been shot. Walter shot a drake in moult at Kraussbukta on Edgeøya between 18 and 21 August 1889 (169 : 245). Kolthoff reports small flocks of drakes along the coast of Bohemanneset in Isfjorden on 19 July 1898, and one bird in moult was shot (261 : 58).

Van Oordt says that at the beginning of July, the males assemble in flocks which may be large or small. On 4 July 1921 he saw about 30 drakes near the glacier Borebreen in Isfjorden and in the bay outside they were extremely numerous. On 22 July he saw only 3 birds at Bohemanneset and supposed that the rest of the birds had gone to sea (370 : 145).

B r e e d i n g. — The breeding habits of the King Eiders are entirely different from those of the Common Eider. As a rule the nest is always placed near freshwater ponds in the tundra, or in bogs. Sometimes they can be found on mossy banks either in a bog or out in the water, but just as often, perhaps, they nest in tussocks standing in ponds or the streams which sometimes cross the bogs. The down which lines the nest is very dark — much darker than the down found in any nest of the Common Eider.

There are not many records of the species breeding in the Svalbard area. Several authors mention that they have found the bird breeding, without giving dates, though they sometimes mention the locality.

Kjellmann found the species breeding on Akseløya and on Mariaholmen in Bellsund in 1873 (135 : 323), and Sundevall has found the birds to be numerous there in 1838. Nordenskiöld also found the birds breeding on these islands in 1873 (145 : 119).

Nathorst was of the opinion that the bird bred on Kong Karls Land (230 : 168) and (228 : 30).

Bianchi states that Dr. Birula found the species breeding in Ginevrabotn in Storfjorden in 1901. He also says that a Mr. Michailowsky found King Eiders breeding in Gothabukta on Kvalpynten on Edgeøya in 1901 (253 : 328).

Dalgety and coll. found the bird breeding in Isfjorden in 1930 (470 : 248). On the island Hermansenøya in Forlandsundet he found a male King Eider mated to a female Common Eider in 1931. The four eggs were fertile (476 : 90). Lings found several ducks breeding on Bohemanneset in 1931 (481 : 91).

The King Eider probably does not lay until about 15 June, although van Oordt says it lays when the snow melts (370 : 145).

This Eider seems to breed later in the year than the common one. With a

few exceptions nests with eggs have always been found between 20 and 30 June. Ducklings have not been seen earlier than the last days of July, and this only once.

Walter shot a female in Kraussbukta on Edgeøya on 7 June 1899. The bird had a shell-less egg in its oviduct and would probably have begun to lay a few days later (169 : 239).

The earliest record of a nest with eggs was in 1949 on 20 June, when Dr. Sager in Ny-Ålesund found the bird breeding in Kongsfjorden (Løvenskiold 615 : 43).

Tomkinson found a nest with 4 eggs in Gipsdalen in Isfjorden on 22 June 1931, and 3 nests on Bohemanneset on 23 and 24 June the same year. The down was black and the eggs brown (485 : 83).

Kolthoff records that a nest was found on an islet near Bohemanneset on 24 June 1900. Here the drake was standing beside the sitting duck. The nest contained one new-laid egg and no down. He also relates that one of his men found a drake standing beside its incubating mate on Forlandsøyane on 28 June 1900 (261 : 58).

Kristoffersen found a few breeding pairs on Isøyane north of Hornsund on 24 June 1924 (432 : 189).

Van Oordt saw a King Eider drake in the company of a Common Eider duck on the "Three Isles", probably Tvillingholmane south of Bohemanneset on 28 June 1921. They were sitting beside an empty nest which had probably been robbed by fishermen.

On 30 June he found a nest close to the edge of a small lake on Bohemanneset. The 5 eggs were small and the down dark. Another nest with 5 eggs was found in the same place on 3 July. This nest was placed on dry ground among *Cassiope tetragona.* The young hatched at the end of July, and during the summer females could be seen everywhere on the fresh-water lakes with their young, but never on the fjord. On 1 August 1921 he saw 30 adults and 100 young birds on a comparatively large lake, close to the glacier Wahlenbergbreen (north of Bohemanneset). All the young were of the same size (370 : 145).

Le Roi states that two nests with 3 eggs each were found in the bogs at the head of Adventfjorden on 29 and 30 June (316 : 244).

Tomkinson found 3 nests containing a quantity of down on Bohemanneset on 3 July 1931 (485 : 84).

Løvenskiold visited Bohemanneset at the beginning of July 1952. No nests were found from 4 to 9 July, but it was evident that the ducks were sitting, for the drakes had assembled in small flocks on several lakes and ponds (615 : 43).

Summerhayes and Elton state the species breeds on the *Cassiope* heath on Bohemanneset (397 : 251). Jourdain relates that 2 nests with 5 eggs each were found here on 12 July 1921 (381 : 168). Kolthoff shot an adult duck with brood-patches on Bohemanneset on 19 July 1898 (261 : 58). See also Nathorst (243 : 169).

Løvenskiold found a duck with 6 ducklings, several days old, on a pond on the north side of the entrance to Hornsund on 3 August 1952. Ten days later

they had grown considerably, but had now moved to another pond. On Kapp Martin on the north side of the entrance to Bellsund, a duck with 5 newly-hatched ducklings was seen on 5 August 1949.

On 15 August 1950 five ducks were seen on a little lake in the valley Sassendalen. They had from one to five ducklings each. On another pond there were two ducks, one with two, the other with five quite small ducklings. On a pond close to the river-mouth in Gipsdalen, five ducks and 15 ducklings were seen on 17 August 1950 (615 : 42, 43).

F o o d. — Although the King Eiders stay very near freshwater ponds, they will also feed on the sea like the Common Eider.

Trevor-Battye saw King Eiders in Adventfjorden between 20 and 28 June 1896 and says: "Several small companies of King Eiders flew with each low tide from the sea to the marshes at the head of Advent Bay, where they fed among the Common Eiders, who also resorted there. If disturbed they would fly round mixed in a flock of Common Eiders, but would presently separate and settle by themselves." He claims to have seen a hundred King Eiders there in all (203 : 586).

In the stomach of a bird shot on Bjørnøya on 30 June 1899 Swenander found small stones, pieces of shell and the leg of a big crab (247 : 46).

Le Roi says that the stomach contained the remains of *Mollusca,* stones the size of hemp-seeds, stalks of *Graminea* and also leaves of unidentifiable phanerogramic plants (316 : 248).

Summerhayes and Elton say that the young birds fed on freshwater ponds on *Crustacea,* plants etc. (397 : 258).

Løvenskiold states that the big flocks on the west coast of Sørkapp Land fed extensively on sea-slugs (holothurians). In one instance a fairly big prawn-like crustacean was also found.

Females with young were never seen on the sea with them. They always kept to fresh-water and fed there (615 : 40).

No. 22. *MERGUS MERGANSER MERGANSER* L.

The Goosander

In his "Revidert Oversikt over Norges Fugler" (Revised summary on the birds of Norway) Schaanning states that the Goosander has been found on Bjørnøya and in Spitsbergen. This paper was published in January 1931, but as far as can be seen, there was at that time no record for this bird from either place.

The first record for Svalbard is from Bjørnøya, Bertram and Lack. They saw a single drake near Nordhamna on 4 July 1932 (488 : 293).

The only other record originates from Dege who saw a Goosander in Duvefjorden on Nordaustlandet on 15 June 1945 (613 : 242).

ANSER ANSER ANSER (L.)

The Grey Lag-Goose

Torell is the first author to mention the Grey Lag-Goose from Spitsbergen (73 : 45, 61), and later authors refer partly to him and partly to their own observations. But all these observations relate to the Pink-footed Goose which has so often been mistaken for the Grey Lag-Goose. *Anser anser* has in fact never been collected in the Svalbard area.

ANSER FABALIS FABALIS (Latham)

The Bean-Goose

The Bean-Goose has never been collected in Spitsbergen or in the Svalbard area, but the Pink-footed Goose has often been erroneously identified as the Bean-Goose. Malmgren was the first to attribute the Bean-Goose to Spitsbergen and other authors followed him, but after a while it became an established fact that of the grey geese, only the Pink-footed was found in Spitsbergen (85 : 107).

No. 23. *ANSER FABALIS BRACHYRHYNCHUS* Baillon.[1]

The Pink-footed Goose

Geographical distribution

This race breeds only in E Greenland, Iceland and in Spitsbergen. It has never been found breeding on Bjørnøya nor in Frans Josef Land, but it is not completely impossible that it may eventually be found breeding in Franz Josef Land. The Greenland and Iceland population winters on the coasts of Scotland and England.

It is replaced in N Norway, N Sweden, N Finland, N Russia, Kolguev and Novaya Zemlya by the nominate form, *A. f. fabalis* (Lath.), which is also found in Siberia east of the Taimyr. Other Siberian races are *A. f. serriostris* Swinhoe and *A. f. middendorfi* Sev.

Occurrence in Svalbard

Bjørnøya is passed on migration, but the species does not breed there. It has been found breeding in the following areas: Hornsund, Bellsund, Isfjorden, Forlandet, Kongsfjorden, NW Spitsbergen, Wijdefjorden, Hinlopenstretet and Storfjorden. The bird has been observed on the island Hopen, but it does not breed there. It has never been seen on Kvitøya nor on Kong Karls Land, but fragments of eggshell found here were supposed to be those of Pink-feet and some droppings of geese have also been found.

[1] Contour map showing distribution, see backflap.

Ringed birds and recaptures

In 1954, a number of geese were ringed in Spitsbergen by Goodhart, Webbe and Wright. Among these were 526 Pink-feet, mainly caught in Reindalen in Van Mijenfjorden (619 b : 170). Holgersen relates that more than a hundred of these Pink-feet were caught or shot in 1954, 1955 and 1956 (622 b : 24, 149). The birds were captured on passage through Denmark and in N Germany and N France where they winter. As far as is known, no Pink-foot ringed in Spitsbergen has ever been found in Great Britain.

First record

Professor Lovén who visited Spitsbergen in 1837, saw Pink-footed Geese in Kongsfjorden on 24 June (51 : 40).

Distribution. Sections I–XIV

Section I. Bjørnøya. — The bird has never been found breeding on Bjørnøya, but it passes the island on both the spring and the autumn migrations. It has also been found there in the summer on a few occasions.

On the spring migration the birds pass the island in May, and on the journey south they seldom arrive there before 20 September. The main body passes in October.

Section II. Hornsund. — Pink-feet have been found breeding near Breinesflyane on Sørkapp Land about midway between Sørkapp and Hornsund, and also on the south side of Hornsund on the slopes between Hohenlohefjellet and Gåshamna. Opposite this bay, on the north side, the birds have been seen on Sofiekammen. Great numbers breed in Revdalen E of Rotesfjellet, and they also breed in numbers on the western slopes of Rotjesfjellet up to Werenskioldbreen. They have been seen on Dunøyane as well as at Kapp Borthen to the north of these islands.

Section III. Bellsund. — Pink-footed Geese have been found breeding on the mountain Griseryggen between Storvika and Dunderbukta and have been seen on Fløyfjellet S. of Dunderbukta and at the lakes Gaulvatna. They have also been found breeding in Buvika N of Dunderbukta and seen in Dyrstaddalen near Kapp Lyell. In Recherchefjorden the birds have been seen in various places and have been found breeding in numbers on Observatoriefjellet. In Van Keulenfjorden they have been seen in several places, including Ahlstrandodden, and they were found breeding in Van Keulenhamna. The species has also been seen at Midterhuken, on the islands Mariaholmen and Akseløya, along the south shore of Van Mijenfjorden, in the valley Braganzadalen at the head of the fjord and at Blåhuken on the north side. In Reindalen they have been both observed and found breeding on several occasions. They have been seen on the west side of the glacier Fridtjofbreen and at Kapp Martin and they were found breeding on the islets St. Hansholmane between Kapp Martin and Kapp Linné.

Section IV. Isfjorden. — In this section the birds have been found in the following places: They have been seen at Kapp Linné and found breeding

near the lake Linnévatnet, in Grønfjorden and in Colesbukta. They have been seen in Adventfjorden and have been found breeding in Adventdalen. In Sassenfjorden they have been seen in various places including Diabasodden and along the shore beneath the mountain Tempelfjellet. In Sassendalen and the side-valley Eskerdalen they have been found breeding. Another breeding-place is Gipsdalen and they probably also bred formerly on Gåsøyane near Gipshuken. They also breed at Brucebyen in Billefjord, and in Petuniabukta. They have been seen in Mimerdalen and Skansbukta on the north side of Billefjord and have bred at Kapp Thordsen at the entrance to the fjord. Other breeding-places are Dicksonfjorden, Ekmanfjorden and Bohemanneset, Erdmannodden and Sylodden and Selmaneset in Ymerbukta. They also breed in Trygghamna near Alkhornet and on the island Hermansenøya in Forlandsundet.

Section V. Prins Karls Forland. — On Forlandet the Pink-footed Goose breeds in the southern part around the mountain Salfjellet. It has not been found breeding on the enormous plain "Forlandsletta" but it does breed in several places in the mountainous part of the island to the north side of this plain. It has been found with nests and young in Haukbukta on the west coast, Kaldneset a little farther north and at Fuglehuken in the extreme north of the island. It probably also breeds all along the mountainous slopes along the coast from Kaldneset to Fuglehuken. Places where the birds assemble are, Richardlaguna in the north, Selvågen on the east coast and Forlandsletta in the south.

Section VI. Kongsfjorden. — In Kongsfjorden the bird breeds mostly on islands such as on Lovénøyane and Gerdøya. In some places it also nests in the valleys inland, on the mountain Ossian Sarsfjellet, for example, and in the valley to the south of this mountain. In Krossfjorden the bird has been found breeding in Møllerfjorden and it has been observed in several places including Signehamna and near the glacier Fjortende Julibreen.

Section VII. NW Spitsbergen. — In this section the species breeds in Magdalenefjorden, on the mountains to the west of Breibogen, on Reinsdyrflya and in Liefdefjorden. It has been observed in Sørgattet, in Kobbefjorden an Danskøya, in Smeerenburgfjorden, in Danskegattet, in Raudfjorden and on Norskøyane.

Section VIII. Wijdefjorden. — The Pink-footed Goose probably breeds in all of the great number of side-valleys branching off the fjord, but it has been found actually nesting in Purpurdalen on the west side and near the glacier Midtbreen on the east side, and in three other places on this side of the fjord.. It has been seen at Verlegenhuken, Mosselbukta, Dirksodden, in the valleys to the south of this point, at Austfjordnes, Landingsdalen in Vestfjorden, and at Krosspynten.

Section IX. Hinlopen. — Pink-feet have been found breeding in Sorgfjorden and have been seen in great numbers in Lomfjorden.

Section X. Nordaustlandet. — Blurton Jones (in litt.) says that members of the International Geophysical Year expedition to Nordaustlandet in 1957 told him that they had found Pink-foot nests near Murchisonfjorden.

Section XI. Storfjorden. — On the east side of the big islands Edgeøya and Barentsøya, the bird has never been found, but on Edgeøya itself it has been observed on Negerpynten, on Zieglerøya in Tjuvfjorden and also in great numbers in Dyrdalen at the head of this fjord. It also occurs in Ekrollhamna on the north side of the fjord, on Kvalpynten and in Discobukta. It has been seen in Ginevrabotn near Barentsøya. On the west side of Storfjorden there is only one observation from Dunérbukta. The bird has been found breeding on Tusenøyane.

Section XIII. Kong Karls Land. — In one instance, eggshells said to belong to the Pink-footed Goose were found on one of the islands, where goose droppings have also been found. But in fact nobody has ever seen a Pink-footed Goose here, and as far as can be seen it has never been recorded in print.

Section XIV. Hopen. — This island is passed by the birds on migration, but they do not breed here.

Biological

Migration. — The Pink-footed Goose feeds on grass and therefore cannot arrive in Spitsbergen too early in the year. When they arrive in the spring they are in extremely good condition (i. e. they are very fat), and so they are able to endure snow, cold weather and lack of food for quite a long period. It is this which makes it possible for them to come to this area, even when the ground is covered with snow.

The Pink-foot is not known to have arrived in Spitsbergen before the middle of May, but the main part of the spring migration takes place in the last half of the month. In some years snow covers the ground far into the summer, and then the birds will not appear until the beginning of June, but this is exceptional.

Dates in May	16	18	19	20	21	22	23	25	26	29	30	31
No. of observ.	1	1	1	2	2	1	2	2	1	4	1	1

In the autumn the geese begin to gather in flocks in the second half of August, and some of them go south in the last days of the month. The main part of the autumn migration, however, takes place throughout September. After 25 September there are only a few geese left, but in some instances Pink-feet have been seen even in October.

Dates in September	2	4	6	7	8	11	12	14	15	16	18	22	23	24	25	26	27	28
No. of observ.	2	2	1	2	1	2	1	3	2	1	1	3	1	1	2	1	1	1
Dates in September	29	30																
No. of observ.	1	1																
Dates in October	5	7	13															
No. of observ.	1	2	1															

Until recent years, very little was known about the winter-quarters of the Pink-footed Goose of Spitsbergen. It was supposed that they wintered in the southern part of the North Sea between Norway and the British Isles but there was no actual proof of this, and it was not known whether the birds found there in autumn and during the winter originated from Spitsbergen or not.

Thanks to the ringing of Pink-feet, undertaken by Englishmen in Spitsbergen, we know now considerably more about winter-quarters of the race.

Goodhart, Webbe and Wright, who, during the summer of 1952, took part in the Sherborne School Expedition, state that they ringed 42 Pink-feet in Gipsdalen in Isfjorden. In 1954 they again went to Spitsbergen and ringed 526 Pink-feet in Reindalen in Van Mijenfjorden and in Sassendalen in Isfjorden (619 b : 170).

Up to the time when their paper went to press, there had been 41 recoveries of the 568 Pink-feet ringed. The birds were shot in the area mentioned above, on the west coast of Denmark and along the coasts of Germany, Holland and Belgium and as far as France. All of them were recovered in autumn and winter: 1 in September, 10 in October, 4 in November, 12 in December, 10 in January, 1 in February and 1 in March. See also "Ringed birds", p. 126.

We know therefore that the Pink-feet from Spitsbergen do not go to the British Isles on the autumn migration, and I have not seen a single record of a Spitsbergen ringed bird from Britain. We do know, on the other hand, that these birds have their winter-quarters in the southern part of Nordsjøen (the North Sea) between Denmark and the English Channel.

G e n e r a l h a b i t s. — The Pink-feet, for the most part, are found in the big valleys, where they have sufficient grazing and suitable nesting-places. It cannot be said that they nest in colonies, but sometimes a number of nests can be found relatively close together. The nest is usually placed in a spot with a clear view in all directions so that the bird can see well in advance if an enemy is approaching. The incubating goose will then be warned by the gander, who takes up his quarters a little distance from the nest, and keeps watch there throughout most of the incubating period. When alarmed by the gander the goose will cover the eggs with moss and grass and slink off, and the camouflage is often so effective that it is difficult to detect the nest.

A favourite nesting ground seems to be a grass-clad hillside beneath a steep mountain-wall; the nests are placed relatively close to the cliff, but in such a way that the birds have a wide outlook. Sometimes the birds will breed on a grass-clad ledge on a steep mountain-side, and such nests have been found more than a hundred metres above level ground. Islets and islands along the shore of the fjords are also often used for nesting sites. For the birds, however, the most essential feature of the nesting site is that there should be grass-clad slopes or plains nearby where the young can be taken to feed. The goslings will begin to eat by themselves shortly after they have been hatched.

The birds seem to prefer a landscape with lakes and rivers where they can take refuge when the goslings are small or when the adults themselves are in moult.

At the beginning of July the Pink-feet start to lose their remiges, the earliest record of birds in moult being on 7 July. About the middle of August the majority of them will have grown primaries and secondaries and will be able to use their wings again. After 18 August there are very few of them incapable of flight, but in two different instances, birds which still were in moult have been found as late as 22 and 24 August.

The Pink-footed Goose is a very wary and shy bird, and it is quite remarkable how it will take wing (or run away in the moulting period) as soon as it detects a man, even at a great distance. This is the more remarkable in a country where most of the birds are almost fearless.

The reason is, of course, that all of the three species of geese in Spitsbergen on migration and in their winter-quarters are very much persecuted by men, and in consequence they have become extremely wary and difficult to approach.

The Pink-foot is a powerful bird, and a pair of them can even drive an Arctic Fox away from their nest. This makes it possible for it to breed on the mainland and also on icebound islands where it can be quite easily reached by foxes crossing the ice. Under such conditions neither Eiders nor even terns will breed, and these species wait until the ice has disappeared and it is is impossible for foxes to come over from the mainland.

Quite a number of people have seen fights between a fox and a pair of Pink-feet, among them Werenskiold. They all agree that if the birds are left alone they will manage to keep the fox away. If, however, they are disturbed by the intervention of man and driven apart, the fox may succeed in killing both of them if they are in moult (398 : 39).

In July the Pink-feet moult and lose all the remiges at once, and so for a rather long period they are unable to fly. During this time they keep close to freshwater lakes and ponds and as soon as danger threatens they take to the water and as long as they are not shot at they will stay there. It is indeed sometimes very difficult to drive them off such a pond, even by drawing a long line across it.

Sometimes, however, they leave the lake and run inland as soon as they see anything that looks suspicious. If the lake is situated close to the seashore, the geese usually take to the sea and swim away.

Pink-feet are very good runners and generally a man cannot overtake them when they are sprinting. Even small goslings are able to run with an astonishing speed. Under certain circumstances it may happen that a fast runner may overtake them and then the whole flock will all suddenly lie down and cover on the ground. See also Trevor-Battye (203 : 582).

When a flock of geese in moult takes to the sea, they swim out from the shore in close formation, and if they are pursued by a motorboat, they can put up a speed of about 6 knots. When eventually overtaken by the boat, some of the birds will thrash the water with their wings, at the same time using their feet so it looks as if they are running on the surface. In this way they will get ahead of the boat. Others will try to save themselves by diving and they are able to stay below the surface for quite a long time.

By chasing the birds in this way when they are in moult, both on the ponds and on the sea, unscrupulous people have done great damage to the population of geese in Spitsbergen, according to Løvenskiold (615 : 14). Until recently the three species of geese in Spitsbergen were not protected by game-laws after 15 August, but at that time many of them were still unable to use their wings. Now Pink-feet are protected until 20 August and after that date there are very few birds left which are unable to fly. The two other species are protected all the year.

The Arctic Fox has been mentioned as one of the few enemies of the Pink-foot in Spitsbergen, but possibly an even more destructive predator is the Glaucous Gull. As long as the geese are undisturbed, they are well able to defend their nests against the large gulls, but if they have been compelled to leave their eggs without having time to cover them up, the gulls and sometimes also the Arctic Skua will immediately take the eggs, but gulls and skuas will also try to catch the goslings as long as they are small. Conway relates how a colony of 12 pairs of Pink-foot in Eskerdalen (Sassendalen), close to the "Waterfall Camp", was completely exterminated by Glaucous Gulls which took both eggs and goslings. The gulls were attracted to his camp in the first place by the refuse they found there (196 : 126). See also Le Roi (316 : 214).

B r e e d i n g. — As we have seen, most of the Pink-feet arrive in Spitsbergen during the last ten days of May. At this time of the year snow usually covers the ground and the birds cannot breed until the snow melts on their breeding grounds. If this takes place in the first half of June, breeding will be normal and a great number of the Pink-feet will go to the ordinary breeding ground to lay.

Incubating does not begin until the clutch is completed, because it is important that all the goslings should hatch at the same time. There are usually five eggs, but often there are only three. Four, two and one egg are much less common. In two cases as many as seven eggs have been found in one nest, obviously originating from one bird, but in one case in which nine were found, two females must have laid together, for three of the eggs had been incubated for some time, while the other six were fresh.

As long as the clutch is not complete there is usually very little down in the nest, and this may be the case even when the eggs have been incubated for some time. But after the goose has begun to sit, the amount of down increases and there can be so much of it that the eggs are completely hidden. The gander takes no part in incubating, but keeps watch at a place some distance from the nest. This place can easily be located by the accumulation of droppings there.

When the eggs are on the point of hatching, there may be very little down in the nest. This may be because the sitting bird has eaten some of it, and on 7 July 1952, Løvenskiold saw a goose eating quite a lot of down from the nest.

The young leave the nest soon after they are hatched. If the nest is placed on a shelf on the mountainside the goslings will jump down, even if the height is considerable; but they rarely hurt themselves in doing this. They very soon begin to eat young grass and plants, and they are in no way fed by the parents, as has been stated by some authors.

As long as they are small, the goose has to keep the goslings warm, and both parents defend them against foxes, gulls and skuas.

Under normal conditions, the majority of the young birds will be able to fly before 20 August, but if the snow covering the breeding grounds has persisted far into the summer, some of them may not be able to fly until the beginning of September.

Even when there is a great deal of snow, there are bare patches of ground along the seashore, and in these places some of the birds will breed. But the

nests are then easily found and the eggs are often taken, even though this is forbidden.

In such years there will of course be a great number of non-breeding birds, far more than under normal conditions. The snow is a direct hindrance to breeding, and is therefore the main cause of non-breeding, but there must certainly be other factors involved.

Very occasionally the Pink-foot begins to breed before the middle of June. Trappers wintering on the islands have of course the opportunity to find early clutches, and on 9 June 1930, Alfred Svendsen found fresh eggs on Tusenøyane (1929/30, 644 a), while Michael Olsen found new-laid eggs in Bellsund on 10 June 1918 (1917/18, 642 b).

Most of the egg-laying takes place in the last half of June, but clutches with slightly incubated eggs have also been found at the beginning of July, and even as late as 12 July in 1898 Nathorst found several clutches with fresh eggs as well as many newly hatched goslings on Observatoriefjellet in Recherchefjorden (243 : 150). The geologist Winsnes told Løvenskiold that during the summer of 1950, he had found a big colony of Pink-feet on this mountain (615 : 18).

The main part of the population of Pink-feet breeds in Vestspitsbergen and they are much more common in the west than in the east. In Wijdefjorden they are still fairly numerous, but in Sorgfjorden and in Lomfjorden in Hinlopenstretet they have been found only in a few instances by trappers. They have also been recorded from the island Edgeøya and Nordaustlandet, but there are no reliable records of breeding from any other places in the Svalbard area.

If we allow for an incubating period of 26 days, and take into consideration the dates for fresh eggs, and also for the different ages of goslings, Tables 9 and 10 give the following dates for the completion of clutches and for the hatching of goslings:

Dates in June	8	9	10	11	12	15	16	18	19	20	24
No. of observations	1	1	4	3	2	1	3	1	2	1	2

Therefore most of the clutches will be completed in the first three weeks of June.

Dates in July	4	5	6	7	8	11	12	14	15	16
No. of observations	1	1	1	3	7	2	3	1	2	1

Most of the goslings will be hatched in the first fourteen days of July.

F o o d. — Very little is recorded about the food of the Pink-feet in the Svalbard area.

Heuglin says: Grass, leaves and buds of *Saxifraga* and leaves of other plants (132 : 132).

Le Roi investigated the stomach contents of 25 adult birds and found stones the size of hempseed in all of them, and earth in four. One stomach was crammed full of stones and soil. In addition there were remains of vegetable matter including *Graminea, Cerastium, Saxifraga, Equisetum,* and in one case small reddish seeds. In three goslings he found the remains of plants but, curiously, no stones (316 : 214).

Table 10

Egg-laying

Date	No. of nests	No. of eggs	Condition	Place	Author
9 June 1930			fresh	Storfjorden	A. Svendsen (29/30, 644)
10 » 1918	6	14	fresh	Bellsund	M. Olsen (17/18, 642b)
16 » 1900	2	5	fresh	Colesbukta	Kolthoff (261: 53)
16 » 1900	3	4	fresh	–»–	–»– –»–
16 » 1900	many	2–3	fresh	–»–	–»– –»–
16 » 1908	1	2		–»–	Le Roi (316: 212)
16 » 1908	1	7		–»–	–»– –»–
18 » 1908	1	9	3 inc. 6 fresh	Kongsfjorden	–»– –»–
19 » 1931	1	7		Isfjorden	Tomkinson (485: 83)
19 » 1931	many			–»–	–»– –»–
22 » 1907	1	5		Isfjorden	Le Roi (316: 213)
23 » 1900	many			–»–	Kolthoff (261: 53)
23 » 1907	1	5		Van Keulenfj.	Le Roi (316: 212)
24 » 1900	1	5	fresh	Isfjorden	Kolthoff (261: 53)
24 » 1900	1	4	fresh	–»–	–»– –»–
24 » 1855	many			–»–	Evans and Sturge (72:
				–»–	171)
24 » 1910	1	5	incub.	Forlandet	Munsterhjelm (313: 17)
24 » 1922	1	3		Kongsfjorden	Congreve (403: 16)
24 » 1928	1	3		Mosselbukta	A. Svendsen (27/28, 644)
25 » 1864	many			Isfjorden	Torell (112: 406)
26 » 1896	1	3	sl. incub.	Isfjorden	Trevor-Battye (203:580)
28 » 1898				Kongsfjorden	Römer and Schaudin
					(245: 81)
28 » 1949	1	3		–»–	Løvenskiold (615: 20)
28 » 1949	1	5		–»–	–»– –»–
30 » 1956	1	1		–»–	–»– (1956, 633)
30 » 1956	1	4	incub.	–»–	–»– –»–
4 July 1864	1			Isfjorden	Malmgren (92: 398)
5 » 1896	many		incub.	Sassendalen	Conway (196: 126)
5 » 1910	1	5	incub.	St. Hans-	Munsterhjelm
				holmane	–»– (313: 17)
5 » 1910	1	5	sl. incub.	St. Hans-	
				holmane	–»– (313: 17)
6 » 1899	1	2	sl. incub.	Hornsund	Bianchi (253: 323)
6 » 1899	1	4	incub.	–»–	–»– –»–
6 » 1928				Lomfjorden	A. Svendsen (27/28, 644)
8 » 1949	1	3	pt. of hatching	Breibogen	Løvenskiold (615: 21)
8 » 1952	1	1	1 egg & 1 young	Isfjorden	–»– (615: 19)
8 » 1952	1	3	pt. of hatching	Isfjorden	–»– –»–
8 » 1952	1	5	–»–	–»–	–»– –»–
8 » 1952	1	5	pt. of hatching	–»–	–»– –»–
10 » 1864	1			–»–	Newton (96: 513)
15 » 1898	many		fresh	Recherchefj.	Nathorst (243: 150)
15 » 1921	1	3	3 eggs and	Isfjorden	Van Oordt (370: 139)
			1 young		

Table 11

Young birds

Date	No. of young	Age	Place	Author
20 June 1930	3	4 days	Sørkapp	Kristoffersen (472: 255)
20 » 1930	4	4 »	–»–	–»– –»–
4 July 1882	3	newly hatched	Van Mijenfjorden	Nathorst (155: 29)
7 » 1898		newly hatched	Spitsbergen	Kolthoff (261: 53)
7 » 1907		newly hatched	Kongsfjorden	Le Roi (316: 208)
7 » 1952	3	newly hatched	Isfjorden	Løvenskiold (615: 18)
8 » 1956	2	3 days	Kongsfjorden	Løvenskiold (1956, 633)
8 » 1949	4	newly hatched	Breibogen	Løvenskiold (615: 21)
8 » 1952	1	newly hatched	Isfjorden	Løvenskiold (» 19)
11 » 1952	5	4–6 days	Hornsund	Løvenskiold (» 15)
11 » 1952	5	4–6 days	Hornsund	Løvenskiold (» 15)
11 » 1952	5	4–6 days	Hornsund	Løvenskiold (» 15)
11 » 1952	3	4–6 days	Hornsund	Løvenskiold (» 15)
11 » 1952	3	4–6 days	Hornsund	Løvenskiold (» 15)
14 » 1950	many	8 days?	Sørkapp Land	Løvenskiold (» 14)
15 » 1898	many	newly hatched	Recherchefjorden	Nathorst (243: 150)
15 » 1921	1	newly hatched	Isfjorden	Van Oordt (370: 139)
16 » 1864	2	newly hatched	Isfjorden	Newton (96: 513)
16 » 1870	many	14 days	Hornsund	Heuglin (116: 58)
18 » 1906	4	8 days?	Bellsund	Mathey-Dupraz (311: 47)
24 » 1906	2	in down	Van Keulenfjorden	Munsterhjelm (313: 17)
25 » 1910	many	almost fledged	Krossfjorden	Zedlitz (319: 319)
27 » 1896	many	almost fledged	Isfjorden	Trevor-Battye (203: 580)
29 » 1881	many	in yellow down	Magdalenefjorden	Cocks (149: 329)

Løvenskiold caught four newly hatched goslings in Breibogen, south of Biskayerhuken, on 12 July 1949. These birds were at once able to find their food, which consisted of fine young grass-sprouts, and in addition to this they also took the buds and leaves of a few other plants (615 : 21).

During a stay in Hytteviken, north of Hornsund in July—August 1952, it was seen that the geese cropped the grass all around the hut and also in other places where grass was growing in abundance. These birds seemed mainly to feed on grass. The birds are, however, often found grazing also on the slopes beneath birdcliffs where the vegetation grows profusedly, and here they feed not only on grass, but also to a great extent on the leaves of *Oxyria digynia* and *Cochlearia officinalis.*

Parasites. — Summerhayes and Elton state that a flea, *Ceratophyllus vagabundus,* occurs in the nests of the Pink-foot (397 : 282).

ANSER CAERULESCENS subsp.?

The Snow-Goose

The first time this goose is mentioned from Spitsbergen is in 1872 in Well's book "The Gateway to Polynia". In Kongsfjorden Wells and his companion

climbed a mountainside and arrived at the top, 800 feet above sea-level, where they came "near to the edge of a deep blue lake, the surface of which was as smooth as a mirror. On it were reposing a number of large pure white geese". Of those they shot two, but the birds fell down the precipice and were lost (141 : 261).

I have never seen this record published by other ornithologists.

Longstaff was assured by General Sir Herbert Chermside that he saw white geese in Wijdefjorden in 1873 (407 : 483). But I think that Johnsen is right when he hesitates to add the bird to the avifauna of Spitsbergen (505 : 35).

Albinos of the Pink-footed Goose have been found, and until a specimen is collected it will be difficult to say whether a white goose is a Snow-Goose or not.

BRANTA BERNICLA BERNICLA (L.)

The Dark-breasted Brent Goose

This race of the Brent Goose has never been found in Spitsbergen or in the Svalbard area. It breeds from N Russia and eastwards to the Taimyr Peninsula.

Müller's old name for the species, *Anas hrota,* was first used for the pale-breasted form in 1932 (Hartert, 260 Ergänzungsband : 435), and this explains why the dark-breasted bird, the nominate form, is sometimes referred to in the literature as an inhabitant of Spitsbergen.

No. 24. *BRANTA BERNICLA HROTA* (MÜLLER)[1]

The Pale-breasted Brent Goose

Geographical distribution

The pale-breasted race of the Brent Goose breeds in Franz Josef Land, Spitsbergen, N Greenland and Arctic Canada. The nominate form, *B. b. bernicla* (L.), breeds from Kolguev, Waigatz, the Yamal Peninsula and eastwards to the Taimyr Peninsula. The third race, the Black Brent, *B. b. nigricans* (Lawrence), is the darkest extreme and occurs in the Bering Strait population. It meets the form *hrota* in W Canada, where both forms breed in the same places but do not interbreed.

The Spitsbergen and Franz Josef Land population migrates south in the autumn, but so far out to sea that the birds are not visible from land. During September they are seen from Utsira on the Norwegian coast and down to Jæren, where they disappear. They winter along the coast of the North Sea from Denmark and westward to Holland, Belgium, France and one point on the east coast of England.

In spring they come to the Norwegian coast between Kristiansand S. and Mandal. From here they go W to Lista where they leave the coast and are seldom seen again before they reach Bjørnøya. Salomonsen says that Dark-

[1] Contour map showing distribution, see backflap.

breasted Brents go south over the White Sea and the Baltic, along the east coast of southern Sweden, to Denmark and the North Sea (630 b : 43–80). Very few of these birds have been seen in Norway in migration time.

Occurrence in Svalbard

The Pale-breasted Brent is now a rare breeder along the west coast of Vestspitsbergen. In a few places it also is found in small numbers on islands in the fjords and in some of the valleys. On the east side of the island they have bred in Lomfjorden in Hinlopenstretet and probably also in Sorgfjorden.

On Nordaustlandet there is probably still a rather big population breeding on islands along the western and northern coasts.

On Kvitøya the bird has never been recorded. In Storfjorden it formerly bred in great numbers on the several groups of small islands, but there are no recent records from there.

On Kong Karls Land the birds have been seen, but there are no records of breeding. Hopen is passed on migration.

Ringed birds

During the summer of 1954 74 Pale-breasted Brents were caught by Goodhart, Webbe, and Wright and ringed in the valleys Reindalen in Van Mijenfjorden and Sassendalen in Isfjorden (619 b : 170). Up to 1957, according to Holgersen (622 b : 24) and (625 b : 15), and Salomonsen (630 b : 52), 23 of these birds had been shot in Denmark and two were found dead in England.

First records

The Brent Goose is the first bird mentioned from Spitsbergen. It was found by de Veer, who was pilot on Willem Barent's ship, on 21 June 1596, in Fair Haven, and either on Cummingøya or Steggholmen, two small islands south of Norskøyane (1 : 18).

Shortly before the geese were found, a nautical observation was taken, which showed the position to be 81° 11' N. Naumann's statement that Barents found the birds in "Wibe-Janzwater" (Storfjorden) on 21 June 1595 is obviously incorrect (266 Vol. 9 : 366), and similarly le Roi's assertion that the species was found breeding on a small island near Sørkapp in 1596 (316 : 215) is erroneous.

Gerrit de Veer, who found the geese, relates that the birds were sitting on their nests and that a goose was killed with a stone. They also took 60 eggs with them to the ship. When the geese were chased from the nests, they cried "rot, rot, rot . . ." and de Veer named them "Rotgansen". In the English translations of his book it is said that the geese cried "red, red, red . . .", and in the German translations one can find that they cried "Roth". Accordingly the bird is called "Red Goose" or "Rothgans". There is not, however, a single red feather on the bird and the Dutch name "Rotgans" is formed from the onomatopoeic "rot, rot, rot", which is the bird's call, and not its colour.

When these names are confused with that of the Little Auk, which in Dutch

is called "Rotjes" (small rat), it can sometimes be difficult to find out which bird is intended.

De Veer knew the birds well from Holland. He lived in Wierengen where the Pale-breasted Brent came every year in winter and were caught. He says that some authors believed that they came from a tree in Scotland. When the fruits of this tree fell into water, they became small goslings and swam away; but if they fell on the ground, they burst and came to nothing. This was written, he said, because at that time nobody had been in latitude 80° N and seen the bird on its nest.

Hudson found Brent Geese in Kongsfjorden in 1607 (3 : 305). Gerritszoon found great numbers of Brent Geese in Spitsbergen ". . . & un grand nombre de Rotgansen lesquel on souloit croire qu'ils croissant en Yerlande aux arbres" (7 : 19). Martens saw the species in Spitsbergen in 1671 (12 : 71). Phipps found them on the island Moffen in 1773 (23 : 53). Pennant knew that Barent's men had seen the species in Spitsbergen in 1595 (1596) (24 Vol. 2 : 551).

Distribution. Sections I–XIV

Section I. Bjørnøya. — The bird is a regular passage migrant on the island. It has also twice been seen there during the summer time, but is has never been found breeding.

Section II. Hornsund. — The birds formerly bred in very great numbers on Sørkappøya, on Dunøyane north of Hornsund and on Isøyane, but on all of these islands there are only a few pairs breeding now.

Section III. Bellsund. — The birds used to breed on islands in Bellsund, Recherchefjorden, Van Keulenfjorden and Van Mijenfjorden, but they have now probably disappeared from these old breeding-places. They are, however, still breeding on islands along the coast between Kapp Martin and Kapp Linné. They are also found in Reindalen, a big valley on the north coast of Van Mijenfjorden and probably also in other valleys in this district.

Section IV. Isfjorden. — The Brent probably does not breed on the islands in Isfjorden, but it can be found in the great valleys, as in Adventdalen and Sassendalen, and possibly also in several other places inland, where it probably breeds in small numbers. On Hermansenøya in Forlandsundet, where there used to be many nests, not a single one was found in 1956, but adult birds were seen on the sea close to the island.

Section V. Prins Karls Forland. — On Forlandsøyane, where great numbers of Brents used to breed, no nests can now be found.

Section VI. Kongsfjorden. — In this fjord the group of islands, Lovénøyane, is known as an old breeding ground, but only a few pairs breed here now.

Section VII. NW Spitsbergen. — On the old breeding places, including the islands Mosøya and Moffen, and on the islands in Liefdefjorden, a few pairs may still be breeding. Probably nests can be found in some of the inland valleys in this district.

Section VIII. Wijdefjorden. — In this fjord the birds have been seen repeatedly, but there is no record of breeding in recent years.

Section IX. Hinlopen. — The birds have been found breeding in Lomfjorden and on both sides of the entrance to this fjord. They have been seen in Sorgfjorden, where they may also breed.

Section X. Nordaustlandet. — This is the only place in Spitsbergen where the Brents breed in any numbers, and on islands along the western and northern shores they are particularly numerous.

Section XI. Storfjorden. — The Brents used to breed on Ryke Yseøyane and on several of the many groups of small islands in Storfjorden. As late as in 1955, Lønø found a few pairs breeding on Kong Ludvigøyane.

Section XIII. Kong Karls Land. — The bird has been recorded from these islands, but has never been found breeding there.

Section XIV. Hopen. — Brents have been seen on migration in spring and autumn.

Biological

Migration. — From the spring migration there are very few records of the arrival of the Brents in the Svalbard area, but from what is known, it seems that they reach Spitsbergen during the last few days of May and the first few days of June. As early as in 1853 Pässler writes about adult birds seen in Finnmark in spring and in July (62 : 317).

The earliest record is 22 May 1930, when Kristoffersen saw eleven birds on the island Sørkappøya. The migration ended on the last days of the month. All the birds came from the ESE. A few of them remained in the Sørkapp area, but the rest continued north along the west coast (472 : 255).

At Kvalpynten on the island Edgeøya Walter saw the first Brents of 1889 from 29 May and onwards, when larger and smaller flocks were seen grazing (169 : 243). Chapman relates that Pike saw the first Brents of the year on Negerpynten, Edgeøya, on 30 May 1889 (195 : 350). Kjellman relates that the first Brent Geese of 1873 came to Mosselbukta at the entrance to Wijdefjorden on 3 June (135 : 263). The trapper Arthur Oxaas, who wintered at Flathuken at the entrance to Raudfjorden, saw the first four Brent Geese of 1926 on 4 June, and the following day he saw six of them (1925/26, 643).

In the autumn the Brent Geese begin to assemble in flocks for their migration south about the middle of August. The actual southward movement can begin at this time, but usually the migration starts towards the end of the month and lasts until the third week of September. Single birds have been observed as late as 20 October.

Heuglin saw a skein of Brents on 10 August 1870 at Kapp Lee on Edgeøya, and at Kapp Brehm on the NE coast of the island he saw big gaggles on the 16th (123 : 168, 192). On the same island Walter saw flocks of 20 to 50 birds each evening between 18 and 21 August 1889 at Kvalpynten where they came to rest during the night. On the morning of the 22nd all of them had disappeared (169 : 245).

In the same place Lamont saw vast flocks on 23 August 1859 (76 : 231). Malmgren saw big flocks in Lomfjorden in Hinlopenstretet on 24 August 1861 (85 : 106).

In some years the geese can still be in moult at this time in the autumn, and Binney saw a flock of at least 40 birds at the head of Wahlenbergfjorden on 24 August 1924, and not one of the birds could fly (413 : 240). On 28 August 1911, Mathey-Dupraz saw females with small goslings near Lovénøyane in Kongsfjorden (333 : 100).

On 25 August 1888, Pike saw a skein of 200 Brent Geese flying south in Smeerenburgfjorden (Chapman 195 : 343). Van Oordt saw how more than a thousand Brent assembled in Ekmanfjorden between Flintholmen and the glacier Sefströmbreen, between 24 and 26 August 1921 (370 : 140). Bianchi saw Brents in Hornsund on 29 August 1899 (253 : 325). The number of the birds is not stated, but a male and a female were shot. On 1 September 1861, Torell and Nordenskiöld saw thousands of Brents at Kapp Thordsen in Isfjorden (112 : 309), and Lamont saw immense flights at Kvalpynten, Edgeøya, on 2 September 1859 (76 : 231). In Adventfjorden, Birula saw a big flock on 4 September 1899 (298 : 205).

The trapper Georg Bjørnnes saw some Brents in Wijdefjorden on 9 September 1933 and shot one of them (1933/34, 636). Keilhau saw a flock on Negerpynten, Edgeøya, on 10 September 1831 (48 : 152), and Munsterhjelm on 15 September 1910 saw 200 Brents flying south across Rechercherfjorden (313 : 19).

Heuglin states that the Brent Geese assembled in large flocks in the middle of September before the migration south (116 : 64).

Kristoffersen saw the last Brents of that year flying south over Sørkapp between 15 and 20 September 1929 (472 : 255). Børre Trøhaug saw some Brents at Hopen on 29 September 1934 (1934/35, 645).

The species does not breed on Bjørnøya, but the geese visit the island on migration. Kolthoff found droppings of geese in only one place on Bjørnøya, viz. the grass-grown slopes north of the mountain Miseryfjellet, and he concludes that Brents must stop there on migration (261 : 56). This may be so, but he had actually no proof of it because it is difficult to tell from the droppings which species of geese has been there. However. Johnsen states that Mr. Hansen, who brought back some material from Bjørnøya for the Zoological Museum in Bergen, had found them to be common in the valley Ymerdalen in September 1923 (505 : 21). Georg Bjørnnes states that he shot seven Brent Geese in Wijdefjorden during the month of September in 1935 (1935/36, 636). Peder Åm, caretaker for the mining company in Ny-Ålesund, saw one single bird there on 20 October 1936 (1936/37, 646).

G e n e r a l h a b i t s. — The goose and the gander keep close together and Quennerstedt says that when one of them is shot, the other will not easily leave its dead companion (81 : 25).

Nathorst relates than when they breed among the Common Eiders, as they very often do, they will sometimes steal an Eider's egg and bring it to their own nest, but sometimes the Eiders also steal eggs from the geese (155 : 16).

Kristoffersen says that except in the breeding season, he did not see the Brents on dry land. They kept to lakes and the sea. In stormy weather big flocks

kept behind a promontory or close to the shore where they had shelter from the wind. They seemed in fact to behave more like ducks than geese (432 : 193).

Løvenskiold saw Brents on Krosspynten in Wijdefjorden where they up-ended like ducks in shallow water, to seek some food on the bottom (1954, 633).

In earlier years, when they bred in great numbers on the islands along the coasts, they were not shy and seemed reluctant to leave the nests until the intruder came quite close. There are several anecdotes about this.

There are many observations on moulting. The period may vary a great deal, but the earliest date for the moulting birds seems to be on 7 July and the latest on 24 August.

Unlike the Pink-footed Goose, which dives immediately when danger threatens, the adult Brent is not able to dive, even in the moulting period. The goslings of the Brent Goose, however, are very good at diving. Mathey-Dupraz saw small goslings off the shore of Lovénøyane on 28 August 1911, which swam after their mother and dived repeatedly (333 : 100).

B r e e d i n g. — Like the Barnacle Goose, the Brent Goose is too small to be able to defend itself against the Arctic Fox. In Spitsbergen it therefore breeds mainly on islands and islets in the fjords and along the coast. Apparently it has occasionally also bred inland, nests having been found on shingle along rivers etc.

The islands where the Brent Goose breeds or has bred in the company of the common Eider are plundered by fishermen and whalers repeatedly throughout the breeding season. The birds are protected all the year round, but as long as there is no constant supervision the law is not respected. The result is that the Brent Goose is almost exterminated along the coasts of Spitsbergen. Only a few exist, in those places where in ordinary years the ice prevents landing before the eggs are hatched. In a few places inland there may also be a few breeding birds, but how many there may be here needs further investigation.

In places like Gåsøyane in Isfjorden, Forlandsøyane, Akseløya in Bellsund and several other places once famous for the immense numbers of breeding geese, there is now not a single breeding pair to be found. The Brent Goose, which was once judged to be the most numerous of the three species of geese in Spitsbergen, is now almost as scarce as the rare Barnacle Goose.

The nest is placed either on islands or on river-beds inland, especially in places where the river branches, to form islands which cannot be reached by the Arctic Fox.

As soon as the snow has melted on the islands, the geese arrive there to lay. Eggs have been found in the nests from 9 June to 6 July and newly hatched young from 6 July to 8 August. In the latter case the eggs must have been laid as late as 10 July, but this is exceptional. To begin with there is little down in the nest, but more and more appears as the breeding period goes on. There can in fact be so much down in a nest that the eggs are completely covered. The down is very light and can sometimes resemble the light down from a very light-coloured female Eider, but the small feathers mixed with down indicate the species.

The nest can be found on boggy ground, on dry ground or among stones in places with very little vegetation. Nests have also been found on big stones covered with lichens.

Usually the bird makes only a shallow scrape and covers it with a relatively thick layer of moss, lichens and plants. This cushion forms the foundation for the down.

The clutch-size is usually three or four. Five eggs are found relatively often, but six and seven rarely.

The records of breeding, from the earliest date and onwards are shown in Table 12.

Other records of breeding are as follows: Dalgety and coll. found 4 nests on Hermansenøya in Forlandsundet on 30 June 1930, one of which was placed in a swamp so wet that the bottom of the nest, under the lining of grass and down, was sodden with water (470 : 247).

Malmgren found a nest at the head of Murchisonfjorden on Nordaustlandet at the end of June in 1861. It was also placed on wet, boggy ground (85 : 107).

Bianchi states that on 6 July 1899, a single egg was found in Hornsund in the nest of a Pink-footed Goose (253 : 325).

Le Roi says that two breeding pairs were found on Bohemanneset in Isfjorden on 10 July 1907. On Gåsøyane there were no breeding geese in 1907 (316 : 215).

Heuglin found the species breeding on Dunøyane on 17 July 1870 (123 : 112).

Miethe relates that the species was found breeding on Lovénøyane in Kongsfjorden at the end of July 1910 (312 : 214).

Chapman found the birds breeding on small rocky islands in Van Keulenfjorden on 1 August 1881 (152 : 154).

Carlheim-Gyllensköld found several families at Kapp Fanshave, south of the entrance to Lomfjorden in Hinlopenstretet on 2 August 1898 (236 : 101).

Newton relates that a young bird, hardly able to fly, was killed on Kong Ludvigøyane in Storfjorden on 10 August 1864 (96 : 217).

Cocks relates that a Norwegian, Mr. Dreyer, found the species breeding on Forlandsøyane in 1883 (153 : 18). Kolthoff found the birds breeding on Isøyane north of Hornsund in 1898 (226 : 311). Schalow states that a nest with 4 eggs was found on Kong Ludvigøyane in 1898 (232 : 384). Zedlitz reports that the birds were breeding on Hermansenøya in Forlandsundet, on Lovénøyane in Kongsfjorden and in Adventdalen in 1900 (319 : 320). Kristoffersen found 50 pairs breeding on Dunøyane in 1924 (432 : 193). Montague found the species breeding on Stasjonsøyane in Liefdefjorden in 1924 (433 : 138). Dalgety and coll. saw breeding Brents on Hermansenøya in Forlandsundet and also in Liefdefjorden in 1930 (470 : 246).

If we assume that the "young in down" in Table 13 were newly hatched, and take the incubation period as being 25 days, we find, if we take the values from both tables, that most eggs must be laid in the last two weeks of June and in the first week of July.

In the same way we find that most goslings are hatched in the last two

Table 12

Egg-laying

Date	No. of nests	No. of eggs	Condition	Place	Author
9 June 1861	?	?		Wijdefjorden	Chydenius (89: 317)
9 » 1900	a few	?		Dunøyane	Kolthoff (226: 502)
12 » 1889	many	4	fresh	Kong Ludvigøyane	Walter (169: 239)
12 » 1889	a few	5	fresh	Kong Ludvigøyane	–»– –»–
13 » 1908	none			Dunøyane	Le Roi (316: 215)
13 » 1910	a few			Forlandsøyane	Munsterhjelm (313: 18)
14 » 1930	1	1	fresh	Tokrossøya	Kristoffersen (472: 255)
15 » 1936	?	?		Nordaustlandet	Glen (520: 300)
16 » 1827	1	2	fresh	Rossøya N of Nordaustlandet	Parry (46: 196)
16 » 1931	many	?		Bellsund	Tomkinson (46: 82)
17 » 1882	many	?		Dunøyane	Nathorst (155: 16)
18 » 1908	1	3		Kongsfjorden	Le Roi (316: 220)
20 » 1855	many			Sørkappøya	Evans and Sturge (72: 167)
20 » 1898	?			Kong Ludvigøyane	Rüdiger (216: 435)
20 » 1931	many			Adventdalen	Tomkinson (485: 82)
20 » 1931	1	6		Adventdalen	–»– –»–
21 » 1596	many	60	fresh	Fair Haven	De Veer (1: 18)
23 » 1898	many	4–8	incubated	Kong Ludvigøyane	Römer and Schaudin (245: 82)
23 » 1930	many	?	8 days	Isfjorden	Dalgety (470: 247)
23 » 1930	4	?		Hermansenøya Forlandsundet	–»– –»–
24 » 1900	a few			Isfjorden	Kolthoff (250: 56)
24 » 1909	2			Dunøyane	Haag (293: 104)
26 » 1900	many	3–4		Forlandsøyane	Kolthoff (250: 61)
26 » 1900	many	5		Forlandsøyane	–»– –»–
26 » 1900	1	6		Forlandsøyane	–»– –»–
26 » 1900	1	7		Forlandsøyane	–»– –»–
26 » 1908	1	4		Dunøyane	Le Roi (316: 220)
27 » 1898	?	?		Dunøyane	Nathorst (243: 84)
27 » 1908	2	3		Dunøyane	Le Roi (316: 220)
27 » 1908	3	4		Dunøyane	–»– –»–
27 » 1931	3			Sørgattet	Tomkinson (485: 84)
28 » 1898	?	?	almost fresh	Kongsfjorden	Römer und Schaudin (245: 82)
29 » 1931	?	?		Liefdefjorden	Tomkinson (485: 85)
30 » 1921	1	3	addled	Adventdalen	Congreve (403: 24)
30 » 1930	?	?	fresh	Isfjorden	Dalgety (470: 247)
5 July 1894	2	3		Forlandsøyane	Feilden (189: 87,89)

Table 13

Young

Date	No. of broods	No. of young	Age	Place	Author
6 July 1910	?	?	first in down	Forlandsøyane	Munsterhjelm (313: 19)
8 » 1898	?	?	first in down	Wijdefjorden	Römer und Schaudin (245: 82)
8 » 1930	?	?	first in down	Sørkappøya	Kristoffersen (472: 255)
14 » 1952	many	many	3–6 days	Dunøyane	Løvenskiold (615: 22)
15 » 1936	?	?	in down	Nordaustlandet	Glen (520: 301)
18 » 1896	1	?	?	Storfjorden	Conway (196: 186)
19 » 1873	1	2	in down	Wijdefjorden	Eaton (130: 3814)
22 » 1956	1	3	in down	Kongsfjorden	Strijbos (1956, 648)
30 » 1889	1	3	in down	Ryke Yseøyane	Walter (169: 249)
2 Aug. 1881	1	2	in down	Bellsund	Cocks (149: 383. 412)
5 » 1950	many	many	3–6 days	Dunøyane	Løvenskiold (615: 22)
8 » 1910	1	?	first in down	Adventfjorden	Zedlitz (319: 320)
28 » 1911	many	many	?	Kongsfjorden	Mathey-Dupraz (333: 101)

thirds of July. These dates are of course by no means exact, and they will also be subject to fluctuations, but the egg-laying period will take place sometime in the interval indicated above.

F o o d. — During their stay in Spitsbergen, the food of the Brent Geese mainly consists of vegetable matter. They are often seen grazing. Keilhau saw them eating grass sticking out of freshly fallen snow on Edgeøya on 10 September 1827 (48 : 152). Walter saw them grazing on Edgeøya in 1889 and found freshwater algae in the stomach of a small young in down (169 : 243). Römer and Schaudin found bits of plants in their stomachs, and on Kong Ludvigøyane also large and small piece of shells (245 : 82).

Le Roi found small stones, the remains of *Fucus,* moss, *Graminea,* stalks and leaves of *Oxyria digynia,* young sprouting *Saxifraga caespitosa,* other *Saxifraga* and other plants (316 : 221). Summerhayes and Elton say that the Brents were feeding on the heath of Bohemanneset in 1921. In this region there is almost only one plant, *Cassiope tetragona,* intermingled with a few others (397 : 251), but it is not stated on which of these the geese were feeding.

Løvenskiold saw six Brent Geese in the company of Pink-feet on Krosspynten in Wijdefjorden on 9 July 1954. The larger species kept to the land, but the Brents were swimming in the shallow water just outside the lagoon where, like ducks, they upended and stood on their heads to get food from the bottom (1954, 633).

Collett obtained a bird shot in Tromsø on 17 June 1872, which had grass and gravel in the stomach (124 : 95). A wintering bird shot on Jæren in SW Norway on 4 February 1890 had eaten algae, some sponges and sand (182 : 264).

Gätke watched Brents at Heligoland during the winter-time and states that at highwater small flocks of 5 to 10 birds were swimming close to the foot of the cliffs, where they took small *Mollusca* (238 : 566).

Witherby says that in their winter-quarters they will take some *Zostera marina,* but chiefly *Enteromorpha* sp. (583, Vol. III : 214).

The decrease of the population. — In a recent paper, "The Present Status of the Brent Goose (*Branta bernicla* (L.)) in Western Europe", Salomonsen points out the serious decrease of the numbers of Brents. He says that "many factors militate against the Brent. But not all are of equal importance" (630 b : 69).

Of these factors many may be of importance for the Spitsbergen population of the Pale-breasted Brent, but in my opinion the worst evil here is the uncontrolled robbing of nests throughout the summer-time by sailors and fishermen on small Norwegian ships visiting the Spitsbergen coast. As mentioned before, the main part of the Brents were wont to breed on the Eider-holms along the shores, and for years their eggs have been taken from there, together with those of the Eiders.

As long as no steps are taken to hinder this shameful robbing of birds which are protected by law, nothing can be done to increase the population of the Brent in Spitsbergen.

No. 25. *BRANTA LEUCOPSIS* (Bechstein)[1]

The Barnacle Goose

Geographical distribution

The only known breeding places of the Barnacle Goose are NE Greenland, Spitsbergen, Novaya Zemlya, and the north coast of Russia. The species winters in the NW of the British Isles, and on the coasts of the North Sea from N France to Denmark, and from there east to Poland and the Baltic.

Occurrence in Svalbard

There are no records from Bjørnøya, but the birds have been observed in Hornsund on several occasions and have also been found breeding there. In Bellsund the bird is not very common, but it seems that the species is still breeding in this district. In Isfjorden the best-known breeding place was in Longyeardalen, but here the birds have now been exterminated. Probably, however, the species is still breeding in some hidden places in the interior; the south side of Isfjorden is the most likely place, but it probably breeds also in the districts around Billefjorden and Dicksonfjorden.

From Kongsfjorden there are no records. In NW Spitsbergen the species has been seen once, and from Wijdefjorden there is one, rather uncertain, record of breeding. In Storfjorden the species has been seen on several occasions.

Ringed birds

During the summer of 1954 23 Barnacle Geese were caught and ringed in Reindalen in Van Mijenfjorden by Goodhart, Webbe and Wright (619 b :170).

[1] Contour map showing distribution, see backflap.

According to Holgersen, only two of these 23 birds have been recaptured, and these curiously enough were in the Solway Firth on the W coast of Scotland (622 : 25). This place is a well-known winter resort of the Barnacle Goose.

First records

The first time the Barnacle Goose is mentioned in connection with Spitsbergen is by Pennant who writes on the occurrence of the bird: "Not in Greenland or Spitsbergen as I once conjectured" (24 : 553).

The first authority to mention the bird as an inhabitant of Spitsbergen is Audubon, but le Roi, says that this was merely guesswork on Audubon's part, because he gives no suggestion as to the source of the record (54 : 201) and (316 : 120).

Torell included the species in his list of Spitsbergen birds, and he had seen a specimen there in 1858 (73 : 60).

Quennerstadt states that a specimen seen by him and Dr. Torell was shot in Bellsund in 1858 (81 : 25). This, however, is incorrect (see below).

Malmgren had not seen Dr. Quennerstedt's paper, but he says that Dr. Torell must have seen the bird in Spitsbergen (85 : 107). In another paper he states that he had never seen the Barnacle Goose in Spitsbergen himself, and that it was not found there either in 1861 or in 1863. The species was not seen by either Professor Lovén, Professor Sundevall, Mr. E. Evans or Mr. Wilson Sturge. Professor Nordenskiöld, however, had informed him verbally that a specimen was shot in the summer of 1858 on the plains south of Bellsund, where eggs had also been found (92 : 395). Malmgren relates further that it was the harpooner Uusimaa, who came from Dunøyane (north of Hornsund) to Bellsund in the summer of 1858, who had shot the bird and obtained the eggs. The specimen was examined by Torell and Quennerstedt, who identified it as *Branta leucopis*. Professor Nordenskiöld, to whom the bird was presented, could not remember whether it had been shot on Dunøyane or on the plains south of Bellsund (94 : 389), but it is not unlikely that the place was Dunøyane, where the species has been found breeding in recent years. Dunér says that the bird and the eggs were then in the possession of Dr. Torell in Lund in Sweden (98 : 248).

Distribution. Sections II–XIV

Section II. Hornsund. — In this district the Barnacle Geese have been seen from Sørkapp in the south, along the coast to the land between Kapp Borthen and Bellsund in the north. The birds also sometimes visit the fjord Hornsund. They breed in small numbers on the islands Dunøyane and also on other islands along the shore. It is not unlikely that they may eventually be found breeding in suitable places in the interior.

Section III. Bellsund. — The species breeds along the coast south of Kapp Lyell. It has bred in Van Keulenfjorden where it may still nest in the interior. It has bred at Midterhuken, but there has been no further record of breeding there since 1882. In the large valley Reindalen on the north side of

Van Mijenfjorden the birds are obviously nesting, although no actual proof of breeding has been recorded.

Section IV. Isfjorden. — In Isfjorden the birds have been seen at the following places: At Kapp Starostin, in Colesbukta, Adventdalen and Sassendalen, and on the mountain Kongressfjellet between Kapp Thordsen and Kapp Wijk. The only known breeding-place was in Longyeardalen, where the birds were exterminated in the late twenties. The species probably also breeds in different places in the interior, in Sassendalen, for example, and in Dicksonfjorden.

Section VII. NW Spitsbergen. — The species has been seen only once, at Amsterdamøya, under conditions which suggested breeding. Professor Mathey-Dupraz, who saw the birds, refers to Lewenthal, who said that the species bred on the island. This has never been confirmed.

Section VIII. Wijdefjorden. — From this district there are only two records; the birds have been seen in one case and in the other instance they were found breeding. Both of these records seem rather uncertain.

Section XI. Storfjorden. — The species has been recorded from the islands Barentsøya and Edgeøya, but has not been found breeding there.

Section XIV. Hopen. — The species passed the island on spring migration in 1956.

Biological

Migration. — Very little is known about the migration of the Barnacle Goose in the Svalbard area, and for the arrival in the spring only a few dates have been available. Walter thought that he saw the species on Edgeøya on 25 May 1889 (169 : 243), and Pike definitely identified it on Negerpynten, also on Edgeøya on 30 May 1890 (Chapman 195 : 350). Kristoffersen found that the arrival in Hornsund district occurred towards the end of May in 1924. On 29 May the first flock of 200—300 Barnacle Geese was seen at Camp Erna, and they arrived at the same time as the Pink-footed and Brent Geese (432 : 192). In 1930 Kristoffersen saw a flock of Barnacle Geese on the island Sørkappøya on 22 May (472 : 256).

It therefore seems that the spring arrival of the species occurs in the last third of May, although in years when snow and ice still cover the ground it will be a little later, perhaps in the first half of June.

The last record for the autumn is on 22 September 1923, when Kristoffersen saw a small flock going past Hornsund on their way south (432 : 192).

General habits. — It seems that the majority of the Barnacle Geese in Greenland breed on steep cliff-walls on the high mountains of the interior, but sometimes they also nest near the shore.

In Spitsbergen the species is not known to breed in the interior; and all the existing records are of birds breeding not far from the sea, either on the coast or in the fjords.

The best known breeding ground in the area was in Longyeardalen, where the birds used to nest on the tops of pillars isolated from the cliff-walls, and on more or less inaccessible ridges extending from the mountainsides. In a few

instances, however, they have been known to nest on ledges, just as they do in Greenland. And it seems likely that the species will eventually be found breeding in similar surroundings in the interior of Spitsbergen, which to date, is little known ornithologically.

On islands along the west coast, between Hornsund and Bellsund, the birds have been recorded breeding on level ground. Here they live in company with the Brent Goose and the Eider.

Like the two other polar geese, when they arrive in spring the Barnacle Geese are very fat, but as they take very little food during the incubation period, which lasts for about a month, both gander and goose are very thin by the end of this period. The reason for this is probably that the eggs are robbed at once if left unprotected. The bird is too small to defend its nest against the Arctic Fox and for this reason it has to breed in safe places. But it also has other enemies and the Glaucous Gull and the Arctic Skua will take the eggs whenever they have the opportunity.

Just as with the other two species, the gander takes up the station near the nest and keeps watch there as long as the goose is sitting. This spot may be easily found because of the accumulation of droppings there.

To avoid leaving the eggs when the nest is on top of a pillar, the bird will drop excrement outside it and in this way quite a wall of this matter will gradually be built up around the nest. In Spitsbergen at least, this is something which is peculiar to the Barnacle, and I have never seen the Pink-foot or the Brent do anything comparable in that area.

Curiously enough the few pairs which have been found nesting on level ground have kept up this habit, and in places where the two species are breeding together this makes it easy to see whether the nest belongs to a Brent Goose or to a Barnacle.

The nesting on level ground is also known from Greenland. Bird and Bird refer to five nests on a piece of land surrounded by melt-water on Hochstetters Forland. The eggs were taken on 6 June 1933, by Norwegian trappers, and Mr. John Giæver of Norsk Polarinstitutt, who was present, has confirmed that the geese were *Branta leucopsis* and that the nests belonged to this species (549 : 136). See also Alwin Pedersen (494 : 15).

Breeding. — The first record from 1858 of the Barnacle Goose as a breeding species in Spitsbergen is a little problematical as to the exact position of the breeding place, but it must have been somewhere between Hornsund and Bellsund. See Malmgren (94 : 389) under "First records".

The second record, provided by Professor Nathorst, who found a Barnacle Goose sitting on its nest on 25 June 1882, on the mountain Midterhuken in Bellsund, is in my opinion perfectly valid. This bird, a male, was shot and the fresh eggs taken and measured (155 : 22).

Jourdain mentions Professor Nathorst's find (384 : 166); but he also quotes Cocks, who had heard from Lieutenant Stjernspetz that three young birds were taken by the Swedish expedition (153 : 16). Because of what he called the "discrepancies in the various accounts", Jourdain would not accept the find as valid, but had he read Professor Nathorst's account of the incident in the ori-

ginal Swedish, he would not have been in doubt at all. How Lieutenant Stjernspetz could have been in a position to say that three young Barnacle Geese had been taken in 1882 by members of the Swedish expedition is difficult to say. There is no published record of such a find in the papers of the expedition. He was perhaps referring to the three young *Anser fabalis brachyrhynchus* taken alive by Nathorst in Bellsund on 4 July 1882.

Nathorst obtained two young birds in down in Van Keulenfjorden on 15 July 1898 (243 : 154). See also Kolthoff and Jägerskiöld (209 : 318) and Kolthoff (261 : 54).

Römer and Schaudin relate that a female bird and four young in down were obtained in Wijdefjorden on 8 July 1898 (245 : 166).

Kolthoff saw eight adult birds and two goslings about a week old in Van Keulenfjorden on 15 July 1898. One adult male bird and the two young were shot (216 : 54). These birds are also referred to by Kolthoff (226; Vol. 2 : 494), Nathorst (243 : 154) and Kolthoff and Jägerskiöld (209 : 318).

Le Roi states that a breeding-place was found in Longyeardalen on 29 June 1907. At least eight pairs were seen sitting on their nests in nearly inaccessible places. Two clutches of respectively five and four eggs were obtained. On 15 June 1908, another nest with three eggs was found in the same place (316 : 223).

Mathey-Dupraz, as mentioned before, saw a pair of Barnacle Geese on Amsterdamøya on 23 July 1911, and these birds were behaving as though they were breeding there. He also says that a Mr. Lewenthal, an old fellow-worker of Wellman's, had mentioned the species breeding on the island, but I have not been able to find his record in print (311 : 100).

Van Oordt says that the species probably breeds in Dicksonfjorden, Billefjorden and in the valley Sassendalen. Principally, however, the Barnacle Goose breeds in Longyeardalen, where the Oxford Expedition of 1921 obtained several clutches of eggs (370 : 140).

Jourdain states that he obtained five clutches of eggs, 22 eggs in all, other nests being inaccessible. He thinks there is good evidence that the species breeds in Sassendalen, Billefjorden, and Dicksonfjorden, and that while Isfjorden seemed to be the main breeding ground, it certainly also bred in Wijdefjorden and probably Bellsund (381 : 163). Congreve found four nests in Longyeardalen on 27 and 28 June 1922. They contained respectively three, five, six, and three eggs 403 : 18–20).

Kristoffersen found twenty breeding pairs on Isøyane north of Hornsund in the summer of 1924, but the size of the clutches is not mentioned (432 : 192).

Tomkinson looked for nests in Longyeardalen in 1931, but without success. All the geese had been shot by the miners, and since that time the species appears not to have bred in the valley (485 : 82). Dalgety found no Barnacle Goose nests in Isfjorden in 1930. At Kapp Hammerfest on Kong Karls Land, however, he found the empty nest of a goose, and from the down and the situation of the nest he thought it to be that of a Barnacle Goose (470 : 245). There is, however, no description of either the nest, its situation and surroundings, or the down and the small feathers intermingled in it.

Løvenskiold saw twelve pairs with young on Dunøyane on 5 August 1950. Of these, four pairs had newly-hatched goslings with them, and he supposed, therefore, that they must be breeding there. This was confirmed in 1952, when he found a nest with six eggs on 14 July. These eggs hatched two days later. In all, five empty nests were found on one of the islands, but there must have been more, because more than six pairs were seen with young. On 30 July 1952, three pairs with goslings were seen on the island Store Isøya. In all there were twenty-nine adult geese there (615 : 24).

If we assume the incubation period to be 24 days,[1] and also take into consideration the stages of incubation of the different clutches, and if we note the time of hatching of the broods of goslings, it should be possible to find out when the breeding period starts.

Table 14

Date	Place	No. of eggs	No. of young	Condition	First egg laid
15 June 1908	Longyeardalen	3		not well incubated	30 May
25 » 1882	Midterhuken	?		fresh	
25 » 1921	Longyeardalen	5		well incubated	1 June
25 » 1921	»	5		well incubated	1 June
25 » 1921	»	5		» »	1 June
26 » 1921	»	4		» »	3 June
26 » 1921	»	3		» »	4 June
27 » 1922	»	6		» »	1 June
27 » 1922	»	5		» »	2 June
27 » 1922	»	3		» »	4 June
27 » 1922	»	3		fresh infertile frozen	
30 » 1907	»	5		well incubated	5 June
30 » 1907	»	4		just before hatching	4 June
8 July 1898	Wijdefjorden		4	small in down	11 June
14 » 1952	Dunøyane	6		just before hatching	16 June
15 » 1898	Van Keulenfjorden		2	small in down	18 June
14 » 1952	Dunøyane		6 broods	newly hatched	16 June
15 » 1898	Van Keulenfjorden		?	» »	17 June
15 » 1898	»		2	1 week old	17 June
30 » 1952	Isøyane		3 broods	small	4 July
5 Aug. 1952	Dunøyane		12 broods	4 broods newly hatched	8 July

The first possible date for the laying of the first egg therefore is 30 May, and the latest possible date is 8 July. The majority of the eggs found must have been laid between 1 and 5 June. The ordinary season for egg-laying seems to be in the first half of June. In clutches where the eggs seemed to have been laid in July, the first eggs must either have been frozen or taken from the nest and a second clutch laid. We know for certain that Dunøyane are very often

[1] 24–25 days in captivity.

plundered for eggs in the middle of the season when the birds are protected by law.

How the young leave the nests is more or less unknown. If the nest is not too high up they will certainly be able to jump down without hurting themselves. But when the distance is several hundred metres, it seems impossible that newly-hatched goslings can get down without any assistance. When Alwin Pedersen was in Hurry Inlet, in Scoresby Sound in Greenland, he was standing at the foot of the mountain Nathorstfjellet when two Barnacle Geese came flying down from the upper perpendicular part of the mountain. With their binoculars he and his companion saw that the birds were carrying in their beaks objects which they identified as young in down. The birds alighted on the shore of a freshwater-lake and when the observers went to the spot, two small goslings followed their parents out on the water (507 : 137).

With regard to the breeding of the Barnacle Goose see also Jourdain (381 : 166) and Paget Wilkes (391 : 28–30). Christoleit (451 : 367) includes some biological notes on the species, and also discusses the down of the bird and the down in the nest.

F o o d. — Le Roi relates that a gander which they shot had some leaves of *Oxyria digynia* in its stomach, and also some stalks of *Graminea,* a little sand and some small pieces of quartz (316 : 225). Witherby says: "On the breeding-grounds in Greenland, the birds feed on twigs, leaves and catkins of alpine willow, seeds of various plants and grass; and in the winter-quarters, on 93.2 % green grass, 1.2 % clover, 4.8 % leaves of other plants and 0.4 % *Equisetum.* That they eat marine *Mollusca* and *Crustacea* requires confirmation (583, Vol. III : 209).

P a r a s i t e s. — Waterston found the mallophaga, *Trinotum anserinum,* on a female Barnacle Goose shot in Adventfjorden on 26 June 1921 (388 : 252). Summerhayes and Elton say that a flea, *Ceratophyllus vagabundus,* was found abundantly in the down of the Barnacles' nests in Longyeardalen (397 : 282).

No. 26. *CYGNUS CYGNUS* (L.)

The Whooper Swan

On 28 August 1936 the trapper Normann Andersen saw tracks of swans at Richardlaguna on Prins Karls Forland. On 11 September he shot one of the two birds (1936/37, 634). The skin was lost, but quite recently (1959) Mr. S. Kristoffersen told Løvenskiold that he had seen the skin, and that it was of a genuine Whooper Swan.

Records without identification of species

The walrus-hunter Mattila told Malmgren that he had shot a swan on a bog in Storfjorden some time shortly before 1860 (85 : 116).

According to Malmgren, Captain Kuylenstierna saw a swan in Isfjorden at the end of August 1861 (92 : 411).

Mr. Peter Brandal told Longstaff that he had shot two swans from a flock in Raudfjorden in August 1900. Mr. A. Levin told him that he had seen swans in Dicksonfjorden in August 1922 (407 : 483).

Bertram and Lack relate that a swan flew over one of them (Bertram) on the north coast of Bjørnøya on 25 June 1932. He could not see the head clearly (488 : 290).

Normann Andersen visited Forlandsøyane on 6 June 1938. A man he met there told him that he had seen a swan on one of these islands a few days previously. On 11 June Andersen saw a pair flying over the plain Forlandsletta on Prins Karls Forland (1937/38, 634).

Lønø saw a swan on 7 May 1955 on Zieglerøya in Tjuvfjorden on Edgeøya (1955, 647).

No. 27. *CYGNUS BEWICKII* Yarr.

Bewick's Swan

Binney reports that a male Bewick's Swan was shot on a tarn on Oxford-halvøya (Oxford Peninsula) at the head of Wahlenbergfjorden, Nordaustlandet, on August 27 1924 (413 : 245 and 414 : 113).

Montague repeats this and says that: "the remains of the skin were sent to the British Museum, and the identification corroborated". The weight of the swan obtained was 15 lb, i. e. about 6,800 gr.

Montague also mentions a flock of swans seen in Isfjorden in April 1924 (433 : 138).

On 9 August 1958 a man from the Meteorological Station on Bjørnøya told Løvenskiold that he had seen two swans, one white and one grey, at Flakmyr-vatna on the north coast. Although the place was visited on several occasions afterwards, the birds were not seen again. However, there were often fresh tracks in the mud at the water's edge. From the top of the middle toe and to the end of the hind toe, the biggest tracks measured 165 mm (1958, 633).

The average length of the middle toe for *C. bewickii* is: 8 males 133 mm and 6 females 125 mm, and for *C. cygnus:* 10 males 158 mm and 10 females 149 mm. (Lehn Schiøler 418 Vol. II : 384, 394).

In the Whooper Swan the hind toe measures 26 mm and the depth of the tarsus in front of the hind toe 30 mm, and the length from the tip of the middle toe to the end of the hind toe is more than 200 mm (measured on specimens in the Zoological Museum in Oslo).

It is therefore very possible that the bird in question was a Bewick's Swan.

FALCO RUSTICOLUS ISLANDUS Brünn.

The Iceland Falcon

Although the Iceland Falcon has been mentioned in the literature as having been found in Spitsbergen, there is really no proof that this form has been recorded there. See under the Greenland Falcon.

No. 28. *FALCO RUSTICOLUS CANDICANS* Gm.

The Greenland Falcon

Quite a number of big Falcons have been observed in Spitsbergen but only in a few instances has the bird been shot. Only three or four specimens have been taken to a museum for identification.

Where do these Falcons come from? If we look on the map of the lands around the North Pole, we see that Greenland is the land nearest to Spitsbergen. From Hovgaard Island, on the east coast in latitude 80° N, it is about 500 km to the north point of Prins Karls Forland. In latitude 75° N, the distance from Shannon Island to the south point of "Forlandet" is about 800 km. From the northernmost point of Iceland to "Forlandet", the distance is more than 1500 km, and from Sørkapp, the most southerly point in Spitsbergen, to Norway is about 600 km.

Although the distance to Norway is relatively short, the Norwegian Gyr-Falcon (*Falco rusticolus rusticolus* L.) has never been observed in Spitsbergen. But there are also two other races to be considered, the Greenland Falcon (*F. r. candicans* Gm.) and the Iceland Falcon (*F. r. islandus* Brünn.).

For the first of these there are three records, of which at least two are absolutely valid. There are three records of a bird described as *F. r. islandus,* but it is more probable that these Falcons belonged to the Greenland race. As mentioned above, it is a very long way from Iceland to Spitsbergen and it seems doubtful that a predatory bird would fly such a stretch over the open ocean.

From NE Greenland the distance is relatively short, and at these high latitudes there are always icefloes where the bird can rest.

On the east coast of Greenland between Scoresby Sound and Germania Land (up to 78° N) the Greenland Falcon is, says Salomonsen, an abundant breeding-bird. In the northern part of this extensive area, only white birds have been observed and obtained (588 : 451). The Iceland race does not go so far north, and it seems that the chances of this race going over Greenland to Spitsbergen are relatively slight.

The records for Falcons seen in Spitsbergen are as follows:

The Greenland Falcon. — Dresser states that Mr. A. Benzon informed him that he had in his possession "an undoubted example received from there" (115 Vol. VI. : 21).

Hartert says that in Tring Museum there is a specimen caught in Spitsbergen (260 : 1066), and in a letter of November 9th 1929 to Johnsen, Hartert gives the following particulars: "The white Falcon was bought by the late H. H. Slater from a whaler in Hull, who had caught it at sea on board ship near Spitsbergen. The bird is not quite an adult male with the usual dark brown markings." Hartert suspected that Munsterhjelm's specimen (see below) could also prove to belong to the Greenland and not to the Iceland race (505 : 33).

In September 1947 G. and T. Sætersdal obtained a Greenland Falcon in Sassendalen, Isfjorden. The skin of the bird is in the collections of the Zoological Museum in Bergen (574 no. 10486).

The Iceland Falcon. — In 1910 Munsterhjelm obtained a dried specimen of a Falcon, found in Recherchefjorden (314 : 46). In another paper he described the bird as *Falco r. islandus* and he gives the measurements for the bill as 25 mm and for the wing as 335 mm (313 : 7). This must be a misprint, for in a letter of 1929 to Johnsen, Dr. Välikangas informed him that the wing measurement of the above-named bird was 348 mm. The wings were worn, but would probably not have been more than 350—2 mm (505 : 33). The general appearance of the bird in the photograph in Munsterhjelm's paper points more in the direction of *Falco r. candicans* than the Iceland race.

In his paper "Notes ornithologiques . . ." Mathey-Dupraz mentions the Icelandic race from Spitsbergen. In a footnote he says that Dr. G. Remp obtained a specimen of *Falco r. islandus* from Mr. Hagerup of Tromsø, when he visited the whaling station in Grønfjorden in February 1912. The Falcon had been shot near the station in 1911. It was, from what Mr. Hagerup said, a young Iceland Falcon. As the specimen had been preserved without any preparation at all, it was not in a fit condition to be mounted (333 : 91). From this it is evident that Dr. Remp, and not Mathey-Dupraz as stated by Pleske, acquired the bird from Mr. Hagerup (448 : 302). However, I agree completely with Pleske when he says that Mr. Hagerup's identification requires confirmation, and consequently the proper reference of this individual remains uncertain.

Kristoffersen, who wintered at Sørkapp, Spitsbergen in 1929/30, saw four specimens of what he calls the Iceland race in October 1929. Of these three were shot, on the 4th, 5th, and 14th respectively. Remains of Snow-Buntings were found in the stomach of all three of these birds. The fourth individual was observed in the vicinity of Sørkapp during the first part of the winter and was seen for the last time on 16 January 1930. In the late autumn 1929, this bird partly ate one or two foxes caught in traps, thus ruining their skins.

In Kristoffersen's paper there is a photograph of one of the Falcons, in which it can easily be seen that both head and under tail-coverts are almost pure white. As these points are important marks of identification for *Falco r. candicans,* it is highly probable that all four birds belonged to this race (472 : 249).

From the facts related above, there appears to be only one race of *Falco rusticolus* in Spitsbergen, and that is the Greenland Falcon.

Quennerstedt says in a footnote that a Falcon was observed on the Swedish expedition of 1861 (81 : 5). Malmgren says that a hunting party saw one Falcon or perhaps two, on 4 June 1861, on the eastern coast of the mouth of Wijdefjorden. A few days later a Falcon was observed in Sorgfjorden, probably the same as that seen on the 4th. This must be the bird referred to by Quennerstedt (85 : 113).

Heuglin says that a Norwegian captain had told him that he had seen a Falcon several times in Isfjorden during the summer of 1870 (132 : 83). Cocks says that Mr. Chapman saw a Falcon in Van Keulenfjorden on 30 July 1881 (149 : 332, 416). In 1882 Cocks visited Kapp Thordsen in Isfjorden (between Dicksonfjorden and Nordfjorden). The Swedish expedition stationed here kept pigeons and on 12 September, a Falcon stooped at one of these birds (151 :

405). On 22 September 1882, Cocks saw a Falcon in Recherchefjorden. This bird, he says, was white enough to be a Greenland Falcon (151 : 438) and (153 : 13). Bianchi says that Dr. Bunge saw a Falcon in Hornsund on 22 September 1899. He thought it could have been an Iceland Falcon (253 : 323).

Falcons have never been found breeding in Spitsbergen, but they breed both in Greenland and in Novaya Zemlya. One would think that such predatory birds would find food enough among the vast multitude of birds in the Svalbard area, but in spite of the presence of ample food, they are not found breeding.

The conditions, at least in parts of these three regions, must be fairly much the same, but there is one big difference. In Greenland and in Novaya Zemlya there are lemmings, but these are totally absent in Spitsbergen. It might be that the big Falcons, at least in the northern part of their range, are more or less dependent on micromammalia as food for their young while they are quite small. This is perhaps why Falcons have never been found breeding in Spitsbergen.

That the big Falcons take lemmings is a fact. Dementiev collected pellets of the Norwegian Gyr-Falcon on the Murman coast and examined the contents of them. In one instance he found that lemmings and voles made up 36.6 % of the remains of the animals found in the pellets and in another instance 52.2 % (565 : 559). Lönnberg says that the greater part of the food of the Greenland Falcon is lemmings, but that it also takes Ptarmigan, Snow-Buntings and smaller waders (409 : 310). Lehn Schiøler is of the same opinion (418. Vol. III : 383).

No. 29. *FALCO COLUMBARIUS AESALON* Tunst.

The Merlin

Munsterhjelm relates that he was on board the whaler "Balaena" on 1 May 1910. Here, at 73° 31′ N, 14° 50′ E, a Merlin was shot down from the rigging (313 : 7). From what the skipper, Mr. Fredrik Svendsen, told Munsterhjelm, a small falcon had come aboard his ship "Hvitfisken" in the middle of May at 74° N, 10° E. According to the description this bird also might have been a Merlin (p. 7 footnote), but the only reliable record of this species for the Svalbard area is that from 1 May 1910.

No. 30. *FALCO TINNUNCULUS TINNUNCULUS* L.

The Kestrel

A Kestrel, now in the zoological collection of the University of Bergen, came aboard the motor-ship "Tovik" on 7 August 1924. The ship was then east of Bjørnøya (Johnsen 490 : 125). This is the only record for the Svalbard area.

No. 31. *LAGOPUS MUTUS HYPERBOREUS* Sundev.[1]

The Spitsbergen Ptarmigan

Geographical distribution

The Spitsbergen Ptarmigan is found only in the Svalbard area and on Franz Josef Land. In Spitsbergen it has been known since 1610, but according to Miller it was not found in Franz Josef Land until 1904 (275 : 509). See also Pearson (279 : 508).

In Europe the species is distributed in several races in Iceland, Scotland, Norway, N Sweden, N Finland, N Russia, the Alps and the Pyrenees. In Asia it occurs in N Siberia, in the mountain ranges of central Asia, on Commander isl., Kurile isl. and Hondo (Japan). In N America it is found in Alaska, the Aleutian isl., Canada, Labrador, Newfoundland and Greenland.

On the Scandinavian Peninsula we have the nominate form, *Lagopus mutus mutus* (Montin) and in Iceland *Lagopus m. islandorum* (Faber). Birds found on the west coast of Greenland and on the southern part of the east coast, belong to the subspecies *Lagopus m. rupestris* (Gmelin), and there is another race in NE Greenland, *Lagopus m. captus* Peters. This according to Salomonsen, is "one of the most interesting forms of the Rock Ptarmigan, as it appears to bridge the considerable differences between the common *rupestris*-forms and the peculiar endemic Spitsbergen form *Lagopus m. hyperboreus* Sundevall . . . No doubt the Spitsbergen Ptarmigan originates from Northeast Greenland" (515 : 32–35). More recently Salomonsen has recognized the NW Greenland Ptarmigan as a special race, *Lagopus m. saturatus* Salomonsen (588 : 162).

Occurrence in Svalbard

The Spitsbergen Ptarmigan is found over the whole of the Svalbard area except on Kvitøya and Kong Karls Land. It breeds in all of the areas in which it occurs except on Hopen.

First records

Poole, who visited Spitsbergen in 1610, wrote: "A briefe note on what Beasts, Fowles and Fishes were seene in this Land", in which he mentions that he had seen "white Partridges" (4 : 23). He also saw "white Land Partridges" on his voyage to Spitsbergen in the following year (5 : 41).

Baffin found "White land partridges" somewhere in Sir Thomas Smythe's Bay, i. e. Forlandsundet, on 21 June 1613 (6 : 62). In the same paper he also includes a note on the fauna of the area: "Upon this land there be manie white bears, graie foxes and great plentie of deare, also white partridges, and great store of white fowle, as queruluduns, wild geese, sea pigeons, sea parrots, willocks, stints, guls, and diuers others wherof some are unworthy of nameing and tasteing" (6 : 71).

[1] Contour map showing distribution, see backflap.

Martens saw an "Eis-Vogel" i. e. "Ice-Bird" in Engelskbukta in 1671, and this bird can only have been a ptarmigan (12 : 53).

Records without any distinct locality

Gray records that the collection of the British Museum (Nat. Hist.) includes a specimen of an adult male Ptarmigan from Spitsbergen (58 : 48).

Gaimard includes a good illustration of the Spitsbergen Ptarmigan (the first to be published), but the picture has no legend (59).

At a meeting of the Zoological Society of London on 13 July, 1858, Gould exhibited a skin of a female ptarmigan shot in Spitsbergen in the summer of 1856 by Mr. Edward Evans. He also described the bird, which he named *Lagopus hemilicurus* (68 : 354).

Salomonsen received for examination the skins of five male birds from Spitsbergen: 1. shot on 18 July 1864; 2. 3 July 1898; 3. 28. August 1923; 4. 21 June 1930; and 5. 24 June 1931. Of these skins Nos. 1, 2 and 4 belong to the Zoological Museum in Stockholm, the remaining two to the British Museum (Nat. Hist.) in London (543 : 91).

Chapman considered that *Lagopus hyperboreus* from Spitsbergen was much more closely allied to the Willow Grouse than to the Ptarmigan (181 : 128). (See also 402 : 27–28).

Jourdain says that the 1921 Oxford Expedition to Spitsbergen failed to find any Ptarmigan, which in that year was absent from several districts in which it had been plentiful in 1920. Feathers and droppings from the previous year were seen in hundreds, and even fragments of the previous years' eggs were found (368 : 152). (See also 381 : 178).

Van Oordt bears out Jourdain's statement as to the absence of Ptarmigan in Spitsbergen in 1921 (370 : 165).

Anonymous: The British Museum (Nat. Hist.) received a Spitsbergen Ptarmigan in 1923 from Mr. George Binney (401 : 825).

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — The first record of Ptarmigan on Bjørnøya was in 1921, and the species is still there. Broods have been seen on Miseryfjellet on at least two different occasions.

S e c t i o n II. H o r n s u n d. — Ptarmigan have been seen on Sørkapp, west of Kistefjellet on the mainland, on Hilmarfjellet in Stormbukta, on Lidfjell south of the entrance to Hornsund, on the north side of Hornsund on Hansbreen and on nunataks on this glacier. The species has been found breeding on Midifjellet south of Gåshamna and in Gåshamna at Konstantinovka. Ptarmigan also breed on the east side of the mountain-range Kovalskifjella north of the glacier Hambergbreen, towards Storfjorden.

S e c t i o n III. B e l l s u n d. — Ptarmigan have been seen north of Storvika on the west coast, in Recherchefjorden, on Observatoriefjellet, Midterhuken, and on the north side of Van Mijenfjorden. They have also been found breeding in Reindalen and at Sveagruva and Braganzavågen at the head of the fjord.

Section IV. Isfjorden. — The species has been seen in several places in Grøntjorden, in Colesbukta, along the shores of Adventfjorden, in several places in Adventdalen, De Geerdalen, along Sassenfjorden and in Sassendalen, on the mountain Tempelfjellet, on Gåsøyane, in several places at the head of Billefjorden, in Skansbukta, on Rundodden, along the coast from Kapp Thordsen and far inside Dicksonfjorden, at Kapp Wærn, in Ekmanfjorden, on Bohemanneset and in Trygghamna. They have been found breeding in Grønfjorden, Colesbukta, several places around Adventfjorden, in Sassendalen and on the mountains north of Rundodden.

Section V. Prins Karls Forland. — Ptarmigan have bred on Salfjellet in the south of the island, and they have been seen on Methuenfjellet north of Forlandsletta, at Kaldneset, in Selvågen and on the NE coast between Richardlaguna and Fuglehuken.

Section VI. Kongsfjorden. — Ptarmigan have been seen at Kvadehuken and on Lovénøyane. In Kongsfjorden they have been found breeding at Ny-Ålesund, and in Blomstrandhamna. In Krossfjorden they have bred in Tinayrebukta, on Christian Michelsenfjella and in Signehamna.

Section VII. NW Spitsbergen. — In this district the birds have been seen in Magdalenefjorden, in Sørgattet, on Danskøya and Amsterdamøya, on both of Norskøyane, on Arneliusneset south of these islands and in Birgerbukta not far from Arneliusneset. They have also been found on Flathukfjellet at the entrance to Raudfjorden and on several places in the fjord, especially on the mountain east of Kapp Svensksund. In Liefdefjorden they have been found close to the glacier Monacobreen and they have been seen on the east side of Woodfjorden. They have bred in Breibogen south of Biskayerhuken, in Bockfjorden and in valleys between Woodfjorden and Gråhuken.

Section VIII. Wijdefjorden. — Ptarmigan have been found in several places in the valleys on either side of the fjord, and at its head and at Verlegenhuken. They have been found breeding in Andredalen, Purpurdalen, at Austfjordnes, in the Royal Society Valley, and in the vicinity of the lake Femmilsjøen.

Section IX. Hinlopen. — Ptarmigan have been found in Sorgfjorden, and in Lomfjorden, where it has also been found breeding.

Section X. Nordaustlandet. — A few authors mention the Ptarmigan as an inhabitant of Nordaustlandet, but they do not give any definite localities. It was found breeding for the first time in 1957 in Bodleybukta and also 10 km away from the coast. Bodleybukta is at the head of Wahlenbergfjorden.

Section XI. Storfjorden. — The species has been seen in Agardhbukta and Dunérbukta on the west side of Storfjorden. They have also been found on Zieglerøya in Tjuvfjorden and in Diskobukta on Edgeøya. On Edgeøya they have bred on Kvalpynten and at Kapp Lee. They have also been found breeding on Barentsøya in Anderssonbukta.

Section XIV. Hopen. — Ptarmigan do not seem to be resident on Hopen, but they visit the island sometimes, especially in winter and the records show that birds were there in the winters of 1923 and 1953.

Wandering movements and fluctuations in the population

In Spitsbergen the Ptarmigan is a resident bird which does not migrate, but especially in autumn and spring larger or smaller flocks may wander from one district to another, and it is possible that Ptarmigan found in such places as the islands Hopen and Bjørnøya, may have wandered there during the winter when it was possible for them to rest on the ice.

As these movements take place late in the autumn or in early spring, very few scientists have been able to study them, and in consequence little is known about them.

It seems that the birds normally breed high up on the mountains, on steep hillsides among stones. In some years, however, they breed much lower down, almost at sea-level. It is possible that in these years there are so many birds in the normal breeding grounds that some of them have to seek nesting-sites elsewhere. But it is possible that the normal breeding places are snow-covered and consequently the birds have to go lower down to breed.

It is a fact that in most years one never sees a Ptarmigan in the lowlands during the summer. At that time they are to be found only in the higher valleys and on the flat tops of mountains up to 600 m above sea-level.

From what the trappers have noted in their diaries, the birds keep to the steepest parts of the mountainsides until the snow comes in September–October. At this time of the year they are white and they will not venture into the lowlands until there is snow there. Because the wind sweeps the snow away on the land close to the shore, there is usually only a slight cover of snow there and birds have no difficulty in finding food. However, if there is no snow at all on the low-lying ground, the trappers have to seek the birds at higher altitudes.

In some years there are periods of rain on the lowlands during the winter, and if the rain freezes, the ground becomes ice-covered. Under these circumstances any Ptarmigan which have not already left the area will starve and many dead Ptarmigan have been found on the lowlands during the winter. As these ice-coverings are mostly local and of limited extent, there is no reason to believe that they have any influence on the population as a whole, but they may certainly cause the disappearance of the birds from some small areas.

The movements of Ptarmigan in late autumn and during the winter are possibly made in search of food, and the flocks which are seen number from 10–12 up to 50 and several hundreds of birds. In districts where no Ptarmigan have been seen for a long time, they may suddenly appear, stay for a longer or shorter time and then disappear again. Notes regarding the direction, time of year, and size etc. of the wandering Ptarmigan flocks are rather scarce.

Kristoffersen records that on 28 September 1929, the birds at Sørkapp were in full winter-plumage and were seen flying north (472 : 257).

Karl J. Bengtson relates that in the autumn of 1900, many thousands of Ptarmigan assembled on the mountainsides of Agardhbukta where they rested for some days before going west. Other trappers have confirmed his observation, and have stated in addition that the birds came from the big islands on the east side of Storfjorden (1909/10, 635).

Georg Bjørnnes states that the birds in Wijdefjorden began their wanderings between 10 and 24 October 1929 (1929/30, 636). In the year 1931 he saw no birds in Wijdefjorden until 12 September, when they appeared in great numbers everywhere. At all hours of the day and night he saw flocks of varying size coming over the sea from the west and flying east. When they reached the shore, they dropped to the ground exhausted (1931/32, 636).

Jung, who visited Wijdefjorden in 1936, saw 50 birds coming from the south along the shore on the west side at the end of August. They went round the ness Gråhuken and into Woodfjorden on the west side of the ness. His map of the directions of the different flights shows that some of them came from the inner parts of the valleys on the west side of the fjord and flew north along the shore (539 : 138).

Waldemar Kræmer wintered on Arneliusneset (Svenskegattet), and on 23 October, 1936, he saw several flocks of Ptarmigan flying towards the east (1936/37, 640).

Hilmar Nøis saw only a few Ptarmigan during the winter in Sassendalen, but from 9 March, 1939, onwards, flock upon flock arrived from the north, and the movement continued until 16 April (1938/39, 642 a).

In some years Ptarmigan are almost completely absent from the Svalbard area. In other years there may be a few, but sometimes they are found everywhere in varying numbers and occasionally they are extremely numerous.

The trappers wintering in Spitsbergen frequently note in their diaries the number of birds shot during the winter. They use the Ptarmigan for food and also as bait in fox-traps, and in recent years they have also sold them to the people wintering in the Norwegian collieries. Even when the the actual numbers obtained are not recorded, the trappers usually mention whether it has been a a bad, a medium or a peak year for Ptarmigan. From these notes and also from printed information, it has been possible to construct the diagram in Fig. 5.

G e n e r a l h a b i t s. — The most striking feature in the behaviour of the Spitsbergen Ptarmigan is their almost incredible tameness. Because they have almost no experience of man, they are not in the least afraid of him, and this has led to the belief that the Spitsbergen Ptarmigan must be an extremely stupid bird, although this is certainly not the case.

As mentioned before, during the summer they are usually found high up on the mountains. Glen and Keith relate that during the summer of 1932, they found the birds in considerable numbers above the 1500-foot level, and not until towards the end of August were the birds found below this height (509 : 606).

When food becomes scarce or when the first snow has fallen in September–October, the Ptarmigan move down into the valleys or to the low-lying land where the cover of snow is thin, and seek their food there. Here the birds may stay all winter, but when the snow is blown into huge impenetrable drifts, the birds may return to higher altitudes where the wind has swept the ground for them.

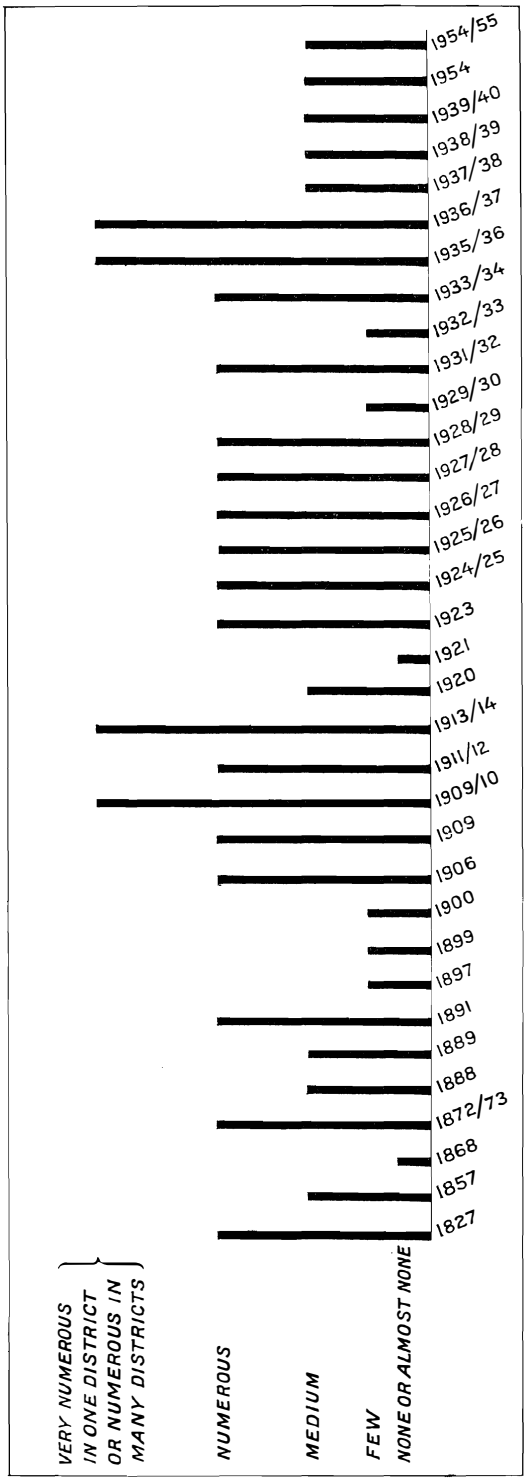

Fig. 5. *Fluctuations in the population of the Spitsbergen Ptarmigan in various years between 1827 and 1955. Where only one year is mentioned, the information is taken from books and papers. Where two years are cited (e. g. "1924/25"), the information has been found in trappers' diaries.*

The trappers have found that when the sun returns in March–April, the birds will often go high up in the mountains on sunny warm days, whereas in overcast or dark weather they keep to the lowlands. Sundevall saw great activity amongst the Ptarmigan on 16 February 1873, when there was sunshine in the middle of the day (133 : 18).

When there is a deep cover of snow which is not too hard to dig in, the birds make burrows down to the ground to find food. This is well known from Greenland, but the first and apparently the only description of Ptarmigan behaving in this way in Spitsbergen is given by Mr. Pike, who wintered on Danskøya 1888/89 (Chapman 195 : 347). To quote him: "The Spitsbergen Grouse make long burrows beneath the snow, and, since snow falls deep long before the severe frost sets in, the autumnal crop of berries, seeds, etc., is thus preserved beneath it, and provides the Grouse with food. This explains the problem of how game-birds can survive the arctic winter. The burrows are too narrow for a fox to enter."

At all times of the year, but especially during the winter Ptarmigan may be found on the leeward side of big stones and boulders, when a cold wind is blowing. Their wanderings are not always undertaken in search of food, and frequently they seem to take the bird away from bad weather. Also when it rains during the winter and the ground becomes bare, they seek snow-covered areas. They do this in the first place because they would otherwise starve when the ground became covered with a sheet of ice from the frozen rain, and secondly because against the dark background their white plumage makes them easily visible to enemies such as the Arctic Fox and the Snowy Owl.

Although usually very tame, the Ptarmigan will sometimes take wing when approached. The trappers say that the variability in their behaviour is correlated with climatological conditions, for they have found them to be very shy in a certain type (or types) of weather.

The birds are very fond of dust-bathing. This is described by Jung, who in 1936 found that they bathed in sand on the arid terraces of the valleys on the west side of Wijdefjorden (539 : 126). Løvenskiold found just the same during the summer of 1954 in the valleys on the opposite shore of the fjord (1954, 633).

It is highly probable that the cock bird defends a certain territory during the breeding season in the same way as in Greenland, where the distance between pairs is usually about 300–400 m. The cock Ptarmigan stays with the hen until shortly before the young are hatched, when she is brown and he is still white. If such a pair is approached, the hen will stay on the bare ground, but the cock will run to any patch of snow in the vicinity and stay there until the intruder has left.

A hen with small chicks is absolutely unafraid. In 1954 Løvenskiold found a hen with 5 chicks which were only a couple of days old. One of his assistants caught them, and sat down on the ground with the chicks in his lap. The mother bird then came right up to him, jumped on his boot, walked along his leg up to her chicks, collected them round her and then left completely unperturbed.

Besides man, the Spitsbergen Ptarmigan also has other enemies. The fox takes a heavy toll of them during the winter, because the Ptarmigan is the only species of bird which stays in the area throughout the period of darkness. One bird of prey which visits the islands almost yearly is the Snowy Owl, and this bird has been seen to pursue and catch Ptarmigan. In a lesser degree the Arctic Skua also may be dangerous to them, as it sometimes tries to take the chicks.

Alfred Svendsen writes on 21 October, 1926, at Verlegenhuken: "There are so many Ptarmigan here that it is bad for the fox-trapping" (1926/27, 644 a). Hilmar Nøis saw a Snowy Owl which had caught a Ptarmigan in Sassendalen on 30 January, 1937 (1936/37, 642 a). Georg Bjørnnes saw an owl which took a Ptarmigan in Wijdefjorden on 22 March, 1932 (1931/32, 636). On 27 July, 1933, he saw a hen bird in Ny-Ålesund, and she defended her chicks against the attacks of a pair of Arctic Skuas. On 28 August of the same year, in Wijdefjorden, he saw an owl which tried to take a Ptarmigan, and on 2 November he found a half-dead Ptarmigan, probably wounded by a Snowy Owl (1933/34, 636). On 2 January 1940, he found that the stomachs of all the foxes caught in his traps, were full of Ptarmigan remains (1939/40, 636).

Breeding. — In Spitsbergen the Ptarmigan usually breed high up on the mountain-sides or on the flat plateaux on the tops of the mountains. The altitude varies from year to year in accordance with the altitude at which the ground is covered with snow. But there are several records of nests having been found between 300 and 600 m above sea-level. In normal years, when the snow begins to disappear in the first half of June, the birds seem to nest at high altitudes, and more especially on relatively steep hillsides strewn with stones.

In most years, however, the Ptarmigan breed in more or less inaccessible places. For this reason very few clutches of eggs have been found in the area, and even hens with chicks are relatively rarely met with; in consequence of this, we know very little about the breeding of the Ptarmigan in Spitsbergen.

Since the chicks of the Norwegian Ptarmigan fly when they are 10 days old, there is no reason to believe that the chicks in Spitsbergen will not do the same. Thus, in Table 15, below, 10 days is allowed from hatching to fledging. The incubation period is taken as 25 days.

The nest is a rather shallow scrape in the ground, and it has been found lined with a handful of dead leaves, mostly *Dryas, Salix* and *Empetrum*. From the rather meagre material shown in table 15, it seems that the last half of June is the time for egg-laying. The two broods from Edgeøya, where the clutches were completed on 8 and 14 July respectively, were probably belated because snow usually covers the ground for a longer period in the east than in the west of Spitsbergen.

The hen seems rarely to lay less than 5 eggs; the mean is probably 9, and as broods have been found with 12 chicks, the maximum is probably 13 eggs. The average of hatched chicks is 6.79, or more often 7 than 6, chicks per brood. Zedlitz's claim of a brood of 21, all hatched from one nest, must therefore be greatly exaggerated.

Table 15

Date	No. of eggs or chicks	Condition or age	Eggs presumably laid	Place	Author
21 July 1954	hen with 5 young	10 days	16 June	Wijdefjorden	Løvenskiold (1954, 633)
17 June 1900	5 eggs	fresh	17 June	Isfjorden	Kolthoff (261: 41)
23 July 1954	hen with 5 young	10 days	18 June	Wijdefjorden	Løvenskiold (1954, 633)
21 » 1954	hen with 5 young	3 days	23 June	Wijdefjorden	Løvenskiold (1954, 633)
20 » 1910	♂+♀ with young	1 day	25 June	Adventfjorden Isfjorden	Mathey–Dupraz (311: 45)
21 » 1910	♂+♀ with young	2 days	25 June	Isfjorden Sassenfjorden	Mathey–Dupraz (311: 45)
30 » 1912	hen with 10 young	8 days	26 June	Krossfjorden	Mathey–Dupraz (333: 96)
25 » 1936	hen with 6 young	8 days	26 June	Wijdefjorden	Jung (539: 136)
30 » 1927	hen with 8 young	10 days	26 June	Wijdefjorden	Georg Bjørnnes (1927/28, 636)
27 June 1855	2 eggs	fresh	27 June	Isfjorden	Evans and Sturge (72: 170)
3 Aug. 1890	hen with 3 young	8 days	28 June	Isfjorden	Nordenskiöld (178: 44)
4 » 1881	hen with young	10 days	1 July	Isfjorden	Cocks (149: 407)
15 » 1900	hen with 12 young	14 days?	8 July?	Edgeøya	Bianchi (253: 321)
17 » 1927	hen with 7 young	10 days	14 July	Edgeøya	Dalgety (442: 30)
15 July 1869	hen with young			Isfjorden	Lamont (139: 284)
27 » 1910	hen with 4 young			Van Mijenfjorden	Munsterhjelm (313: 8)
30 » 1910	♂+♀ with 6 young			Krossfjorden	Zedlitz (319: 323)
30 » 1912	hen with 8 young			Kongsfjorden	Nansen (360: 132)
21 » 1957	hen with 3 young	⅓ to ½ the size of the ad.		Raudfjorden	Bateson (1957, 650)
21 » 1957	hen with 9 young	–»–		Raudfjorden	Bateson (1957, 650)
21 » 1957	hen with 9 young	–»–		Raudfjorden	Bateson (1957, 650)
30 » 1925	hen with 10 young			Isfjorden	Orvin (1925, 632 a)
7 Aug. 1899	hen with 9 young	half-grown		Barentsøya	Birula (298: 169)
7 » 1936	hen with 4 young			Wijdefjorden	Dege (594: 77)
19 » 1949	hen with 8 young	half-grown		Isfjorden	Løvenskiold (615: 131)
22 » 1861	hen with young			Lomfjorden	Malmgren (85: 100)

The hatching of the young takes place in the last half of July. Often broken egg-shells can be found in the nest, which show, on closer investigation, that the eggs have been hatched. Such finds have been mentioned by various authors, including Trevor-Battye, Nathorst, Mathey-Dupraz and others. But only in one instance were the empty shells counted: a nest found in Wijdefjorden on 13 August, 1954, by Løvenskiold, showed that 9 chicks had been hatched.

In most instances only the hen has been found with the chicks. Salomonsen says that the cock leaves the hen just before the eggs hatch and only returns to her when the young have grown to two-thirds of the adult size (588 : 173). In Spitsbergen Mathey-Dupraz found several coveys with chicks one or two days old, accompanied by both parents (311 : 45). Zedlitz found a brood of 6 chicks with both parents present on 30 July, a date at which the chicks must have been rather small, and by no means half-grown (319 : 323).

In late autumn the different coveys gather together into larger or smaller flocks.

Moult and condition. — The moult of the Spitsbergen Ptarmigan has been studied by Dr. Finn Salomonsen, whose results are given in a paper entitled "Moults and Sequence of Plumages in the Rock Ptarmigan", Copenhagen 1939. Another interesting paper on this subject, written by the late Mr. Sigurd Johnsen, is "Remarks on the Svalbard Ptarmigan (*Lagopus mutus hyperboreus* Sundev.)" published in 1941. These two papers contain most of what is known about the moult of the Spitsbergen Ptarmigan, and the following remarks are drawn mainly from these two sources.

During the winter both the male and the female are white. In May the female begins to moult and by the end of May, she will have shed most of the white feathers. By the beginning of June her brown summer-plumage will be complete, so that when she lays her eggs and begins to incubate in the second half of June, her new plumage gives her full protection. This protective colouring is necessary to her during the incubation period and as long as the chicks are small and unable to use their wings effectively.

According to Johnsen, the female has no regular autumnal plumage. The autumn moult takes place in the middle of August, but even before it is completed, the feathers of the winter-plumage begin to grow and about the middle of September the female is almost pure white (see his diagram, Fig. 6).

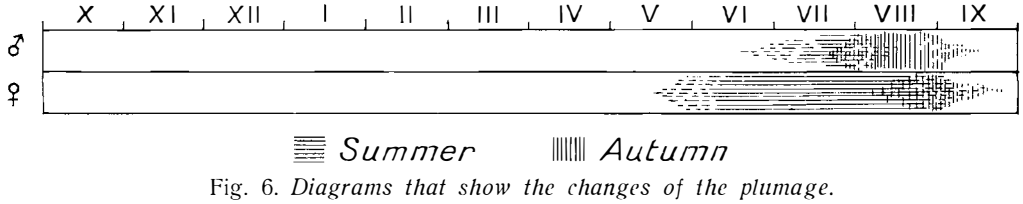

Fig. 6. *Diagrams that show the changes of the plumage.*

The annual plumage cycle. — On this subject Johnsen says: "The Svalbard Ptarmigan has, as I see it, the following plumages: ♂. 1. Winter plumage. 2. Summer plumage (incomplete). 3. Autumn plumage (complete or nearly so). ♀. 1. Winter plumage. 2. Summer plumage (complete). 3. Autumn plumage (incomplete)."

The diagrams, Fig. 6, are meant to give a general idea of the changes of the plumage, but no attempt is made to specify the exact dates of the beginning and completion of each dress, these being indicated by broken lines. The diagrams also illustrate how short the season of pigmented plumages is in these latitudes. The short arctic summer does not give the bird time to acquire and change a succession of pigmented plumages; it has to concentrate upon the most important ones, i. e. for the female the summer-plumage during the incubation period and when the chicks are young (552 : 20).

The male does not need any protective colour during the period when the hen is sitting, and during the incubation period he stays near her. In his white plumage he is extremely conspicuous and by diverting attention from the hen and the nest he protects them against predators. When the chicks are almost hatched, however, he leaves her until the young birds have put on weight and are more than half-grown, when he joins the family again. During this period of absence the male undergoes his autumn moult.

The cock seldom begins his moult into summer-plumage until the middle of June. The summer-plumage is worn for only a short time, because the feathers of the autumn plumage begin to grow as early as the first half of July. Until this plumage is completed he looks very ragged, dirty an untidy. The autumn plumage is also worn only for a short period; the white feathers of the winter-plumage begin to grow at the end of August and this plumage is completed by the middle of September. By this time the hen also is usually pure white.

A pair of Ptarmigan during the period from the middle of May to about mid-July is a very remarkable sight. The cock is then white and the hen is in her protective summer-plumage. This fact has been mentioned by many ornithologists and also by some trappers in Spitsbergen. Eaton mentions that of several birds shot in Krossfjorden at the end of May, 1873, all the cocks were white and the hens brown (130 : 3808). Trevor-Battye states that a cock shot in Isfjorden on 18 June, 1896, was white, but that all the males obtained after this date were in advanced stages of moult (203 : 587). Roth says that a white cock was shot in Adventdalen on 15 July, 1900 (257 : 147). Kolthoff mentions a white cock shot in Isfjorden on 12 June, 1900. In Colesbukta he found about 10 pairs of Ptarmigan on 17 June, 1900, and then all the cocks were white and the hens brown. On one male bird, shot at the beginning of July, the feathers of the summer-plumage had begun to grow on the head and on the rump (261 : 39).

Le Roi states that one cock obtained in Isfjorden on 16 June, 1908, and two shot on the 22nd were all white with some brown feathers on the head. Two cocks from Isfjorden, shot on 29 and 30 June, 1907, respectively, had brown feathers on the head and also on the upper part of the neck. Two hens obtained in Isfjorden on 22 June, 1908, were in summer-plumage (316 : 156).

Peder Åm saw a white cock with a brown hen in Kongsfjorden on 29 May, 1936 (1935/36, 646). Arthur Oxaas had a similar pair staying close to his hut at Kapp Wijk on 23 May, 1940 (1939/40, 643).

Other records on the moult include the following:

Malmgren saw two birds (probably two males) in full winter-plumage on 4 June, 1861, in Wijdefjorden (85 : 100). A male shot in Isfjorden on 7 July,

1864, had a few grey feathers on the neck, and another male shot on 8 July, had just begun to moult (92 : 379). Heuglin mentions a number of birds, shot in Sassendalen on 15 September, 1870, which were in the intermediate plumage between summer and winter. The adults were in heavier moult than the young birds (123 : 286). The cocks had only a few feathers of the summer-plumage left, but the young birds had only a few white feathers on the head (132 : 99).

Kjellman shot two birds in moult in Mosselbukta on 6 May, 1873 (132 : 256). Cocks states that four male birds shot in Grønfjorden on 27 July, 1881, were in heavy moult. He had never before seen wild birds in such a ragged and dirty condition (149 : 325). Birula mentions a female in full summer-plumage, found on Barentsøya on 7 August, 1899. On 4 September he saw great numbers of Ptarmigan in Adventdalen. Here some of the males were white, while some of the females were brown (298 : 169). On the same day he also saw a flock near Hotellneset. These birds were adults with many white feathers in their otherwise brown plumage.

Salvadori describes eight Ptarmigan shot in Spitsbergen in May, 1900. Of these, six birds (probably males) were white. Of the other two, one otherwise white bird had one isabelline feather with a grey-black transverse band, while the second was mainly white, but with many reddish feathers, which had black transverse bands (252 : 2).

Munsterhjelm saw a cock Ptarmigan on Forlandet on 24 June, 1910; its head and neck were brown, and the rest of the plumage white. He also describes a number of birds shot during September in the vicinity of Bellsund, whose plumage was intermediate between summer and winter (313 : 8). Horn found a covey of 6 young birds on Miseryfjellet on 27 September, 1924. They were white with a few grey feathers (1924, 632 b). The females Jung obtained in Wijdefjorden at the end of July, 1936, were in summer-plumage with a few small white feathers on the breast. At the end of August they were in an advanced state of moult, but the winter-plumage was not completed until the end of September (539 : 136).

Georg Bjørnnes writes in Wijdefjorden on 25 September, 1927: "The majority of the cocks have now moulted and are white, while the hens and the young still have some feathers from the summer-plumage. In the spring the hens moult in May, but the cocks not until in June. In the pairing season the cocks grow a little red patch over the eye. The Spitsbergen birds are of the same size as the 'forest grouse' in Norway [i. e. *L. lagopus*], but the Spitsbergen birds are distinguished by their thicker winter-plumage" (1927/28, 636).

There are only a few notes to be found on the condition of the birds in the different seasons of the year, but it seems that they are very fat in the autumn. As this time there is a layer of fat between the skin and the body, and the intestines are embedded in fat. This metabolic reserve seldom seems to last them longer than till January when they begin to get noticeably thin.

Kjellman relates that Ptarmigan shot in Mosselbukta on 7 February, 1873, were very thin, but those which had been kept since the autumn were fat (135 : 228).

Pike shot 16 birds in Wijdefjorden on 14 September, 1888, many of them young birds of the year. Their total weight was 24.5 lbs, and their average

weight, therefore, was 695 gr. per bird (Chapman 195 : 344). Munsterhjelm states that 5 specimens shot between 18 and 20 September were very fat (313 : 8).

Kristoffersen shot some Ptarmigan in Hornsund in December, 1923. These were very thin, but the ground had been covered with ice since the autumn (432 : 193).

Georg Bjørnnes shot three birds on 5 September, 1927, and these were very fat. He says: "They are fat in the autumn, but in January they often become thin" (1927/28, 636).

Arthur Oxaas shot one bird on Indre Norskøya on 25 October, 1924, and this bird was very fat. Another bird which he shot on 6 April, 1926, was thin (1924/25 and 1925/26, 643).

The average weight of the Spitsbergen Ptarmigan is between 600 and 700 grammes.

F o o d. — Not much is known about the food of the Spitsbergen Ptarmigan. Some authors have made a few general remarks on the remains of plants found in the crops of the birds killed during the summer, but there are very few records for the period when the ground is covered with snow.

Ekstam has published an analysis of the crop contents of 6 birds obtained in the middle of August, 1896 (221 : 52), and Høeg examined 18 Ptarmigan, of which two had empty crops, shot in Isfjorden at the end of September, 1928. This was a very thorough investigation in which the different species of plants were sorted out, dried and weighed (456 : 165).

The results obtained are therefore very valuable and they can be compared with similar investigations made in other areas.

Table 16 below brings together as many as possible of the records on the food of the Spitsbergen Ptarmigan. The numbers refer to the weights in mg found by Professor Høeg in 1928.

In twelve of his birds, Professor Høeg found stones in the stomach and the following numbers are taken from his paper:

No.	1	2	3	4	5	6	7	8	9	10	11	12
Weights in gr	8.60	6.94	7.40	5.68	6.95	8.40	5.74	5.64	6.88	7.23	8.02	7.36

The stones consisted mainly of white quartz, and another characteristic component was a dark flint.

The material analysed by Ekstam was not dried and weighed, but in some instances he gives the numbers of bulbils etc. found in the crops (Numbers correspond to Table 16).

No. 7. *Papaver radicatum,* large numbers of capsules and seed.

No. 8. *Cerastium alpinum,* leaves, buds and flowers. 294 capsules and many seeds. *Polygonum viviparum* 4,254 bulbils.

No. 9. *Cerastium alpinum,* 173 seed capsules.*Polygonum viviparum* 3,181 bulbils.

No. 10. *Polygonum viviparum,* 42 bulbils.

No. 11. *Polygonum viviparum,* 2,429 bulbils.

No. 12. *Cerastium alpinum,* 244 seed capsules, *Polygonum viviparum* 939 bulbils.

Jung found some individuals in which the gastric juice was coloured red by the seed of *Saxifraga nivalis*. Løvenskiold in 1954 found several puff-balls partly eaten by Ptarmigan. Some of these puff-balls were collected and it was seen that the bill of one of the Ptarmigan which had been collected corresponded exactly to the notch in the puff-ball (1954, 633).

The majority of the birds mentioned in table 16 were shot in the summer, or at least mostly during periods when no snow covered the ground. The food in their stomach consisted of 32 species of plants, together with moss, and one species of mushroom. Among the plants *Polygonum viviparum* was absolutely preponderant. Sixteen of the birds examined by Høeg contained in all 131.514 mg of dried food, of which the *Polygonum* amounted to 82.85 %, the remaining 17.15 % being made up of all the other plants. Of the birds examined by Ekstam, five had eaten a total of 10,845 bulbils of *Polygonum,* i. e. an average of 2,169 per bird.

Gelting mentions 10 birds from Eskimones on East Greenland, shot on 24 August, 1933. The stomachs of these 10 birds contained 20,400 mg *Polygonum* bulbils (dried material), giving an average of 2,040 mg per bird, compared with the average of 6,810 mg per bird given by the 16 birds in Høeg's investigation (519 : 99).

Gelting therefore states that during the summer, the food of the East Greenland Ptarmigan is *Polygonum viviparum,* and he estimates the proportion of this plant in their food to be 87.4 %. From Høeg's investigation he has found that there is 83.7 % of this plant in the summer food of the Spitsbergen birds, but he reckoned with 18 birds instead of the 16 Høeg actually had. It seems to be quite obvious, however, that both in NE Greenland and in Spitsbergen the summer food of the Ptarmigan must be mainly *Polygonum viviparum.*

According to Gelting the winter food of the bird in East Greenland is, *Salix arctica, Dryas octopetala* and *Saxifraga oppositifolia.*

There are no records of the food of the Spitsbergen Ptarmigan during the winter. But it is reasonable to believe that it is the same as in Greenland, and it is to be hoped that future investigations will show this to be correct.

Curiously enough the various records of the food of the Ptarmigan in Spitsbergen do not mention insects as being a part of their diet, although in Norway insects are a major ingredient in the diet of the young of the Willow Grouse (*L. lagopus*) in the first days of their lives. Probably the young of the Spitsbergen Ptarmigan also need some insect food as long as they are small. Summerhayes and Elton, who visited Bjørnøya in 1921, say that the Ptarmigan there lived on all kinds of plants and to a certain extent on insects (397 : 227).

As mentioned before, food is not always easily obtainable during the winter. When, as sometimes happens, an ice-sheet covers the ground the birds must leave the area or starve, but usually there is food in abundance. On the lowlands the wind normally sweeps away the snow over great areas, and then when the covering of snow is only slight the birds have no difficulty in getting down to the ground.

Sundevall says: "One must suppose that they pass a greater part of the dark period beneath the snow. Here they also find their food, which consists of *Saxifraga, Cerastium, Salix, Dryas* etc., all of which are found under the snow cover." (133 : 18)

	The roman numerals are the numbers of Professor Høeg's Ptarmigan,		*Bovista* (Puff-balls)	*Bryophyta* (Moss)	*Equisetum variegatum*	*Poa* sp. seeds, viviparous flowers (Grass)	*Festuca brevifolia*, flowers	*Carex misandra*	*Luzula* (capsules)	*Salix polaris*, buds, stalks and leaves	*Betula nana*	*Oxyria digynia*, fruits and stalks	–»– –»– leaves	*Polygonum viviparum*, bulbils and stalks
1	1 cock, Bellsund 29 July, 1838									x				
2	1 specimen, Isfjorden, 1861										x			
3	1 cock, Isfjorden 7 July, 1864													
4	Several specimens Wijdefjorden, July 1873					x				x				x
5	–»– –»– Spitsbergen, 1870									x				x
6	–»– –»– –»– 1873									x				
7	1 specimen Spitsbergen about 15 August 1897													
8	1 –»– –»– » » » »					x								x
9	1 –»– –»– » » » »											x		x
10	1 –»– –»– » » » »			x						x				x
11	1 –»– –»– » » » »									x				x
12	1 –»– –»– » » » »										x			x
13	1 –»– Isfjorden 23 June, 1896					x								
14	Several specimens Spitsbergen 1899													
15	–»– –»– –»– 1907–1908									x		x		x
16	5 specimens Bellsund 18–20 September 1910													
17	4 specimens Isfjorden 1910												x	
18	1 juv. Krossfjorden, 30 July, 1912							x		x				
19	1 ad. Isfjorden, 30 April, 1912									x				
20	2 specimens Isfjorden, 28 August, 1923													
21	1 specimen Wijdefjorden 21 August 1924					x						x		
22	16 specimens Isfjorden about 25 September 1928	I							0.5	50		75		8864
23		II			11				0.9	69		476		9928
24		III							29	12		41		10137
25		IV										179		13140
26		V			5				45	545		239	x	324
27		VI				94			66	935		178		6330
28		VII								15		19		7351
29		VIII							1.5	7		82		5438
30		IX								87		114	87	9595
31		X			13				164	277		1142		11436
32		XI			10					88		102		2479
32		XII			4					350		221		3621
34		XIII					1.5			368		76		6607
35		XIV		1						371		1.3		4169
36		XV		x	1.2					416				4289
37		XVI		1.4	1					729		2343	43	5249
38	Several specimens Wijdefjorden, August 1936 ..									x		x		x
39	–»– –»– –»– » 1954 ..		x											

Table 16. *Food of the Spitsbergen Ptarmigan*

	Carex misandra	*Luzula* (capsules)	*Salix polaris*, buds, stalks and leaves	*Betula nana*	*Oxyria digynia*, fruits and stalks	—»— —»— leaves	*Polygonum viviparum*, bulbils and stalks	*Stellaria* sp.	—»— *longipes*	*Cerastium* sp. capsules and seeds	—»— » leaves	—»— *alpinum*	*Ranunculus sulfureus*, fruits	—»— *pygmaeus*, »	—»— *glacialis*, leaves	*Papaver radicatum*, capsules and seeds	—»— —»— leaves	*Cardamine bellidifolia*	*Draba* sp. siliqua with seeds and stalks	» » leaves	» *alpina*	» *glacialis*, prob. mis-spelt for *nivalis*	*Cochlearia officinalis*	*Crucifera*, seeds	*Saxifraga* sp. leaves	—»— » buds and stalks	—»— *foliolosa* (*S. comosa*)	—»— *nivalis*
			x																						x			
				x																						x		
			x				x	x											x									
							x												x							x	x	
			x								x														x			
												x				x					x							
							x		x			x							x				x					
					x		x		x			x				x		x										x
			x				x					x						x										
			x				x					x																
				x			x					x						x										
																x								x				
			x		x		x						x															
																x							x					
						x																						
	x		x					x		x						x						x						
			x					x				x																
																x												
					x					x						x			x									
		0.5	50		75		8864			46				5					65							43	105	
		0.9	69		476		9928			276				14					949								55	
		29	12		41		10137			113									65						x	14	171	
					179		13140			15				29					249							81	15	
		45	545		239	x	324			108				1.5					32						x	32		
		66	935		178		6330			741	76								171							34		
			15		19		7351			258			9						99							200		
		1.5	7		82		5438			40									16							8		
			87		114	87	9595			135									22							40	2	
		164	277		1142		11436			98									70							92		
			88		102		2479							1439		63	x		45								0.5	
			350		221		3621			23				264					184							13		
5			368		76		6607			437			226			227	70		105	2.5							2.2	
			371		1.3		4169			36	109			8					146							41		
			416				4289			60	26		98			1055			3							14		
			729		2343	43	5249		3	69	17			312		73			68						26	121	7	
			x		x		x					x			x	x			x				x					x

» » leaves	» *alpina*	» *glacialis*, prob. mis-spelt for *nivalis*	*Cochlearia officinalis*	*Crucifera*, seeds	*Saxifraga* sp. leaves	–»– » buds and stalks	–»– *foliolosa (S. conosa)*	–»– *nivalis*	–»– *hieracifolia*	–»– *oppositifolia*	–»– *cernua*, bulbils	–»– *caespitosa*, prob. mistaken for *cernua*	–»– *groenlandica*	*Potentilla* sp. nuts.	–»– *pulchella*, leaves	–»– *emarginata*, fructiferous flowers	*Dryas octopetala*, buds, fructiferous flowers	» –»– leaves	*Pedicularis* sp. capsules	–»– *hirsuta*	*Taraxacum arcticum* fruits	Various stalks and leaves	Stones, pieces of quartz	
					x												x							Sundevall (52: 125)
						x																		Quennerstedt (81: 20)
																	x							Malmgren (92: 382)
							x										x							Eaton (130: 3808)
							x										x							Heuglin (132: 104)
	x				x													x						Sundevall (133: 18)
			x								x													Ekstam (221: 52)
			x								x													–»– »
								x		x	x													–»– »
											x													–»– »
																								–»– »
																				x				–»– »
				x								x													Trevor–Battye (203: 587)
											x													Birula (298: 198)
			x								x									x			x	Le Roi (317: 161)
			x								x													Munsterhjelm (313: 11)
		x									x								x					Mathey–Dupraz (311: 45)
									x		x													–»– –»– (333: 96)
										x														–»– –»– »
																							x	Longstaff (407: 494)
						43	105				26							x						Montague (433: 151)
							55				73		x		x				x			51		Høeg (456: 165)
					x	14	171				18											66		–»– »
						81	15				19											9		–»– »
					x	32					31		70		24			6				57		–»– »
						34					38		207					33				336		–»– »
						200				6	20													–»– »
						8				x	14											10		–»– »
						40	2				19											15		–»– »
						92					78											98		–»– »
							0.5				113											47		–»– »
						13					49							128				53		–»– »
2.5							2.2				10						46	82		6		15		–»– »
						41					97					15		3.8	3.3		4.5	46		–»– »
						14				2.2	51											46		–»– »
					26	121	7				365											12		–»– »
			x					x				x						x						Jung (539: 136)
																								Løvenskiold (1954, 633)

Nordenskiöld relates that seven Ptarmigan shot in Mosselbukta on 6 February, 1873, had their crops filled with buds of *Cerastium uliginosum* (probably misprint for *C. alpinum*). Such food could only have been found under the, at that time, deep cover of snow (138 : 60). We know, however, that Ptarmigan dig deep burrows in the snow both in Greenland and in Spitsbergen.

Such food, *Polygonum viviparum* during the summer and *Salix, Dryas* and *Saxifraga* during the winter, seems to be characteristic of high-arctic areas such as NE Greenland and Spitsbergen; and there is an investigation from the Taimyr Peninsula which points in the same direction. From this area, "the Mortuary on Chelyuskin Peninsula", Lid obtained the crop contents of a species of *Lagopus* for investigation. On 17 April 1919 three birds were shot and the crop contents were preserved in spirit. The foreland where the birds were shot was partially swept bare by the wind. Lid dried the material, which amounted to 7,101 mg. Of this 795 mg or 11.2 % consisted of *Dryas,* 5,820 mg or 82 % of *Salix,* and 425 mg or 6 % of *Saxifraga, S. oppositifolia* being the biggest component with 290 mg. The rest, apart from 3 mg of mosses and lichens, in all about 0.8 %, consisted of *Cerastium, Papaver, Steversia* and *Stellaria.* But of course with so small an amount of material it is impossible to draw any definite conclusions (492 : 2–7). The bird in question must have been a Ptarmigan and not a Willow Grouse, probably *Lagopus mutus kelloggae* Grinell. This race has also been described by Sserebrowsky, who named it *L. m. pleskei* (Hartert 260, Erg. bd : 515).

In other countries outside the high-arctic regions, the food of the species seems to be different.

In Iceland Mohr relates that the food of the Ptarmigan (*L. m. islandorum*) is *Dryas, Empetrum nigrum* and *Betula nana, Dryas octopetala* being the favourite winter food (25 : 50). Holmboe obtained 10 Ptarmigan from Iceland, shot in Akureyri on 14 April, 1923. They had mainly lived on *Empetrum,* in a lesser degree also on 10 further species of plants (406 : 28).

In Norway Barth names the following plants as the food of the Ptarmigan: *Polygonum viviparum, Betula odorata, Salix glauca, Salix herbacea* and *Empetrum nigrum* (170 a : 309). Holmboe investigated two birds shot in February, 1922, and found *Vaccinium myrtilus, V. vitis idaea* and *Empetrum nigrum* (406 : 28).

Lid has material from 21 Ptarmigan shot in Jotunheimen during the months of January, February, March, June, July, and August in 1924. The plants taken during the winter were mainly *Betula odorata, B. nana, Salix glauca, S. hastata. Vaccinium vitis idaea* and *Empetrum nigrum* were also present. In the birds shot during the summer a number of quite different plants were found. The more dominant are: *Ranunculus glacialis, Anemone vernalis, Saxifraga oppositifolia, Cerastium alpinum, Oxyria digynia, Betula nana, Salix lapponum, S. herbacea, Loiseluria procumbens, Arctostaphylos uva ursi* and *Taraxacum croceum* (436 : 159).

In his paper Gelting also gives an interesting comparison of the food of the Ptarmigan at different times of the year, especially for NE Greenland and Norway.

No. 32. *RALLUS AQUATICUS AQUATICUS* L.

The Water-Rail

According to Johnsen a dead Water-Rail was found on the ground at the base of the mountain Kistefjellet, not far from the southernmost point of the mainland of Spitsbergen, on 21 August, 1920 (380 : 286).

The botanist Johannes Lid who found the bird, presented it to the Zoological Museum in Bergen.

There is no other record of this bird from the Svalbard area.

No. 33. *HAEMATOPUS O. OSTRALEGUS* L.

The Oyster-catcher

According to Mathey-Dupraz one Oyster-catcher was killed in Adventfjorden in July 1906, and another was observed near Bjørnøya on 28 July, 1910. Regarding the second record Mathey-Dupraz says: "On 28 July, 1910, an Oyster-catcher followed our ship for a long time on the sea near Bear Island. Without doubt it had been led astray on account of the fog." (311 : 46)

In 1948 an Oyster-catcher was seen by Duffey and Sergeant near Herwighamna on Bjørnøya on 18 and 29 July, and also on 5 August. The men at the Meteorological Station told them that the bird had been there since May, and that during May they had seen a flock of 10 birds (586 : 559).

The men at the Meteorological Station on Bjørnøya told Løvenskiold that an Oyster-catcher had been seen in Herwighamna a few days previous to his arrival on 23 June, 1958 (1958, 633).

No. 34. *VANELLUS VANELLUS* (L.)

The Lapwing

According to Johnsen, Mr. Ullring, radio-operator on the meteorological station on Bjørnøya, saw a Lapwing there in 1928, and this is the first record for the Svalbard area (505 : 47).

Since stragglers of this species have visited Greenland, Jan Mayen and Iceland, it is by no means improbable that the bird reached Bjørnøya.

No. 35. *PLUVIALIS APRICARIA ALTIFRONS* (BREHM)

The Northern Golden Plover

The Golden Plover has been found repeatedly on Bjørnøya and is said to have bred there; this may well be true, but so far there is no certain record of breeding.

The first printed record of the bird's occurrence in Spitsbergen was based

on an observation made in 1950 and published in 1954. But the bird was seen there as early as 1921, and since that time it has been found twice.

Jourdain saw a pair of Golden Plovers near Kvalrossbukta on Bjørnøya on 13 June, 1921, and the male bird was shot. On 23 June he met with a pair high up in the mist-covered hills near Kapp Bull, the south point of Bjørnøya. The male was very nervous and was probably breeding not far away (381 : 170).

Summerhayes and Elton say that the Golden Plover is a rare breeding bird on Bjørnøya, but I have not found a single certain record of real nesting there in the literature available to me (397 : 222).

From Spitsbergen there are three definite records. Dr. Orvin (former director of Norsk Polarinstitutt) saw a Golden Plover in Colesdalen (valley in Isfjorden) in 1921, and another on 30 July, 1936, in Dunderbukta south of Bellsund (1921, 1936, 632 a).

Løvenskiold saw a pair at Breinesflyane, north of the glacier Bungebreen on Sørkapplandet on 23 July, 1950. The birds were seen there for a long time (615 : 72).

No. 36. *CHARADRIUS MORINELLUS* L.

The Dotterel

About 11 September, 1827 Professor Keilhau found a dead Dotterel on the roof of one of the houses in a Russian establishment on Edgeøya (48 : 163).

From Keilhau's paper (p. 96) it is quite clear that he knew the difference between the Golden Plover and the Dotterel and that he really knew the bird. But quite a number of scientists, and among them Malmgren and Koenig, have denied that it was a Dotterel that he found. They say that it must have been a Ringed Plover.

However, one of Keilhau's contemporaries, the famous Swedish zoologist Professor Sven Nilsson, has decided the matter in favour of Keilhau. In his "Skandinavisk Fauna. Fåglarna" he states that the Norwegian scientist brought a Dotterel back with him from Spitsbergen (50, Vol. 2 : 126).

I therefore have no hesitation in restoring this species to the avifauna of the area.

No. 37. *CHARADRIUS HIATICULA* Subsp ?[1]

The Ringed Plover

Geographical distribution

The nominate form *Charadrius h. hiaticula* L. breeds in Baffin Island, Greenland, Iceland, Færoe Islands, the British Isles, Denmark, S Norway, central Sweden, Åland Island, W Finland and the Baltic States. South of Denmark it is found only in small numbers.

The form *Charadrius h. tundrae* (P. R. Lowe) breeds, according to Witherby, in Spitsbergen, Bjørnøya (?), Kolguev, Waigatz, Novaya Zemlya and in the

[1] Contour map showing distribution, see backflap.

tundras of northern Scandinavia, Finland, and N Russia. In Asia it breeds in N Siberia as far as the Tchutchki Peninsula (583, Vol. IV : 353).

However, the Ringed Plovers found in the Svalbard area seem to be far too light on their upper parts to belong to the form *tundrae*.

In 1930 Dalgety obtained a breeding pair on Reinsdyrflya on 9 July. These he proclaimed to belong to the typical race (470 : 248).

Pennie and Andrew, who saw several of these birds in the vicinity of the valley Sassendalen during the summer of 1955, say that one of them was very pale-coloured (623 : 55).

The birds collected by Løvenskiold in Spitsbergen (now in the Zoological Museum in Oslo) also seem to be too light-coloured for *tundrae*.

Recently Bateson and Barth have discussed the geographic variation of the Ringed Plover and their conclusion concerning the Spitsbergen birds is as follows: "Although there are only nine skins from Spitsbergen in the Norwegian collections, the mean for the wing length of these indicates that the birds of Spitsbergen are more closely related to those of Greenland than to those of North Scandinavia. This would also seem to be borne out by the light backs of the Spitsbergen specimens that we have examined. However, it is possible that a certain amount of geneflow from North Scandinavia takes place, which might explain the tundrae records." (625 a : 24)

In the literature, as far as can be seen, there is nothing to suggest that the population of the Ringed Plover in the Svalbard area belongs to the form *tundrae:* there is not a single instance of a Svalbard specimen having been described as belonging to this race.

Presumably the reason that the birds in Spitsbergen have been placed under the Arctic Ringed Plover in the Handbook of British Birds, is that they are found even further north than Northern Norway, where the Arctic Ringed Plover breeds.

If the Spitsbergen birds resemble those from Greenland, it must be supposed that they have come to the Svalbard area from the west and not from the south. From NE Greenland where the bird is common, the distance to Spitsbergen is even less than the distance from N Norway to Sørkapp, the southernmost point of Vestspitsbergen.

From Spitsbergen, however, there is too little material to allow anything definite to be said about the race question. This must wait until a large series of skins can be compared with material from Greenland and Norway.

Occurrence in Svalbard

The birds have been found in Vestspitsbergen, Prins Karls Forland, Nordaustlandet and on Kong Karls Land. It has bred in Isfjorden, Kongsfjorden, NW Spitsbergen and probably also on islands north of Nordaustlandet.

First records

The first author to mention the Ringed Plover from Spitsbergen is Anthon Rolandson Martin, who visited Forlandsøyane on 1 July, 1758. Here he saw

Ringed Plovers running and flying along the beach. He says "våra strandpipare", which is Swedish for "our Ringed Plovers". Had he meant the Purple Sandpiper, he would have said "skärsnäppa". Martin was a pupil of Linnaeus and seems to have known the birds well (17 : 131). The same Swedish name for the Ringed Plover is also used by Linnaeus himself when he writes: "CHARADRIUS Hiaticula . . . Suecis Strandpipare." (19 : 67)

The first absolutely certain record of the bird is given by Parry. He relates that a specimen was shot in Hecla Cove (Heclahamna in Sorgfjorden) by M'Cormick in 1827. From what he writes it also seems possible that Captain Sabine obtained a further specimen in Spitsbergen (46 : 193).

On several occasions the species had been found under conditions which strongly suggested that the birds were breeding, but so far neither eggs nor chicks had been actually found. In 1921, however, Jourdain and van Oordt relate that Mr. P. S. Gordon found 3 or 4 pairs with young in Adventfjorden on 21 July (381 : 169) and (370 : 151). Since that time, eggs, chicks in down and fully fledged young birds have been found repeatedly in Spitsbergen.

Distribution. Sections I–XIII

Section I. Bjørnøya. — The Ringed Plover was found on the island in 1907, 1908, and in 1932.

Section II. Hornsund. — The species has been seen a few times on Sørkappøya, Dunøyane and on Isøyane.

Section III. Bellsund. — In this section the bird has been found once in Van Keulenfjorden and once in Van Mijenfjorden.

Section IV. Isfjorden. — The species has been found in Colesbukta, on both sides of Adventfjorden, in Adventdalen, De Geerdalen, Sassendalen, Gipshuken, Gipsdalen, on the east side of Billefjorden and in Ebbadalen. The bird has bred in Adventdalen, in De Geerdalen (in 1957), in Sassendalen and probably also in Ebbadalen at the head of Billefjorden.

Section V. Prins Karls Forland. — From this island there is only one record.

Section VI. Kongsfjorden. — Ringed Plovers breed near the mining town of Ny-Ålesund where the species is rather common. They have also been observed on Brandalpynten to the west of the colliery, and they have twice been seen on Lovénøyane.

Section VII. NW Spitsbergen. — The species has been observed in Smeerenburgfjorden and has been found breeding on Reinsdyrflya.

Section VIII. Wijdefjorden. — From this fjord there are only three records.

Section IX. Hinlopen. — In this district the species has been found once in Sorgfjorden and once in Lomfjorden.

Section X. Nordaustlandet. — The Ringed Plover has been found breeding on one of Sjuøyane (Martensøya).

Section XIII. Kong Karls Land. — The bird has been observed on Svenskøya and on Kongsøya.

Biologicat

M i g r a t i o n. — There are only a few dates for the spring migration of the Ringed Plover in Spitsbergen.

The earliest date is 6 June, 1937, when Peder Åm saw the bird arriving with a flock of Purple Sandpipers at Ny-Ålesund in Kongsfjorden (1936/37, 646). But there is a record of a nest with 3 frozen eggs found by Dalgety and coll. on 6 June, 1930 (470 : 248), and this suggests that the bird can arrive much earlier.

All other dates for the spring migration are from about the middle of June. Kristoffersen saw two specimens on Sørkapp in the middle of June 1930 (472 : 254). Kolthoff reports one bird seen in Isfjorden on 12 June, 1909 (261 : 43), and le Roi states that a bird was shot in Adventfjorden on 15 June, 1908 (316 : 162).

The southward migration may possibly start towards the end of July or in early August. Løvenskiold saw two flocks of respectively 12 and 15 birds on Sørkappøya on 25 July, 1950 (615 : 71). These may have been non-breeding birds starting their migration at an early date.

Pike saw several Ringed Plovers in Smeerenburgfjorden on 25 August, 1888 (Chapman 195 : 343). Løvenskiold relates that a young bird of the year was shot on Forlandsletta on 26 August, 1948. This agrees well with Strijbos's record of two young birds which were known to have hatched on 3 August, 1956 (626 : 213). With a fledging period of 25 days, these chicks should have been able to start on the autumn migration about 30 August.

G e n e r a l H a b i t s. — The Ringed Plovers in Spitsbergen seem to prefer the same sort of ground at those in Norway, and during the breeding season they keep to places with sand and small stones and with no or little vegetation.

In Spitsbergen they are not particularly shy on the breeding ground, but straying individuals, especially single birds and birds on migration, are often very wild and difficult to approach.

B r e e d i n g. — The breeding of the Ringed Plover in Spitsbergen is first mentioned by Malmgren who says that an adult male was shot out of a brood of the year on Sjuøyane, the northernmost islands in the Svalbard area, in the middle of August, 1861 (85 : 100). Chydenius relates that one of his men found a Ringed Plover's nest on the island Martensøya (one of Sjuøyane) on 1 August, 1881 (89 : 238). This may have been the same brood as that referred to above.

More recently, Ringed Plovers shot during the breeding season have been found to have well-developed sexual glands, and some specimens also had brood-patches. There are also many records of birds whose behaviour suggested that they had young.

Two or three pairs were seen by Nathorst on the east side of Adventfjorden on 26 July, 1870, and these birds behaved as though they had young (155 : 36, 37).

According to Eaton, Lieutenant Chermside saw a Ringed Plover somewhere in Wijdefjorden in 1873, which performed an injury-feigning display and probably had young (130 : 3809).

Nathorst relates that de Geer saw four or five Ringed Plovers in Sassendalen on 15 July, 1882. Both sexes were present, and one bird shammed injury and probably had young.

Klinckowström found four or five pairs 15 km from the coast in Adventdalen on 6 July, 1890, and these birds also behaved as if they were breeding (176 : 92).

Kolthoff relates that an adult female with brood-patches was shot in Van Mijenfjorden on 4 July, 1898 (261 : 43).

According to le Roi a pair and a single female were shot on Bjørnøya on 18 June, 1907. Ovaries and testes were fully developed. On 3 July, 1908, a female with brood-patches was shot on the island (316 : 162).

A nest with three frozen eggs was found by Dalgety, McNeile and Ingram, somewhere in Isfjorden on 6 June, 1930. One pair with a nest which contained three eggs, was found by Dalgety on 9 July, 1930, on Reinsdyrflya in Liefdefjorden. The eggs had been incubated for about a week (470 : 248).

Løvenskiold records that a young bird of the year, fully fledged, was shot on Forlandsletta on 26 August, 1948.

Close to the quay in Ny-Ålesund in Kongsfjorden there is a big pond where some Ringed Plovers are usually found. On 4 August, 1949, a pair which was seen here were behaving as if they had young.

A family of one adult and three young, almost fully fledged, were seen daily at the house of Mr. Nøis in Sassendalen, from 15 to 25 August, 1950 (615 : 71). At the above-mentioned pond in Ny-Ålesund three birds were seen on 7 July, 1956 (1956, 633).

Strijbos saw a pair of Ringed Plovers near the shore in Ny-Ålesund during the summer of 1939, and he thought that they had a nest there. In 1956 he found three pairs in the same place and on 9 July he discovered a nest with two eggs. These hatched on 3 August, and on the same day he found the newly hatched young of the other two pairs. On 7 July he had seen a pair with three newly hatched young to the west of Ny-Ålesund (626 : 213).

From the scanty records it can be seen that eggs are laid in the period between 6 June and 10 July, and the young are correspondingly hatched between 30 June and 3 August. With a fledging period of 25 days, these young birds should be perfectly able to go south by the end of August.

No. 38. *ARENARIA INTERPRES INTERPRES* (L.)[1]

The Turnstone

Geographical distribution

The typical race breeds in Greenland, on both the east and west coasts, and also in Iceland, Spitsbergen, and continental Europe from the Danish and Baltic islands in the south to Norway, Sweden, Finland and N Russia with Kolguev and Novaya Zemlya in the North. The race *A. i. morinella* (L.) is found in

[1] Contour map showing distribution, see backflap.

arctic America from W Alaska eastwards to Southampton isl. and W. Baffin Land.

Occurrence in Svalbard

With the exception of Bjørnøya, almost all of the Turnstones recorded have been found on Vestspitsbergen and there are only three records from other islands, viz. Nordaustlandet, Edgeøya, and Hopen. Three breeding places are known, namely Adventfjorden, Kongsfjorden and Liefdefjorden.

First records

The first reference to the Turnstone in Spitsbergen is made by Walker, who gives a list of fifteen species of birds found in the area. His list contains so many errors, however, that it is virtually useless (75 : 63).

The first reasonably reliable record of the species in Spitsbergen is given by Professor Edward Newton. A bird which he thought was a Turnstone flew past his boat in Adventfjorden on 12 July, 1864 (96 : 207, 505).

On this trip he met Dr. Malmgren, and understood from him that he also had seen a Turnstone in Isfjorden in 1864. This is denied by Malmgren, however, who says that Newton's statement was based on a linguistic misunderstanding, and since Newton did not shoot the bird, and so had no proof of its identity, Malmgren excludes it from the Spitsbergen fauna (92 : 387).

In a reply to Malmgren's paper, Newton states that he did actually see the bird, and since the Turnstone has been found breeding in the same district subsequently, it seems likely that the observation was correct. The appearance of a Turnstone in flight is so characteristic that it seems impossible that Newton could have mistaken it for another bird (101 : 208).

Only four years later, in fact, Malmgren himself found a pair of Turnstones on Amsterdamøya in the summer of 1868, and one of these was shot (111 : 230).

The first record of Turnstones breeding in the area is from 1921, when not less than nineteen pairs were found in Liefdefjorden.

Distribution. Sections I–XIV

Section I. Bjørnøya. — Single birds and small flocks have been seen on several occasions.

Section II. Hornsund. — A flock has been observed once on Sørkappøya and two birds have been observed at Nebbodden north of Hornsund.

Section III. Bellsund. — 4 and 5 birds were seen on two consecutive days at Kapp Martin in 1949.

Section IV. Isfjorden. — The species has been found in the following places: Grønfjorden, Colesbukta Adventfjorden, Brucebyen in Billefjorden, Sassenfjorden, Gipshuken, Dickson Land with Kapp Wijk and Bohemanneset. In 1910 the bird was supposed to be breeding in Adventdalen and subsequently it has been found there on several occasions both with eggs and young. In 1957 the Turnstone was found breeding in Sassendalen. The species was first found breeding in this section in 1930.

Section V. Prins Karls Forland. — From this island there is one record.

Section VI. Kongsfjorden. — The species was found breeding here in 1956.

Section VII. NW Spitsbergen. — The first bird obtained in Spitsbergen was shot on Amsterdamøya in 1868, and Turnstones were found later on Albertøya and on Smeerenburgodden. In 1921 great numbers of breeding pairs were found in Liefdefjorden. This was the first record of breeding.

Section VIII. Wijdefjorden. — One specimen was seen in 1936 and three in July, 1954.

Section X. Nordaustlandet. — One specimen was sighted in Wahlenbergfjorden in 1936.

Section XI. Storfjorden. — One specimen was seen on Zieglerøya in Tjuvfjorden in August, 1954.

Section XIV. Hopen. — The species visited the island in 1954, 1955 and in 1956.

Biological

Migration. — There is no information available concerning the date of the spring migration. That the birds can be on passage northwards late in the year is shown by the observations of Bertram and Lack from Bjørnøya in 1932. They saw two birds on 22 June, two on the 4th, one on the 9th, and two on 31 July (488 : 295).

The autumn migration can start early. Between 4 and 14 August, 1948, while they were on Bjørnøya, Duffey and Sergeant saw 61 birds on passage southwards. None of these birds were in breeding plumage (586 : 599).

Lønø says that he saw a Turnstone on Edgeøya on 11 August, 1954. His photograph shows that the bird was in non-breeding plumage (1955, 649). Løvenskiold saw nine birds on 15 and 16 August at Kapp Martin in 1949. Two birds were seen on Nebbodden, north of Hornsund, on 19 August, 1952, and in 1950 twenty-seven Turnstones were observed on 25 and 26 August on Sørkappøya (the southernmost point of Spitsbergen). All these birds were adults (615 : 60).

Nathorst shot an adult male bird on Albertøya in Smeerenburgfjorden on 28 August, 1898 (243 : 323) and the latest observation for any year was a bird which, according to Løvenskiold, came on board the M/S *Minna* south of Bjørnøya on 2 September 1950.

The autumn migration probably does not start until the beginning of August and then lasts at least until early September.

General habits. — In Spitsbergen the Turnstone is almost always found near the shores of the fjords. The nest is placed somewhere near the shore, but sometimes it may be as much as several hundred metres from the sea.

When not visiting the tidal flats and the shore in search of food, the bird is

found mostly on stony ground where the vegetation in sparse, but it seldom goes far from the sea. It also seems to prefer stony ground thickly covered with lichens and sometimes also phanerogams, (mainly *Dryas*) for breeding.

The nest is generally built in a place where the bird has a wide outlook and where it can leave the nest unseen if an enemy appears at a distance.

When the bird is nesting near the shore of a large coastal strip, it seems that, as soon as the young are hatched, the parents take them inland, where they probably live on insects.

B r e e d i n g. — As a breeding ground the bird seems to prefer places in which *Dryas* grows. Summerhayes and Elton write: "The only other constant inhabitant of the Dryas areas is the Turnstone, which shows a marked though not exclusive preference for nesting in these places." (450 : 219) This could also be seen in the nesting place at Hotellneset where Løvenskiold found Turnstones breeding in 1950. Here the *Dryas* was flowering all around the nest site.

The breeding ground in Adventdalen, found by Congreve in 1922, was situated on an island formed by glacial streams, but he says nothing about the vegetation, if any.

Paget Wilkes who saw 19 nests with eggs and young in down on Reinsdyrflya in 1921, says that most of the nests were placed in much the same sort of bare, stony, wind-swept positions. The ground there was obviously similar to that referred to by Summerhayes and Elton (see above).

The birds will sometimes build their nests in or close to an Arctic Tern colony. The first nest Paget Wilkes found in 1921 was situated on an island occupied by terns (390 : 173), and the nest on Hotellneset was also placed in a tern colony. This has also been observed in other places. Durango has shown that Turnstones in Sweden may prefer tern colonies as a breeding place, because there they are protected against many of their enemies (546 : 23).

The nests found by Jourdain and Paget Wilkes were all placed fairly near the shore, a fact confirmed by Dalgety who found the species breeding in the same place in 1931 (476 : 88, 90). Montague, who visited the area in 1924, found young birds on 13 July about half a mile from the shore. As Dalgety remarks, this was probably due to the fact that Montague arrived after hatching time, for as soon as the young are able to run, they are taken inland by the parents.

At "London" in Kongsfjorden a pair of Turnstones, seen on 29 June, 1956, by Løvenskiold, behaved as if they had eggs, and when the nest was found on 19 July it contained 4 newly hatched young. On 15 July a nest with 4 eggs, incubated for 16–17 days was found on Kapp Guissez by Professor de Naurois, who had also seen Turnstones in Ny-Ålesund. Both of these clutches were probably completed on 29 June (1956, 633).

Between 15 and 27 July, 1957, Blurton Jones repeatedly saw an adult bird with one chick in Sassendalen (1959, 652).

In several breeding places, eggs on the point of hatching or newly-hatched young have been found around 1 July. If we suppose the incubation period to be 21 days, the egg-laying should probably take place between the second week of June and the first day of July.

F o o d. — Adult Turnstones will usually feed along the shore. When they take their offspring with them further inland, however, there must be some food for the chicks there, probably insects.

With two exceptions, the ornithological literature contains very little information about the food of the Turnstone in the Svalbard area.

In the summer of 1923, according to Summerhayes and Elton, the Turnstones were feeding on the common maritime and intertidal oligochete worm, *Lumbricillus aegialites,* in the icefoot on the mainland of Reinsdyrflya in Liefdefjorden. The worm is abundant both in the snow and in seaweeds (450 : 201).

Blurton Jones relates that an adult bird with a chick fed freely on pupae and maggots on carcasses in wire-netting cages near a trapper's hut in Sassendalen during July in 1957 (1959, 625).

P a r a s i t e s. — Baylis relates that several specimens of the nematode, *Echinorhynchus longicollis* and perhaps also another species, were taken from the intestine of a Turnstone preserved in spirit (374 : 426). The bird was obtained by the Oxford University Expedition to Spitsbergen in 1921.

No. 39. *GALLINAGO MEDIA* (Lath.)

The Great Snipe

Close to a trapper's hut on Prins Karls Forland (just opposite the northernmost of Forlandsøyane), Løvenskiold found numerous snipe feathers on 4 August, 1956.

The feathers were taken to the Zoological Museum in Oslo, and after comparison with skins of both *G. media* and *G. gallinago,* they were identified as belonging to *Gallinago media* and presented to the Museum.

This is the first record for the Svalbard area.

No. 40. *SCOLOPAX RUSTICOLA* L.

The Woodcock

Le Roi relates that the remains of Woodcock were found at a fox's earth in Sassendalen in 1907 and in 1908. In both instances a great number of feathers were found, mostly parts of both wings. There is an element of doubt about this record, because according to le Roi there was a slight possibility that the birds might have been brought to Spitsbergen by a tourist-steamer (316 : 164).

Some years later, however, according to Lönnberg another Woodcock was found dead at the (then) Swedish colliery Sveagruva in Van Mijenfjorden on 8 May, 1919. The bird was sent to Riksmuseet in Stockholm (409 : 705).

In June 1954, a Woodcock was found in Longyearbyen in Adventfjorden, and, according to Bengt Christiansen, was sent to Tromsø Museum (personal communication, 1956).

No. 41. *NUMENIUS PHAEOPUS PHAEOPUS* (L.)
The Whimbrel

More than a dozen specimens of the Whimbrel have been found in the Svalbard area between 1881 and 1958.

On Akseløya at the entrance to Van Mijenfjorden a dead Whimbrel was picked up by Cocks on 31 July, 1881 (149 : 379, 408).

Collett states that a specimen was shot in Spitsbergen in August 1891 and sent to Tromsø Museum (174 : 174).

According to Schalow a dead male bird, which had apparently starved to death, was found on Bjørnøya on 14 June, 1898 (232 : 376).

Kolthoff and Jägerskiöld record that a Whimbrel was seen flying past their ship towards the shore of Amsterdamøya on 4 July, 1900 (256 : 5). See also Kolthoff (261 : 49).

Orleans relates that a specimen was seen from the *Belgica* not far from Bjørnøya in 73° 25′ N, 18° E. on 6 June, 1905 (277 : 20, 333).

Mathey-Dupraz says that two males and one female were shot on Hotellneset in Adventfjorden at the end of June, 1906 (311 : 46). At Smeerenburgodden he saw a Whimbrel on 28 July, 1911, which behaved as if it had eggs or quite small young. A close research revealed nothing, however (333 : 98).

Van Oordt relates that on 26 June, 1921, a bird of this species was seen flying south from Bohemanneset in Isfjorden (370 : 156).

According to Dalgety and coll. one specimen was picked up dead in Isfjorden on 23 June, 1930 (470 : 252).

Johnsen states that over a period of a few weeks a Whimbrel was seen several times on Hotellneset in Adventfjorden, before it was shot in early July, 1927. Later the remains were given to Professor H. U. Sverdrup, who took them to Bergen's Museum where the species was identified (505 : 23).

Løvenskiold records that Professor Hans Johansen saw a Whimbrel at Kapp Martin in Bellsund on 15 August, 1949 (615 : 53).

In 1958 Løvenskiold was told that the men on the meteorological station on Bjørnøya had repeatedly seen a Whimbrel up to 23 June. On 18 July he saw the bird himself in Herwighamna on the north coast (1958 : 633).

From the above records it seems that the Whimbrel is an irregular visitor to the Svalbard area. There is a slight chance that it may have bred in the area, but considering the distance from its normal breeding places this seems unlikely.

No. 42. *TRINGA TOTANUS* Subsp?
The Redshank

A single Redshank was seen by Bertram and Lack on several occasions, near different lakes on Bjørnøya on 21 June and on 10 and 17 July, 1932 (488 : 295). This is the first record for the Svalbard area.

Another Redshank was seen on the island by Duffey and Sergeant on 19 August, 1948 (586 : 559).

Løvenskiold states that four Redshanks were seen near the football-ground in Longyearbyen in Adventfjorden on 14 August, 1950 (615 : 71).

ACTITIS HYPOLEUCOS (L.)

The Common Sandpiper

Scoresby mentions that he saw considerable flocks of Common Sandpipers in Spitsbergen in 1818 (40 : 537).

Torell also mentions the species (73 : 55), but Malmgren says that the birds Scoresby saw must have been Purple Sandpipers (85 : 118), and Kolthoff is of the same opinion (261 : 98).

As far as can be seen, there is no reliable record of the Common Sandpiper from the Svalbard area.

No. 43. *ACTITIS MACULARIA* (L.)

The Spotted Sandpiper

In a list of birds included in the collection of the British Museum (Natural History), there is a specimen of this species labelled "Spitzbergen, presented by the Admiralty." (58 : 102)

This American bird has been found on several occasions in Britain and also a few times in other European countries.

Many authors deny that the bird could have been found in the Svalbard area, but *Calidris fuscicollis,* according to Bruce, is reliably recorded from Franz Josef Land (207 : 95), and in this case there seems to be no reason why *Arctitis macularia* should not occasionally reach Spitsbergen.

No. 44. *CALIDRIS CANUTUS CANUTUS* (L.)

The Knot

The first record of the Knot from Spitsbergen is from 1889, when Walter shot an adult male between 12 and 14 June on one of the islands in the group Kong Ludvigøyane, not far from Edgeøya in Storfjorden (169 : 247). The bird was found on the central island of the group, which Walter named "Berentine Island" after the ship that took them there.

In 1905 Orleans reported that he saw the species in Spitsbergen, but he found out himself that they were nothing but Grey Phalaropes (277 : 63, 67, 125, 335).

Since 1889 there is thus no certain record of the species from the Svalbard area until it was found breeding there in 1930, when a brood of four was observed on Reinsdyrflya. On 4 July Dalgety, McNeile and Ingram had seen a single bird and a party of four. On the 8th, four birds were seen again, and on the 13th one bird was found with four young, about three days old (470 : 250). See also Ticehurst (475 : 5).

In the same place as they found the bird with young, McNeile flushed a Knot from two eggs on 12 July, 1931. The eggs were well incubated, and the nest was placed a hundred yards from the sea-shore. "The bird behaved very much like a Purple Sandpiper does when disturbed from eggs, fluttering and

throwing itself on the ground squealing." Two birds in addition to the sitting bird were observed the next day from a hide put up at the nest, but no other nest was found (483 : 86, 87). The bird was photographed in 1931 by Dalgety, Hosking and Svanberg (581 : 277).

Dege's identification of a bird he found nesting on the mountains Coloradofjella in Sassendalen in 1938, is almost certainly erroneous, and the bird in question appears to have been not a Knot but a Purple Sandpiper (594 : 151). No nest has been found outside Reindyrflya, and it is most unlikely that the species breeds on the barren plateau of Coloradofjella, so far away from the sea-shore.

Løvenskiold states that four Knots were seen on the beach near the football-ground in Longyearbyen, Adventfjorden, on 14 August, 1950.

In the summer of 1949, a single bird was observed on Arneliusneset on 29 and 30 July, and eventually shot. This ness is on the south side of Svenskegattet (between the island Indre Norskøya and the mainland). In the summer of 1949 the ground was covered with snow until about 17 July, and there were no breeding Knots to be found on Reinsdyrflya (615 : 61).

No. 45. *CALIDRIS MARITIMA MARITIMA* (Brünn.)[1]

The Purple Sandpiper

Geographical distribution

The nominate form breeds in Iceland, on the Færoe Islands, in Norway, Sweden, Waigatz, Novaya Zemlya, Svalbard, Franz Josef Land and in Siberia up to the Taimyr Peninsula. There is no proof of its having bred in E Siberia. In N America the race is found from Melville Island in the west to Ellesmere Island in the east, in the south to S Baffin Island. It also breeds in Greenland.

Løvenskiold tried to separate the Greenland Purple Sandpipers as a special race (587 : 161), but Salomonsen would not accept this subspecies (588 : 230).

In size the Spitsbergen birds are nearest to the Norwegian ones and they do without doubt belong to the same race.

Calidris m. maritima is replaced by allied races on the Commander Islands, in Alaska, on the Aleutian Islands and on the Pribilof, St. Laurence and other islands in the Bering Sea.

The Purple Sandpipers which are breeding in the Svalbard area probably winter in N Norway, and the birds breeding in N Norway probably go further south in winter. There is no proof of this, however, and only ringing of both populations can give a solution to this problem.

Occurrence in Svalbard

The species breeds in all districts of the Svalbard area with the exception of Kvitøya, where it has never been found.

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[1] Contour map showing distribution, see backflap.

The greatest numbers occur along the coast and in the fjord districts of Vestspitsbergen.

First records

Baffin, who visited Spitsbergen in the summer of 1613, relates that he saw "Stints" there, and this bird must obviously have been the Purple Sandpiper (6 : 71). Fotherby also mentions "Stints" from Spitsbergen (8 : 33). Martens saw the bird in Spitsbergen and gives a good description of it. He says: ". . . because of its brown colour, it seems to me to resemble a field-mouse." (12 : 52)

Scoresby saw a wader in Spitsbergen which he named *Tringa hypoleuca.* Since the Common Sandpiper has never been recorded from the area, the bird must have been *Calidris maritima* (40 : 537). Köhler also saw *C. maritima* in Spitsbergen (38 : 119), and Parry found the species to be abundant around Heclahamna in Sorgfjorden (46 : 194).

Gaimard gives an excellent illustration of *Calidris maritima.* There are no legends to the pictures of the Spitsbergen birds in this volume, but the birds are named. (59)

Records without locality

There are also a few records with insufficient dates and localities. Quennerstedt states merely that the Purple Sandpiper is found all over Svalbard, and that in 1858 he saw the species on the islands Norskøyane (81 : 20). Torell also mentions the species from Spitsbergen (73 : 44). Holmgren saw the bird in Spitsbergen and on Bjørnøya in 1868 (100, Vol. 2 : 861) and (110 : 5).

Distribution. Sections I–XIV

Section I. Bjørnøya. — In summer Purple Sandpipers can be found in all the bays around the island, either singly or in small parties. On the plain north of the mountains they breed in fairly large numbers.

Section II. Hornsund. — The bird is a common breeder on the plains between the sea-shore and the mountains, both along the coast and in Hornsund. On the islands Purple Sandpipers sometimes occur in great numbers, but only a few pairs breed.

Section III. Bellsund. — Purple Sandpipers have been seen between Kapp Lyell and Calypsobyen, in Recherchefjorden, in Van Keulenfjorden, at Midterhuken, on Akseløya, and along the south shore of Van Mijenfjorden. They also occur between the glacier Paulabreen and Sveagruva, to the east of this colliery in Braganzavågen, in the big valley Reindalen on the north side of the fjord and in Bysadalen. In Bellsund they have been seen on Reiniusøyane and on Kapp Martin. They have been found breeding in Bysadalen on Midterhuken and in Van Keulenfjorden.

Section IV. Isfjorden. — In this district the birds have been seen near Kapp Linné, Kapp Starostin and Festningen. They breed in Grønfjorden, Colesbukta, Blomsterdalen, and Hotellneset near Longyearbyen, in Adventdalen, De Geerdalen and in Sassendalen. They have been observed on the beach

below Tempelfjellet and they breed in Gipsdalen. They have also been found on Gåsøyane. They are reported as breeding at Brucebyen in Billefjorden and they have been observed in Petuniabukta at the head of Billefjorden and at Pyramiden in Billefjorden. Similarly there are records from Kapp Wijk in Dicksonfjorden and from Coraholmen in Ekmanfjorden, and the birds are known to breed on Bohemanneset and on Erdmannodden. They also occur on Hermansenøya in Forlandsundet.

Section V. Prins Karls Forland. — The Purple Sandpiper breeds both on Forlandet and on Forlandsøyane. Although they certainly must breed on the large island wherever there are suitable breeding places, so far the only places where they have actually been found breeding are at Salpynten, the south point of the island, on Forlandsletta and in Selvågen.

Section VI. Kongsfjorden. — In this district the birds have been seen in many places both in Kongsfjorden and in Krossfjorden. They have been found breeding at Ny-Ålesund and on Brandalpynten, at "London" on Blomstrandhalvøya, on Kapp Guissez at the entrance to Krossfjorden, and in the fjord in Ebeltofthamna and in Møllerfjorden.

Section VII. NW Spitsbergen. — The birds have been observed in Danskegattet, in Kobbefjorden on Danskøya, in Virgohamna, in Smeerenburgfjorden, on Amsterdamøya, in Svenskegattet, on Norskøyane, at Flathuken, in Raudfjorden and on the island Moffen, as well as on Biskayerhuken, in Breibogen and in Vesle Raudfjorden. They have also been seen on Velkomstpynten, in several places in Liefdefjorden and in Bockfjorden, and on Gråhuken. Although they certainly breed in most of the places named above, they have rather curiously only been found with eggs and young on Reinsdyrflya and on the islands in Liefdefjorden.

Section VIII. Wijdefjorden. — The Purple Sandpiper has been seen in Ragnardalen at the head of Billefjorden and at the head of Austfjorden in Jäderindalen, Zeipeldalen, and between Zeipeldalen and Høegdalen. On the W side of Wijdefjorden it occurs in Purpurdalen, Kartdalen and at Krosspynten. It has been observed on Gyllensköldholmane and on the east side of the fjord at Austfjordnes, Bjørnesholmen, near the glacier Sydbreen, at Dirksodden, at Røyetjørna, around the lakes Immervatnet and Femmilsjøen, in Mosselbukta and at Verlegenhuken. It has been found breeding in Purpurdalen, at Krosspynten and at Røyetjørna.

Section IX. Hinlopen. — The species has been found breeding in Sorgfjorden and on the islands in the strait. They have been seen in Lomfjorden but there is no record of their breeding there.

Section X. Nordaustlandet. — The birds also live on Nordaustlandet but they are not so abundant as farther west. So far as it can be seen, there appear to be only two records of breeding in the area. One from the coast between Ekstremhuken and Kapp Lindhagen, and the other 10 km south of Rijpfjorden in July 1957. There is one record of a single specimen having been seen flying over the inland ice.

Most of the records are from the islands to the west and the north of Nordaustlandet. The species has been observed on Gyldénøyane, in Murchisonfjor-

den, on Lågøya, in Finn Malmgrenfjorden, Wordiebukta and Duvefjorden, on Tavleøya, Phippsøya and Waldenøya.

Section XI. Storfjorden. — In this district the Purple Sandpiper has been found breeding on Kong Ludvigøyane and on Edgeøya, namely at Kvalpynten and at Kapp Lee. They have been observed on Ryke Yseøyane, on Negerpynten on Edgeøya, in Freemansundet, on Barentsøya, in Ginevrabotn, Agardhbukta, Bastianøyane and Tusenøyane.

Section XIII. Kong Karls Land. — The bird has been observed occasionally on these islands, and it has been found breeding on Kongsøya.

Section XIV. Hopen. — The species is reported to breed on the island.

Records from the sea around Svalbard

From the sea south of Svalbard there are very few records of the Purple Sandpiper. According to Mathey-Dupraz, Orléans saw the first Purple Sandpiper of 1905 on 6 June at 73° 45′ N, 16° 42′ E. The bird was flying towards the NE. (333 : 99)

Løvenskiold relates that a Puple Sandpiper came on board his ship on 21 June, 1949, a few nautical miles south of Bjørnøya (615 : 63).

Biological

Migration. — As in the cases of other landbirds, the date on which the Purple Sandpiper arrives in the Svalbard area depends upon whether the spring is early or late. They are hardy birds and can endure a considerable amount of snow and cold, and on several occasions they have been found in the area in June, when their breeding places were still snow-covered. In such circumstances, the only place where they can find food is the narrow intertidal zone along the shores.

The earliest record for their arrival in Spitsbergen is on 16 May, but the majority of the birds seem to arrive either during the last week of May or in the first week of June.

The first arrival of the Purple Sandpiper in various years has occurred on the following dates:

16 May, 1930, Sørkapp, Kristoffersen (472 : 255). Only two birds arrived at this time and the majority came on the 20th and the 22nd.
23 » 1936, Murchisonfjorden, Nordaustlandet, Glen (520 : 299).
24 » 1940, Kapp Wijk, Dicksonfjorden, Oxaas (1939/40, 643).
25 » 1939, Kapp Wijk, Dicksonfjorden, Oxaas (1938/39, 643).
26 » 1889, at sea between Sørkapp and Edgeøya, Walter (169 : 238).
27 » 1873, Isfjorden, Kjellman (135 : 42).
28 » 1861, Kobbefjorden, Danskøya, Malmgren (85 : 101).
28 » 1930, Kvalpynten, Edgeøya, Alfred Svendsen (1929/30, 644).
29 » 1889, Kvalpynten, Edgeøya, Walter (169 : 238).
30 » 1889, Negerpynten, Edgeøya, Chapman (195 : 350).
30 » 1924, Hornsund, Kristoffersen (432 : 191).
30 » 1937, Kongsfjorden, Peder Åm (1936/37, 655).
31 » 1900, Hornsund, Bianchi (253 : 320).
31 » 1926, Flathuken, Raudfjorden, Oxaas (1925/26, 643).

1 June, 1873, Mosselbukta, Kjellman (135 : 263).
3* » 1889, Kvalpynten, Edgeøya, Kükenthal (167 : 62).
3* » 1912, Longyearbyen, Adventfjorden, Mathey-Dupraz (333 : 99).
3 » 1936, Nordaustlandet, Godfrey (529 : 157).
9 » 1900, Dunøyane, Hornsund, Kolthoff (261 : 44).
9 » 1929, Lomfjorden, Alfred Svendsen (1928/29, 644).
11 » 1939, Wijdefjorden, Georg Bjørnnes (1939/40, 636).
11 » 1945, Nordaustlandet, Dege (613 : 233).
12 » 1766, West of Sørkapp, Čičagov (26 : 60).
12 » 1889, Kong Ludvigøyane, Walter (169 : 247).
12 » 1900, Colesbukta, Isfjorden, Kolthoff (250 : 39).
12 » 1931, Bjørnøya, Tomkinson (485 : 81).
13 » 1861, Wijdefjorden, Chydenius (89 : 93).
13 » 1866, Bjørnøya, Fries and Nyström (109 : 40).
13 » 1898, Bjørnøya, Römer and Schaudin (245 : 67).
13 » 1910, Prins Karls Forland, Munsterhjelm (313 : 12).
14 » 1908, Van Keulenfjorden, le Roi (316 : 164).
15 » 1890, Dunøyane, Hornsund, Klinckowström (172 : 39).
15 » 1900, Bjørnøya, Kolthoff (261 : 44).
15 » 1921, Bjørnøya, Summerhayes and Elton (397 : 221).

In many cases, when the bird has been seen, let us say, between the 10th and 15th of June, there is a possibility that it might have arrived earlier. But in the case of the last two arrivals quoted here as occurring on 15 June, it is certain that the birds did actually arrive on this date.

The autumn gathering of the various families of Purple Sandpipers is also either earlier or later according to what kind of season it has been. They may assemble as early as the middle of August, because it is known that by that time they have left their breeding places (on isolated islands etc.), but the main migration south does not really take place until September.

The flocks of Purple Sandpipers which begin to gather in the last half of August must not be mistaken for non-breeding birds, which can be found in flocks of over a hundred birds as early as June and July. Although the movement south probably begins in the second half of August, the birds have been seen along the shores throughout September and a few even as late as 23 October.

From the third week of August and onwards, the species has been observed on the following dates:

21 August, 1889, Edgeøya, Walter (169 : 244).
21 » 1936, Gråhuken, Wijdefjorden, Jung (539 : 128).
23 » 1954, Wijdefjorden, Løvenskiold (1954, 633).
26 » 1948, Poolepynten, Forlandet, Løvenskiold (615 : 67).
27 » 1948, Smeerenburg, Amsterdamøya, Løvenskiold (615 : 67).
28 » 1948, Sørgattet, Danskøya, Løvenskiold (615 : 67).
29 » 1866, Kobbefjorden, Fries and Nyström (109 : 131).
29 » 1870, Tusenøyane, Heuglin (123 : 236).
3 September, 1827, Tokrossøya, Sørkapp Land, Keilhau (48 : 139).
3 » 1948, Pyramiden, Billefjord, Løvenskiold (615 : 67).
5 » 1921, Bohemanneset, van Oordt (370 : 154).

* In both cases "in the first days of June".

6	»	1899, Isfjorden, Birula (298 : 170).
9	»	1882, Grønfjorden, Cocks (151 : 402).
9	»	1949, Adventfjorden, Løvenskiold (615 : 66).
11	»	1939, Wijdefjorden, Georg Bjørnnes (1939/40, 636).
12	»	1870, Adventfjorden, Heuglin (123 : 277).
13	»	1870, Adventfjorden, Finsch (131 : 205).
16	»	1882, Sassendalen, Cocks (151 : 434).
19	»	1933, Wijdefjorden, Georg Bjørnnes (1933/34, 636).
22	»	1882, Recherchefjorden, Cocks (151 : 484).
24	»	1882, Recherchefjorden, Cocks (151 : 484).
25	»	1923, Hornsund, Kristoffersen (432 : 191).
29	»	1910, Bellsund, Munsterhjelm (313 : 12).
5	October	1888, Danskegattet, Chapman (195 : 344).
10	»	1868, Kongsfjorden, Fries and Nyström (109 : 176).
20	»	1899, Hornsund, Bianchi (253 : 321).
23	»	1938, Billefjorden, Hilmar Nøis (1938/39, 642 a).

General habits. — The most striking feature of the Purple Sandpiper is that when the bird is approached, it raises one wing straight up over its back. Keith, in his paper entitled "Observations on the Purple Sandpiper in North East Land", states that the wing "ceremony" is performed in 5 different circumstances: 1. By a bird alighting near its mate. 2. By a mated bird attacking another. 3. By mated birds without external stimulus. 4. By mated birds alarmed by man, and 5. Before copulation (531 : 185). In my opinion it is not only mated birds which perform the "wing ceremony" when alarmed by man. Any single bird, approached at close quarters in the breeding season, will in most cases, raise one wing in "salutation", but birds in a flock will not do this. This "wing ceremony" has been observed and noted by almost every ornithologist who has visited Spitsbergen.

Another prominent characteristic of the Purple Sandpiper is the so-called "rodent run", which it performs to lure an intruder away from the eggs or young birds. This has been known for a long time, and when Martens (1675) says that the bird reminds him of a field-mouse, he is probably referring to the "rodent run". When the bird creeps along the ground with fluffed feathers on low legs, it does indeed resemble a small rat more than anything else.

This rodent run has been observed on very many occasions in the Svalbard area; among the published records are the following: Swenander (247 : 15), Birula (298 : 190), Kristoffersen (472 : 255), Worsley (441 : 49) and Jung (539 : 128). Løvenskiold saw the rodent run on numerous occasions under normal conditions, but once on 23 August, 1952, near the house of Mr. Nøis in Sassendalen, the reaction seemed to be a little out of place. Here a male bird in attendance on three fully grown young birds, which were excellent fliers, performed the rodent run although there was apparently no need for it. The young were perfectly well able to take care of themselves (615 : 67).

Pennie and Andrew describe a Purple Sandpiper which was nearly trodden on by a running Reindeer in Sassendalen. The poor bird left the nest in a desperate hurry "trying to go through the distraction display and at the same time keep in front of the Reindeer". Another bird lured one observer 500 yards away from the nest before flying back (623 : 56).

There is, however, a very interesting paper on this subject by Duffey and Creasey which includes a chapter by Kenneth Williamson, who gives an interpretation of the "rodent run" display (585 : 27). That the display really serves its purpose was shown when a husky dog chased a Purple Sandpiper performing the rodent run and was completely fooled.

Purple Sandpipers form pairs soon after their arrival in spring and the males then begin to perform their sexual display. This was observed by Walter on Edgeøya on 2 June, 1889 (169 : 242). Trevor-Battye saw the performance in 1896 (203 : 590). Kolthoff says that the male bird rises into the air, calling, and then descends on fluttering wings. The song of the bird on these occasions is somewhat similar to the song of the Tree-pipit (261 : 45).

Van Oordt saw this display as late as 25 June, 1921, on Bohemanneset (370 : 152). Tiedemann saw the bird in the Hornsund area and describes the song, which, he says, resembles the call of the Curlew (560 : 244). He also refers to the description of the song given by le Roi (316 : 165), which agrees very well with that given by Kolthoff. Dege speaks of fights among the males performing their nuptial display (613 : 233).

The Purple Sandpiper is not at all afraid of man and will allow the observer to come quite close before taking wing. Nathorst tried singing as loudly as he could when passing a Purple Sandpiper, but this had not the slightest effect on the bird (243 : 126).

In 1937, during a summer expedition to Billefjorden, Marshall found that some species of birds underwent a distinct period of quiescence, and among them possibly also the Purple Sandpiper (533 : 248).

Løvenskiold found that the bird had a special and distinct warning signal. Near the hut in Stormbukta on Sørkapp Land, in 1950, there was a family of foxes which came every day to the camp to be fed. Each time a fox came a nearby Sandpiper with his four young, gave his warning signal (615 : 64).

A common feature of many species of birds breeding in the Svalbard area, is that of non-breeding. The Purple Sandpiper is no exception to this rule, and large flocks of non-breeders can be found in most parts of the area. As stated previously, it is important not to mistake for non-breeders the birds which assemble after the breeding season, in mid-August, and later for the autumn migration; but any flock of a hundred individuals or more, seen either in June or July, may safely be regarded as non-breeders.

Keith states that large numbers of non-breeding Purple Sandpipers were a normal feature of the bird life of Nordaustlandet in the summer of 1936 (522 : 57), while Bertram and Lack report that in 1932 a large number of adult birds on Bjørnøya (75 % or more of some species) failed to breed. The Purple Sandpiper was probably amongst these, although it is not specially mentioned (528 : 47). Jung saw flocks of non-breeding Sandpipers at Gråhuken at the entrance to Wijdefjorden in the summer of 1936 (539 : 128). Løvenskiold saw more than a hundred birds at Kapp Linné at the entrance to Isfjorden on 24 July, 1948. In 1949 big flocks were seen near Longyearbyen on 24 June, in Kongsfjorden on 27 June, and in Breibogen south of Biskayerhuken on the north coast, on 20 July. At about the same time, many hundreds

of Sandpipers were seen a little further south in Vesle Raudfjorden, but neither in Breibogen nor in Vesle Raudfjorden were any nests found. In Svenskegattet, south of the islands Norskøyane, large flocks of Sandpipers were seen on 27 July, and on 5 August, 1949, there were more than a hundred birds near the lighthouse on Kapp Martin in Bellsund. All of these flocks probably consisted of non-breeders (615 : 65). In 1954 Løvenskiold saw a flock numbering considerably more than a hundred birds in the valley Sassendalen on 29 June, and on 9 July great numbers were found along the shores of the lagoon at Krosspynten in Wijdefjorden (1954, 633).

B r e e d i n g. — The Purple Sandpiper is one of the most common landbirds in the Svalbard area. With few exceptions it can be found breeding wherever the ground is favourable for nesting and it will breed as readily on islands as on the mainland. Its breeding range in Svalbard stretches from Sørkapp to the islands north of Nordaustlandet, and from Prins Karls Forland in the west to Kong Karls Land in the east.

On the breeding grounds of the Purple Sandpiper old nest-scrapes are very numerous, and it seems that a nest is not used for more than one year. The nests are seldom found close together, and probably Hartley and Fisher are right when they state that the normal density is two pairs to a mile (513 : 372).

The birds breed on the raised beaches along the fjords and the seashore, on the plains between the hills and the sea, and on the low hills between the plains and the mountains. They also penetrate far into the bigger valleys, and it is not unusual to find them at a considerable distance from the sea. Walter found them more than 10 km from the sea on Edgeøya where he also saw them on the hillsides (169 : 244). Cocks found a nest some miles inland in a valley east of Grønfjorden, while Nathorst reported a nest situated deep in the valley Forkastningsdalen, SE of Midterhuken in Bellsund (155 : 24). Conway saw a nest at "Bunting Bluff" (Breinosa) in Adventdalen, about 10 km from the shore (196 : 89). Munsterhjelm found the species breeding 5 km from Kaldneset on Forlandet and four nests in Bysadalen (Reindalen) in Van Mijenfjorden at a distance of 2 to 8 km from the shore (313 : 12). Longstaff states that he found the birds as far as five miles from the sea and at a height of 300 metres above sea-level (407 : 85), while Heuglin says that on the coastal mountains, the bird may go up to 600 m. He does not mention, however, whether the bird actually breeds at that altitude (116 : 65). Birula saw a bird high up in the mountains on the west side of Barentsøya, which seemed just to have left the nest (298 : 190), and Mathey-Dupraz found a nest in Blomsterdalen in Adventfjorden at 350 m (more than 1,000 feet) (311 : 46). Løvenskiold saw the species on the mountains of Hornsund at 250–300 m above the sea (615 : 64), and a nest was also found 5 km from the sea in a valley west of Selvågen on Forlandet (1956, 633).

The nest is almost always placed on turf clad with moss, lichens and other vegetation, including *Cassiope tetragona* and *Dryas octopetala*. The nest itself is a perfect circular scrape in the turf or in the ground, about 10 cm in diameter and about 6 cm deep. Usually it has a thick lining of dry leaves, the commonest leaf being that of the Polar Willow, but leaves of Dryas are also

used. Both these plants are characteristically found in or near the breeding places of the species.

Evans and Sturge describe nests found on the hills in Colesbukta in Isfjorden, "Lined with stalks of grass and leaves of Dwarf Birch (Betula nana L.)" (72 : 171). Trevor-Battye says that this is incorrect, and that the leaves must have been *Salix polaris;* but in fact the nests were found in one of the very few places in Spitsbergen where *Betula nana* does occur (203 : 590).

There is one reference in the literature to cocks' nests. Keith saw a male bird making settling movements and turning round in a slight hollow, but this was so shallow that it was not until the bird sat on it that it was recognized as a scrape. The female took no notice of these cocks' nests (531 : 192).

Usually the nest is placed well out in the open. although Kristoffersen describes a nest which was found "under overhanging grass and other plants" (472 : 255), and Løvenskiold once found one placed on the turf between some small pieces of driftwood (615 : 66).

The breeding season can begin at any time from the middle of June to the first ten days of July, earlier or later, according to the melting of snow on the breeding grounds.

Table 17

Nests and eggs

Date	No. of nests	No. of eggs	Condition	Place	Author
16 June 1921	many	4		Bjørnøya	Jourdain (381: 171)
20 » 1930	1	4	fresh	Isfjorden	Dalgety (470: 251)
24 » 1855	4	4		Colesbukta	Evans and Sturge (72: 171)
24 » 1907	1	4	fresh	Forlandet	Le Roi (316: 166)
24 » 1910	1	4	fresh	Forlandet	Munsterhjelm (313: 12)
25 » 1909	1	4		Kongsfjorden	Dr. Sager in letter.
27 » 1930	1	4		Edgeøya	Bjørnnes (1929/30, 636)
28 » 1882	1	4	well inc.	Bellsund	Nathorst (155: 24)
28 » 1898	1	4	fresh	Kong Ludvig-øyane	Römer und Schaudin (245: 67)
28 » 1921	1	4	fresh	Bohemanneset	Van Oordt (370: 152)
28 » 1955	2	3		Sassenfjorden	Pennie (623: 56)
28 » 1955	3	4		Sassenfjorden	Pennie –»–
29 » 1907	2	4	incubated	Adventfjorden	Le Roi (316: 166)
29 » 1930	1	1	fresh	Sørkapp	Kristoffersen (472: 255)
29 » 1931	many	4		Liefdefjorden	Tomkinson (485: 85)
30 » 1931	many	4		Liefdefjorden	Tomkinson –»–
1 July 1894	4	4		Adventdalen	Feilden (189: 86)
1 » 1899	1	4		Hornsund	Bianchi (253: 320)
1 » 1931	4	4	fresh	Reinsdyrflya	Tomkinson (485: 85)
1 » 1954	1	4	fresh	Adventdalen	Løvenskiold (1954, 633)
3 » 1873	1	3		Sorgfjorden	Eaton (130: 3809)
3 » 1931	1			Bohemanneset	Tomkinson (485: 85)
4 » 1930	1	4		Sørkapp	Kristoffersen (472: 255)

Date	No. of nests	No. of eggs	Condition	Place	Author
4 » 1950	1	4		Adventfjorden	Løvenskiold (615: 62)
5 » 1890	many			Grønfjorden	Nordenskiöld (178: 22)
5 » 1952	1	4		Erdmannodden	Løvenskiold (615: 62)
6 » 1956	1	4	fresh	Kongsfjorden	Løvenskiold (1956, 633)
7 » 1899	1	4	well inc.	Hornsund	Birula (298: 169)
9 » 1861	?	many		Wijdefjorden	Chydenius (89: 317)
9 » 1899	1	4	fresh	Bjørnøya	Swenander (247: 15)
9 » 1907	1	2	fresh	Sassendalen	Le Roi (316: 166)
9 » 1907	1	4	well inc.	Sassendalen	Le Roi –»–
11 » 1930	1	3		Sørkapp Land	Kristoffersen (472: 255)
11 » 1954	1	4		Wijdefjorden	Løvenskiold (1954, 633)
14 » 1907	1	4	incubated	Bjørnøya	Le Roi (316: 166)
14 » 1910	4	4	well inc.	Van Mijenfjorden	Munsterhjelm (313: 12)
16 » 1873	1			Wijdefjorden	Eaton (130: 3809)
16 » 1905	1	4	well inc.	Adventfjorden	Le Roi (316: 164)
16 » 1910	1	4	incubated	Grønfjorden	Zedlitz (319: 322)
17 » 1956	1	3		Krossfjorden	Løvenskiold (1956, 633)
18 » 1948	1	4		Bjørnøya	Duffey (585: 27)
19 » 1899	1	4	well inc.	Hornsund	Birula (298: 169)
20 » 1899	1	4	well inc.	Hornsund	Bianchi (253: 320)
21 » 1906	many	4		Sassendalen	Mathey–Dupraz (311: 46)
21 » 1910	many	4	well inc.	Krossfjorden	Zedlitz (319: 322)
22 » 1910	1	4	well inc.	Adventfjorden	Mathey–Dupraz (311: 46)
22 » 1948	1	4	well inc.	Bjørnøya	Duffey (585: 27)
23 » 1956	1	3		Forlandet	Løvenskiold (1956, 633)
25 » 1937	1	4	well inc.	Hornsund	Tiedemann (560: 244)
26 » 1896	1	4		Adventdalen	Conway (196: 88)
26 » 1932	2	4		Bjørnøya	Bertram and Lack (488: 295)
26 » 1956	1	1	addled	Forlandet	Løvenskiold (1956, 633)
27 » 1881	1	4	well inc.	Grønfjorden	Cocks (149: 325)
5 Aug. 1898	1	3		K. Karls Land	Nathorst (243: 244)

According to the material in Table 17 given above and Table 18 relating to "Young birds", fresh clutches of eggs have been found (or are calculated to have been completed) on:

June 7 14 16 16 18 20 23 23 24 25 25 27 28 29 29 29 30 30.
July 1 1 1 4 5 6 9 9 10 11 11.

Within certain limited areas all the females seem to lay at the same time. Bertram and Lack state that on Bjørnøya in 1932 newly fledged birds became common from 7 August, This indicated that most pairs had laid at about the same time (488 : 295), although hatchings were also recorded on 5, 14, 20, and 21 July. Van Oordt had the same experience. On 19 July, 1921, he found many newly hatched chicks in the tundra of Bohemanneset. He says that the males began to incubate on the same day, and that this appeared to be correlated with the melting of the snow. He adds that although the difference in

appearance of the two sexes is easily seen in the breeding season, it can be more difficult later (370 : 154).

Usually it is the male bird which is found sitting on the nest, but the female also incubates at least part of the time. Trevor-Battye found that with one exception, all the specimens he put off eggs were males (203 : 589). In one case only, on Kong Karls Land on 9 August, 1898, Kolthoff saw both members of the pair with the young. On this occasion the male performed the rodent run. Some of the females he obtained had brood-patches, from which he concluded that the female must take some part in the incubation (261 : 45). Van Oordt also found the males incubating and with only one exception all the sitting birds he obtained on Bohemanneset in 1921 were males (370 : 152).

The incubation period is estimated by Römer and Schaudin to be 16 days, but this is incorrect (245 : 67). As stated in the Handbook of British Birds the correct period is 21–22 days.

On 3 July, 1956, Løvenskiold found a nest in "London" on Blomstrandhalvøya on the north side of Kongsfjorden. This nest contained three eggs and a 4th and last egg was laid on 6 July. As soon as the clutch was complete, incubation began. When he had to leave, the Dutch ornithologist Mr. Strijbos and his wife undertook to watch the bird. (The male bird did most of the incubating.) On the 27th at 8.45 a.m. three eggs had hatched, and the fourth chick emerged at 5 p. m. From the 26th both birds were present, and one of the pair, probably the female, was much alarmed when the observers approached the nest. This is one case in which it is known for certain that the eggs were incubated for 21 days.

Newly hatched chicks have been found (or are calculated to have hatched out) on the following dates:

July 5 11 14 15 15 16 18 19 19 20 21 21 24 26 27 30 30.
August 1 2.

It appears therefore that the first chicks hatch about the second week of July, but the majority are hatched from the middle of July to the first week of August. By the middle of August most of the young birds will be able to fly.

The incubating bird sits very close, and often will not leave the nest until it is almost trodden on. Usually, when it does leave, it performs the rodent run, to entice the intruder away, but occasionally something quite different happens. Eaton has recorded a curious incident in this connection. On 16 July, 1873, he flushed a Sandpiper from its nest in "Aldert Dirck's Bay" (now Dirksodden in Wijdefjorden). When the adult left the nest "three newly-hatched young were killed by their mother". How this was done is not related (130 : 3809).

F o o d. — The statement by Summerhayes and Elton that the Purple Sandpiper will eat almost anything it can find is largely true, but the bird will not take seal blubber and it will not approach a camp to eat refuse.

The birds can almost always be seen on the shores, where they seek their food in the intertidal zone along the beach. They also feed in the wetter parts of plains and valleys, in bogs, along rivers and on the margins of lakes. But they can also be found feeding in the "heather", i. e. land covered with *Cassiope*

Table 18
Young birds

Date	No. of young	Age	Place	Author
5 July 1932		newly hatched	Bjørnøya	Bertram and Lack (488: 295)
9 » 1898		small, in down	Adventfjorden	Hartlaub (239: 175)
12 » 1955	1	recent. hatched	Adventdalen	Pennie (623: 56)
14 » 1930		first seen	Reinsdyrflya	Dalgety (470: 251)
14 » 1932		newly hatched	Bjørnøya	Bertram and Lack (488: 295)
16 » 1873	3	–»–	Wijdefjord	Eaton (130: 3809)
18 » 1906		–»–	Recherchefjorden	Mathey–Dupraz (311: 46)
18 » 1910		half grown	Adventfjorden	Zedlitz (319: 322)
19 » 1921	many	newly hatched	Bohemanneset	Van Oordt (370: 154)
19 » 1956	4	–»–	Kongsfjorden	Løvenskiold (1956, 633)
20 » 1910	many		Adventfjorden	Mathey–Dupraz (311: 46)
20 » 1932		newly hatched	Bjørnøya	Bertram and Lack (488: 295)
21 » 1910		small, in down	Krossfjorden	Zedlitz (319: 322)
21 » 1932		newly hatched	Bjørnøya	Bertram and Lack (488: 295)
21 » 1949	4	–»–	Liefdefjorden	Løvenskiold (615: 62)
23 » 1898		small, in down	Colesbukta	Nathorst (243: 181)
25 » 1949	4	3 days old	Liefdefjorden	Løvenskiold (615: 69)
26 » 1898		newly hatched	Kong Karls Land	Römer und Schaudin (246: 102)
27 » 1956	4	–»–	Kongsfjorden	Strijbos (1956, 648)
28 » 1952	4	half grown	Hornsund	Løvenskiold (615: 64)
30 » 1910		small, in down	Krossfjorden	Zedlitz (319: 322)
30 » 1950	4	half grown	Sørkapp Land	Løvenskiold (615: 64)
30 » 1954	4	–»–	Wijdefjorden	Løvenskiold (1954, 633)
1 Aug. 1881	4	4 days old	Van Keulenfj.	Cocks (149: 382)
1 » 1949	4	newly hatched	Kongsfjorden	Løvenskiold (615: 67)
2 » 1927	1		Edgeøya	Dalgety (442: 28)
2 » 1950		newly hatched	Sørkapp Land	Løvenskiold (615: 64)
3 » 1910	many		Amsterdamøya	Zedlitz (319: 322)
4 » 1899	4	not fledged	Bjørnøya	Swenander (247: 15)
5 » 1948	4	3 days old	–»–	Duffey (585: 27)
9 » 1898		half grown	Kong Karls Land	Kolthoff (261: 100)
11 » 1936	1	small in down	Wijdefjorden	Jung (539: 127)
12 » 1858	1	–»–	Norskøyane	Quennerstedt (81: 20)
12 » 1910		able to fly	Bjørnøya	Zedlitz (319: 322)
16 » 1890		fully fledged	Norskøyane	Klinckowström (172: 127)
23 » 1950	3	fully developed	Sassendalen	Løvenskiold (615: 62)

tetragona, Dryas octopetala and *Empetrum nigrum.* They range in fact from the bare shingle on the beach to several hundred metres above sea-level on hills and mountains; only snow-covered areas and glaciers are avoided. Since Sandpipers remain in Spitsbergen far into the autumn, the ground is often snow-covered for at least part of the time before they leave. (The first snow almost always disappears quite quickly.) After such a snow-fall, they are forced to keep to the narrow strip of bare shingle along the beach, and the adjoining snow will almost always be covered with their footprints.

The following notes about their food have been made by a long succession of ornithologists visiting the area:

Sundevall: *Crustacea* and chironomid larvae (52 : 126).

Eaton: small white worms (130 : 3809).

Heuglin: small flies, larvae and spiders (132 : 117).

Nordenskiöld: flies, mosquitoes and other insects (145 : 122).

Nathorst: a little worm in rotten sea-weed (155 : 241).

Walter: small stones the size of hempseed, small seeds of plants and fine grass (169 : 241).

Oustalet: vegetable matter and insects (213 : 303).

Schalow: Algae (232 : 386).

Richard: vegetable matter and sand (244 : 75).

Römer and Schaudin: green freshwater algae (245 : 67).*

Swenander: freshwater algae, *Diptera* larvae and small molluscs. In two instances the stomachs were completely filled with *Diptera* (247 : 15).

Bianchi: larvae of *Diptera* (253 : 320).

Orleans: *Margarita helicina* and seeds of *Cochlearia* (278 : 566).

Birula: marine animals found on mud-flats at low tide (298 : 190).

Le Roi: 25 stomachs investigated; all contained stones the size of hempseed. Vegetable matter occurred in 18 stomachs, molluscs in four, larvae of *Diptera* in two and a few spiders in one (316 : 167).

Summerhayes and Elton have made a more thorough investigation. In one instance the birds were feeding on *Collembola* and flies, and in another on algae in a rocky intertidal zone (397 : 221, 250, 259). They were also found feeding in the intertidal zone along the shore, and on the large numbers of the common maritime and intertidal oligochaete worm, *Lumbricillus aegialites,* living in the snow covering the ice-foot of the shore of Andøyane, in Liefdefjorden, July 1924 (450 : 201, 210). On Nordaustlandet the birds were feeding on aquatic chironomid flies, *Chironomus lugubris, Metriocnemus ursinus* and *Orthocladius conformis.* These, however, were apparently not sufficiently numerous to support the whole population of Sandpipers, and they supplemented their diet with the springtails *Achorutes viaticus* and the *Lumbricillus aegialites* mentioned above.

Other records of the Sandpipers' food are as follows:

Bertram and Lack: Sandpipers presumed to be feeding on chironomid larvae living on Bjørnøya in cracks in the ice and in the moss of the lake margins (488 : 295).

Kristoffersen: seeking food in sea-weed thrown up on the ice by the sea (472 : 255).

Hartley and Fisher: *Crustacea, Gammarus,* insects and vegetable matter and small stones (513 : 387).

Jung: freshwater-algae and food in the sea-weed on the shore (539 : 128).

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* A note stated to be taken from Trevor-Battye, to the effect that the bird takes mosquito larvae, is not to be found in his papers (203 : 589).

Duffey and Sergeant: insects, *Littorina rudis, Balanus balanoides* and algae (586 : 559).

Løvenskiold: *Lumbricillus* in the rotten ice of the shore (615 : 67).

Parasites. — Waterston found the following *Mallophaga* on Purple Sandpipers from the Svalbard area in 1921:

Menopon lutescens, Billefjorden on 15 August.

Philopterus fusiformis, Bjørnøya on 16 June, Billefjorden on 15 August.

Degeeriella zonaria, Bjørnøya 16 June, Billefjorden 15 August.

Degeeriella actophilus, Bjørnøya 16 June, Billefjorden 15 August (388 : 251).

CALIDRIS MINUTA (Leisl.)

The Little Stint

In a publication by Schlegel and Hoeck there is a footnote on *Calidris maritima* and *Calidris minuta* (148 : 2). It is impossible, however, to determine whether the birds were seen in Spitsbergen or in Novaya Zemlya. In fact *C. minuta* was probably found in Novaya Zemlya, for it is known to breed there.

Kükenthal refers to *Calidris minuta* as found on the island Edgeøya (168 : 84), but from a paper of Walter it is quite clear that the bird seen there was *Calidris alpina* (169 : 242). Le Roi also considers that the bird in question was a Dunlin and not a Little Stint (316 : 168).

There is thus no clear indication that the Little Stint has ever been found in the Svalbard area.

No. 46. *CALIDRIS ALPINA* Subsp ?[1]

The Dunlin

Geographical distribution

In Europe the race *Calidris a. alpina* (L.) breeds in Norway, N Sweden, N Finland, N Russia including Novaya Zemlya, Waigatz, Dolgoi and Kolguev; and in Asia it breeds eastwards along the Siberian coasts to Jenisei and Lena (?).

The race *Calidris a. schinzii* (Brehm) breeds in the British Isles, Holland, Denmark, N Germany, SW Norway, S Sweden, the Baltic States and S Finland. In Iceland and the Færoe Islands the population is intermediate.

The race *Calidris a. arctica* (Schiøler) is an inhabitant of NE Greenland, and in Canada there is a different race, *Calidris a. sakalina* (Viell.).

Occurrence in Svalbard

Very few specimens of this bird have been obtained in Spitsbergen, where it is rare. One of these specimens is stated by Jourdain to have had less black on the breast than Norwegian birds.

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[1] Contour map showing distribution, see backflap.

The material collected in Spitsbergen is scanty and very scattered, and this makes it difficult to say to which race the population should be ascribed. It is possible that it belongs to the nominate form.

The bird has been seen several times under circumstances which suggested strongly that it was breeding in the Svalbard area, and in 1957 Blurton Jones found an adult bird with chicks in Isfjorden (1959, 652).

First records

The first record of the Dunlin in Spitsbergen is relatively recent. The first specimen was seen by Walter on Edgeøya in 1889, and much more recently it was found for the first time on Bjørnøya by Bertram and Lack in 1932.

Distribution. Sections I–XI

Section I. Bjørnøya. — Bertram and Lack saw one specimen on the north coast on 21 June, 1932. On the 25th they saw two birds, and another was sighted on the 28th. The authors say that though the bird had not previously been found on the island, it has probably occurred there fairly regularly because it has been found breeding in Spitsbergen (488 : 295). Until 1957, however, there was no actual proof of breeding in Spitsbergen, and since 1932 the bird has not been seen on Bjørnøya.

Section II. Hornsund. — Kristoffersen shot a single bird on Dunøyane on 23 June, 1924. It was feeding on the beach, and this was the only specimen seen (432 : 191).

Section IV. Isfjorden. — When von Zeppelin writes about Dunlins in Spitsbergen, he is in fact referring to Purple Sandpipers. On p. 98 he writes: "Alpenstrandläufern oder Seestrandläufern." This shows quite clearly that he had not completely identified the birds he saw (179 : 57, 84, 98, 150). Le Roi says that in fact the birds concerned were *Calidris maritima* and not *C. alpina* (316 : 167).

Feilden picked up the withered wings of a wader in Grønfjorden on 4 July, 1894. They were shown to Professor Newton who said that he thought that they were the wings of a Dunlin (189 : 88). As Dunlins have been found several times subsequently in the Isfjorden area, it seems very probable that the wings did belong to this species.

On 15 June, 1908 le Roi shot a female Dunlin in Adventfjorden, where it was in company with a flock of Purple Sandpipers (316 : 168).

On 25 June, 1921, van Oordt observed an adult specimen in summer-plumage on Bohemanneset (370 : 151).

At the beginning of July 1921 Jourdain and his companions were in Sassendalen when they came upon five pairs of Dunlins. The males were flying around anxiously and trilling, but in the limited time available no occupied nest was found, although the birds were evidently breeding. One male bird was shot. This and the other Spitsbergen specimens had less black on the breast than the Norwegian birds (381 : 170).

Congreve saw "some Dunlins" in Adventdalen on 30 June, 1922 (403 : 24).

Dalgety and coll. saw two pairs of Dunlins between 23 and 30 June, 1930 (470 : 251), but they do not say whereabouts in Isfjorden these birds were found. One pair obviously had young on 14 July, but no chicks were found.

Løvenskiold saw a Dunlin in summer-plumage on 16 August, 1950 in Sassendalen. It had a great black patch on the breast and behaved as if it had young, but none were found. On subsequent days great numbers of young Dunlins were found in two different places on the beaches round Sassenfjorden. Without exception these were young birds of the year, for they still had some down adhering to the nape and under the tail. On 17 August two specimens were observed near the river mouth in Gipsdalen, but they were most numerous on the plain to the south of the house belonging to Mr. Nøis at the head of Sassenfjorden. Here they were seen daily from 15 to 25 August. They were found in flocks from seven up to 20 individuals, usually in company with young Sanderlings.

One imagines that the large bogs along the river in Sassendalen ought to provide many good breeding places for the Dunlin, and since the young birds still had down adhering to different parts of the plumage, it seems reasonable to suppose that they could have been hatched in the vicinity of Sassendalen. It is unlikely that they could have come from the south, and it is just possible, therefore, that they came from a breeding place somewhere in Spitsbergen (615 : 61).

Sassendalen was visited again by Løvenskiold towards the end of June in 1954, but although a close search was made not a single bird was seen. The area, however, is so vast that some birds farther up the valley would certainly have escaped discovery (1954, 633).

On 22 July, 1957, Blurton Jones saw two birds in Sassendalen in full summer-plumage, and on 1 August he found an adult bird with two chicks in Ebbadalen at the head of Billefjorden (1959, 652).

Section V. Prins Karls Forland. — Jourdain saw two birds on Forlandsøyane on 29 June, 1921, and one of them, a female, was shot. Three more birds were observed by Mr. H. L. Powell (381 : 170).

Section VI. Kongsfjorden. — Mathey-Dupraz shot an adult female in summer-plumage in Signehamna in Krossfjorden on 3 August, 1911 (333 : 99).

There is a further record from this area, but it is erroneous. Roth gives on the last page of his book a list of birds shot on a hunting trip in Spitsbergen in 1900, and included in this list is a Dunlin shot in Kongsfjorden (257 : 178). Koenig and le Roi, however, heard later from Count Zedlitz, who had taken part in the trip, that the bird was not in fact *C. alpina,* but some other species (316 : 167).

Section XI. Storfjorden. — Walter saw an adult male in Krausbukta on Edgeøya on 5 June, 1889. The date is a misprint, as Dr. Walter was by then in Norway. On 22 August, 1889, he shot an adult female out of a flock of Purple Sandpipers on Kong Ludvigøyane (169 : 238, 242, 247).

No. 47. *CROCETHIA ALBA* (Pall.)[1]

The Sanderling

Geographical distribution

The Sanderling breeds in Siberia on the Taimyr Peninsula, and on the New Siberian Islands (and probably on Liakov Isl.). In N America it breeds on the arctic islands of Canada.

According to Salomonsen the Sanderling breeds on the east coast of Greenland from Scoresby Sound in latitude 70° N, northwards to Peary Land and from there along the north coast to Hall Land at 82° N, 60° W (588 : 215).

When they are on migration they are found almost all over the world; and they have occurred, for example, in Franz Josef Land, Novaya Zemlya, Jan Mayen etc.

Occurrence in Svalbard

The Sanderling has not been seen on Bjørnøya, but in Spitsbergen it has been recorded from Hornsund, Bellsund, Isfjorden, Prins Karls Forland, Kongsfjorden, NW Spitsbergen, Wijdefjorden, Nordaustlandet and Storfjorden. It has been found breeding in Isfjorden, and on Forlandet, but the majority of these birds breed on Reinsdyrflya in NW Spitsbergen.

First records

Heuglin once stated that he had seen a Sanderling somewhere near Hornsund in 1879 (116 : 61), but as he does not repeat this observation in later publications, he must have been somewhat uncertain of his identification.

The first Sanderling to be shot was obtained by Pike on Amsterdamøya in 1888, and Walter shot a specimen on Kong Ludvigøyane in 1898.

In 1908 Bruce found the species breeding on Prins Karls Forland, and this is the first breeding record for the Spitsbergen area.

Distribution. Sections II–XI

Section II. Hornsund. — Le Roi states that a Sanderling was seen in Hornsund on 25 July, 1908, and another was sighted the following day on Dunøyane. After 1908, however, no Sanderlings were recorded in the district until 1950, when Løvenskiold saw a flock of 11 to 12 birds on the island Sørkappøya on 25 July.

Section III. Bellsund. — Løvenskiold saw two Sanderlings at Kapp Martin on 16 August, 1949.

Section IV. Isfjorden. — Le Roi records that 4 males and 2 females were seen in Adventfjorden on 15 June, 1908, and a single male bird was seen in Sassendalen on 22 June. Mathey-Dupraz relates that twice, on 26 July 1906 and also on 26 July 1910, a hunter returning from Sassendalen brought back a collection of waders. The professor examined these birds and found that

[1] Contour map showing distribution, see backflap.

3 of them were Sanderlings. Tomkinson saw a pair of Sanderlings in Dicksonfjorden, Isfjorden, on 25 June, 1931. Dalgety saw 3 pairs in Isfjorden on 23 June, 1930. Two nests were found, each containing 4 eggs, and on the 27th he found a third nest with one egg. This clutch was completed on 30 June, and then contained 4 eggs.

G. and T. Sætersdal shot two adult male birds in Sassendalen on 15 and 19 July, 1947. Løvenskiold states that 4 Sanderlings were seen in Longyearbyen in Adventfjorden on 14 August, 1950. During a visit to Sassendalen between 15 and 25 August, 1950, Sanderlings in flocks of varying size were seen every day on the mudbanks along the shore of the fjord, particularly near the estuary of the river. They were also found on the plain to the south of the house belonging to Mr. Nøis. The birds were all juveniles and still retained some down on the nape of the neck, and in some cases also under the tail. Very many birds were present on the south side of the fjord, at Vindodden, on 24 August.

Five miles up the valley in Sassendalen, Blurton Jones saw two adult Sanderlings and a small chick on 15 July, 1957, and the same three birds were seen again on 22 and 27 July.

Section V. Prins Karls Forland. — Kolthoff says that a single Sanderling was shot on 28 June, 1900. The next day another Sanderling was seen there. The male bird obtained had well-developed testes.

During the summer of 1906 Bruce found the Sanderling breeding on Forlandet.

Le Roi says that great numbers of Sanderlings were seen at the northernmost point of Prins Karls Forland on 19 June, 1908. One male and three females were shot.

Munsterhjelm shot an adult male on one of Forlandsøyane on 13 June, 1910. The testes of the bird were well developed.

Section VI. Kongsfjorden. — Kolthoff saw a Sanderling in Kongsfjorden on 1 July, 1900. Le Roi states that two male birds and one female were shot on Lovénøyane in Kongsfjorden on 18 June, 1908.

Mathey-Dupraz says that a Sanderling flew on board his ship in 1911 when they were just outside the shore by "Pierre Remarquable", i. e. Merkesteinen in Krossfjorden.

Section VII. NW Spitsbergen. — Pike shot one specimen out of a flock of three on Amsterdamøya on 21 August, 1888. This is the first record of the bird from Spitsbergen.

Clarke relates that he was shown a skin of a Sanderling, an adult female, obtained by Bruce on Amsterdamøya on 15 August, 1898. Jourdain says that four birds were seen on Reinsdyrflya on 3 July, 1921, and of these, two were shot. On the islands Andøyane in Liefdefjorden, one bird was seen on 6 July, and another (perhaps the same) on 7 July, 1921. On these two days two individuals on the mainland were watched for some time.

Longstaff found a nest with 4 eggs on Reinsdyrflya on 28 July, 1923. The female was shot and sent to the British Museum (Nat.Hist.). Binney found the nest of a Sanderling on Reinsdyrflya in 1924, in the same place as Longstaff found his nest in the previous year. The nest was not disturbed. Montague found

the nest of a Sanderling on Reinsdyrflya on 11 July, 1924, and this may be the same one as that mentioned above by Binney. In addition six birds were seen on the shore of Reinsdyrflya on 12 July. The Sanderlings were scarce there in 1924.

Dalgety and coll. found a nest with four eggs on 14 July, and two newly-hatched young on 18 July, 1930. McNeile found not less than five clutches in the same place. This also was in the summer of 1930, and some of these nests, therefore, may have been the same. He says also that no nests could be found in this place in 1931, although several pairs were seen. In that year there was a period of bad weather, and when that cleared up on 13 July, the birds seemed still to be only in the pairing stage.

Løvenskiold saw one bird on Danskøya on 1 July, 1949, a second on Amsterdamøya on 2 July and a third on the shore of a lagoon in Breibogen, south of Biskayerhuken on 8 July, 1949. That year snow covered the ground until the middle of July, and in consequence very few birds, and apparently no Sanderlings, bred on Reinsdyrflya.

S e c t i o n VIII. W i j d e f j o r d e n. — Longstaff relates that on 19 August, 1923, about a dozen Sanderlings were seen in Wijdefjorden on the west side, feeding on a mud-flat in a tidal lagoon. Afterwards, eight birds were flushed from dry, stony ground, and later four more were flushed in the same place. These birds were all very wild and flew north.

S e c t i o n X. N o r d a u s t l a n d e t. — Glen says that on 3 June, 1936, a Sanderling was seen in Brennevinsfjorden. This is the first and only record for Nordaustlandet.

S e c t i o n XI. S t o r f j o r d e n. — Walter saw one Sanderling on Kong Ludvigøyane, to the SW of Edgeøya, between 12 and 14 July, 1889.

Biological

M i g r a t i o n. — Very little is known about the migration of the Sanderling in the Svalbard area. Assuming that birds seen before 16 June are on the spring migration, there are three records: single birds were seen on Nordaustlandet on 3 June, 1936, on Forlandsøyane on 13 June, 1910, and in Adventfjorden on 15 June, 1908.

Similarly if 14 August is taken as the beginning of the autumn migration, there are six records as follows: one bird on Amsterdamøya on 15 August, 1898, two birds at Kapp Martin on 16 August, 1949, 24 birds in Wijdefjorden on 19 August, 1932, flocks of young birds in Sassendalen on 16 August, 1950, three birds on Amsterdamøya on 21 August, 1888, and about 15 birds in Sassendalen on 24 August, 1950. This is all that is known at present about the migration of the Sanderling in the Svalbard area, and more and better information on the subject is badly needed.

B r e e d i n g. — On a few occasions this rare bird has been found breeding in Spitsbergen. The following notes are taken from the papers of Longstaff (407 : 485), Montague (433 : 142), and Dalgety, McNeile and Ingram (470 : 249), and deal exclusively with what is known about the Sanderling in Spitsbergen.

Display. When courting, the male rises up to fifteen feet into the air, then makes a short, steep, downward flight, simultaneously uttering a loud "churring" noise. This noise is very like that of the Grasshopper Warbler, but is much more resonant. The male also chases the female or a rival male at great speed and for considerable distances, uttering a high harsh note, a loud and angry "chert-chert-chert . . .". When on the ground, the male runs round the female with puffed-out feathers and drooping wings, making a lower "chert-chert . . .", which is quite a soft sound without any trace of anger (Dalgety).

Description of the nest. No nest was found more than half a mile from the sea. One nest was placed on bare red stony earth and not concealed in any way by vegetation (Longstaff). "Nest round and deep, on small, bare patch of clayey soil." (Montague)

Two nests were found nearly half a mile from the sea on flat ground composed of shingle and damp silt, which was covered so sparsely with vegetation that there were many patches of bare ground. The vegetation consisted mainly of *Saxifraga oppositifolia, Papaver radicatum, Silene acaulis* and grass. A third nest was situated in a small patch of *Saxifraga oppositifolia* and lichens on a bare stony hillside almost devoid of vegetation. The fourth nest was 300 yards from the sea on flat peaty ground, where the vegetation included *Saxifraga oppositifolia, Oxyria digynia, Cerastrium alpinum* and grass. The fifth nest, on rather rough broken ground of a very dark appearance, was situated on a cushion of dark grey-green moss and partly-dead *Saxifraga* and Arctic Willow (Dalgety).

The scrape is 81 mm in diameter, 64 mm deep, unless bare stones are reached at a lesser depth. The nest-cup is filled almost to the brim with dry Arctic Willow leaves, and the completed nest is very shallow. "The eggs lie on their sides" (Dalgety). In one instance the eggs were more than half buried in the lining material, the points being placed almost vertically downwards (Longstaff).

Nests are exceedingly difficult to find, because the bird will leave the nest while the observer is still two hundred metres away, and, as birds which are not nesting feed all over the tundra, much time is spent watching in vain (Dalgety).

Behaviour of the bird after leaving the nest. Montague says: "The sitting bird crept off as we approached, and then feigned injury in the usual manner. After leading us away by this device for some hundred yards, she changed her method; closing her wings and tail and hunching her shoulders, she ran along the ground in front of us in complete silence. Looking exactly like some small mammal [rodent run], she led us away for not less than a quarter of a mile, before taking wing."

Egg-laying and hatching. The egg-laying period of the Sanderling begins in Spitsbergen about the third week of June, two nests with fresh eggs having been found on 23 June and another on the 24th. Eggs near hatching point have been found on 13 July, and newly hatched chicks on 18 July and 3 August. If the incubation periods is 24 days, these clutches must have been completed on 19 June, 6 and 7 July respectively. Other clutches with fresh eggs have been found on 11 and 13 July, slightly incubated eggs on 9 and 28 July, and eggs incubated for a long time on 14 July.

From these records it appears that the egg-laying period can last from about 20 June to 15 July, depending on the weather. If snow covers the ground until 15 July, the birds will not breed at all; and this happened in 1949. Newly-hatched chicks have been found from 18 July to 3 August.

For a long time the Sanderling was suspected of breeding in Spitsbergen, but there was very little proof of this. Kolthoff shot a male bird with well-developed testes on 28 June, 1900, on Prins Karls Forland and this indicated that the birds were breeding there, but the first indisputable evidence of breeding was provided by Bruce in 1906.

In 1908 Professor Koenig saw and shot quite a number of Sanderlings in Vestspitsbergen, and in all of these birds, males as well as females, the sexual glands were fully developed. Le Roi says that no nests were found and that the species probably did not begin to breed until the expedition had left Spitsbergen. The birds were obtained between 15 and 26 June, and from the available information about the nesting time, it seems that le Roi was right.

Records of breeding in chronological order. Bruce found the Sanderling breeding on Prins Karls Forland in the summer of 1906 (272 : 153). Clarke states that Bruce found a Sanderling with her brood of young, a day or two old at the most, on 3 August, 1906. The birds were found in the north-east part of Prins Karls Forland, about a mile from the sea and about a hundred feet up on stony ground (a raised beach). The family was killed and presented to the Royal Scottish Museum. This is the first breeding record for the area (290 : 33).

Longstaff found a female and her nest with four moderately incubated eggs on 28 July, 1923, on Reinsdyrflya (407 : 485). Binney states that the nesting place found by Longstaff in 1923 was visited again in 1924, and one nest was found with eggs which were not taken (414 : 113). Montague also mentions this nest and says that it was found on 11 July, 1924 (433 : 142).

Dalgety and coll. state that two nests with four fresh eggs each were found on 23 June, 1930, somewhere in Isfjorden. On 27 June a third nest with one egg was found, and there were four eggs in this nest on the 30th. On Reinsdyrflya one nest with four slightly incubated eggs was discovered on 9 July, and another with four well-incubated eggs was found on 14 July; on 18 July, 1930, two newly hatched young were found (470 : 249). In another publication Dalgety says that he found a nest on 13 July 1930 on Reinsdyrflya. It was found close to a mark put up on the 4th, because he suspected a nest was there. On the 13th the eggs were on the point of hatching, and so they must have been there all the time, not far from the camp and in a place where people walked past them all the day (476 : 88, 89).

McNeile states that five clutches of Sanderlings' eggs were found on Reinsdyrflya in 1930, but in 1931 no nests could be found. Several pairs were seen during a spell of fine weather at the end of June, but a period of rain, driving mist, and snow followed, which made observation of such an elusive bird extremely difficult. When the weather cleared up on 13 July they seemed still only to be paired (483 : 87).

Thus the Sanderling is a more or less irregular breeder in Spitsbergen. In

some years several pairs breed, while in other years there are no nests to be found at all. As stated above, 1931 was one of those years, for it is not likely that the birds have laid their eggs after 15 July.

In 1949 the ground in this area was snow-covered to a very great extent, and with the exception of a single bird, no Sanderlings could be found.

Between 15 and 25 August, 1950, Løvenskiold found a great number of young birds of the year at the head of Sassenfjorden. As these birds still had some down at the nape and also under the tail, they probably did not come from far away, and it seems reasonable on this evidence to assume that they were bred somewhere in Spitsbergen, perhaps even in Sassendalen.

To find whether in fact the Sanderlings were breeding here, the valley was visited again in 1954, in the last week of June, but not a single Sanderling was seen (1954, 633). Blurton Jones, however, found two adult birds and a small chick five miles up the valley on 15 July, 1957. The first of the adults did the "rodent run", shortly afterwards another flew up and did the same, and then the small chick was found (1959, 652).

F o o d. — Le Roi examined the stomachs of 12 Sanderlings and found: in all the birds, small stones the size of hemp-seed; in 10 birds the remains of molluscs; in some of them fragments of sea-weed and moss; in one individual nothing but moss, and in another small seeds and the flower of a phanerogamic plant. He concludes that the food consists mostly of animal matter (316 : 170).

No. 48. *PHALAROPUS FULICARIUS* (L.)[1]

The Grey Phalarope

Geographical distribution

In Europe the Grey Phalarope breeds in Iceland (locally), Svalbard, and Novaya Zemlya, and in Asia from the Yamal Peninsula across Siberia and on the New Siberian Islands. In America it breeds from N Alaska to Melville Isl. and Ellesmere Land in the north, to the Yukon delta, N Mackenzie, Southampton Isl. and Hudson Bay in the south. According to Salomonsen it also breeds in Greenland on the east coast from Germania Land towards the south to Scoresby Sound, and on the west coast from the Upernavik District south to Disco Bugt (588 : 254).

On migration the Grey Phalarope is sometimes found on inland lakes in Europe, on the North Sea, the Atlantic coasts and the Mediterranean.

As regards the winter-quarters of the species, Meinertzhagen says that the Grey Phalaropes winter in the northern Indian Ocean off southern Arabia (421 : 333). (He is presumably referring here to a section of the Euro-Asiatic population.) From the Atlantic Ocean west of Africa he has only a few winter records and he thinks that "There is probably another as yet undiscovered winter resort off the West African coast." See also G. C. Low (525 : 866).

[1] Contour map showing distribution, see backflap.

The "Handbook of British Birds" states that the birds winter in the S Atlantic and off the coast of W Africa, but the areas of sea south of the Arabian coast and south of the Persian Gulf are not mentioned. Nor is there any mention of the exact location of the Grey Phalaropes' winter resort. See, however, P. R. Lowe (339 : 40).

Now the distance from the Gulf of Guinea to the Cape of Good Hope is approximately 2,400 nautical miles (about 4,400 km) and the birds have been met with all along this stretch of sea. For this reason the exact wintering position of the Spitsbergen birds is still more or less unknown.

The birds mentioned by Wynne-Edwards off the coast of N America probably all originate from Greenland and arctic America (512 : 295). However, the birds seen in winter off the W African coast may be the breeding population from the Svalbard area and also east of Svalbard.

There are some excellent records relating to Grey Phalaropes seen in the winter in the S Atlantic Ocean. W. P. Lowe saw many thousands on migration far out at sea along the W African coast, and he also saw them in the region of Madeira, the Canary and Cape Verde Islands, and from there through the Gulf of Guinea southwards to the Cape of Good Hope (556 : 103). Vedel-Tåning saw over a thousand birds of this species off the W African coast on 14 March, 1930 at 6° 55′ N, 18° 3′ W, midway between Cape Blanco and Cape Verde (498 : 132).

Occurrence in Svalbard

The species breeds on Bjørnøya. In Spitsbergen it is most numerous on the west coast, but it has been found in all parts of the Svalbard area with the exception of Kvitøya and Hopen.

Outside Vestspitsbergen it has been found breeding on Nordaustlandet, on Barentsøya and the islands in Storfjorden.

First records

The species was first recorded from Spitsbergen in 1837, when Lovén saw a pair of Grey Phalaropes on 24 June on one of the islands (Lovénøyane) in Kongsfjorden (51 : 37.38). The next year Sundevall saw the species in Bellsund between 25 July and 5 August (52 : 126).

Wolley mentions a specimen from Spitsbergen in 1855 (66 : 17) and another one found there two years later (71 : 18).

The first record of breeding is mentioned by Malmgren who records that Professor Lovén shot a female with an egg in its oviduct in Isfjorden on 10 July, 1837 (94 : 388). In another paper he mentions that Dunér found a nest with three eggs somewhere in Bellsund at the end of July, 1864 (92 : 384).

The northernmost point at which the species has been found in this area is mentioned by Collett and Nansen who state that on 10 June, 1896, in latitude 83° 1′ N and 250 km N of Spitsbergen, two specimens (♂ & ♀) were shot by Mr. Juell on board *Fram,* Fridtjof Nansen's ship (237 : 45).

Distribution. Sections I–XIII

Section I. Bjørnøya. — The Grey Phalarope was found on the island for the first time in 1907. The first breeding record is from 1922, and at the present time the species breeds regularly in small numbers in the NE part of the island.

Section II. Hornsund. — In this area the birds breed mostly on the islands, but they also breed on Øyrlandet, the SW point of the mainland, and in a few other places.

Section III. Bellsund. — Grey Phalaropes breed on the coast between Kapp Borthen and Kapp Lyell; they also breed on Reinholmen in Recherchefjorden, in Van Keulenfjorden, on Akseløya and on Mariaholmen. They have been observed at Sveagruva at the head of Van Mijenfjorden and at Kapp Martin at the entrance to Bellsund on the north side.

Section IV. Isfjorden. — In Isfjorden the Grey Phalarope has been found in many places, but the authors have not always given the exact locality of their observations. The birds have been found breeding in the following places: Kapp Linné, Festningen, Grønfjorden, Colesbukta, Adventfjorden, Sassendalen, Gåsøyane (in 1957), Kapp Thordsen and Bohemanneset. They are reported to have been present, but not breeding, at Kapp Starostin, Diabasodden, Kapp Wijk and on Coraholmen in Ekmanfjorden.

Section V. Prins Karls Forland. — The species breeds both on Forlandsøyane and on Forlandet itself, where it has been found on the west coast opposite Forlandsøyane.

Section VI. Kongsfjorden. — In this fjord the birds breed in fairly large numbers on Lovénøyane, and several pairs breed on Gerdøya. They also breed on Brandalpynten near Ny-Ålesund. The birds have been seen, but not found breeding, on Blomstrandhalvøya and in Krossfjorden only in one place, i. e. Signehamna.

Section VII. NW Spitsbergen. — The birds have been seen on the island Moffen, in Breibogen south of Biskayerhuken, on Reinsdyrflya and at Gråhuken, but they are not known to breed in these places. They do breed, however, on Albertøya near the NE corner of Danskøya, in Sallyhamn in Birgerbukta, and on the islands in Liefdefjorden.

Section VIII. Wijdefjorden. — In this fjord the species has not been found breeding, but it has been seen at Bjørnnesholmen in Austfjorden, in Mosselbukta and at Verlegenhuken.

Section IX. Hinlopen. — Grey Phalaropes have not been found breeding in the strait, but they have been seen in Sorgfjorden, in Lomfjorden and on one of the islands Vaigattøyane.

Section X. Nordaustlandet. — The birds have been found on Oxfordhalvøya in Wahlenbergfjorden and in other places in the fjord, on Gyldénøyane, on Lågøya, on Langgrunnodden, in Pentavika, in Detterbukta and elsewhere in Murchisonfjorden, where they also have been found breeding.

Section XI. Storfjorden. — In Storfjorden the species has been found breeding on Barentsøya, Kong Ludvigøyane and on Ryke Yseøyane. It has been found in Kraussbukta, at Kapp Lee, on Zieglerøya in Tjuvfjorden and

in other places on Edgeøya, and has also been observed on Tusenøyane.

Section XIII. Kong Karls Land. — A single bird has been seen on Kongsøya.

Biological

Migration. — If the conditions are favourable the Grey Phalaropes arrive in Spitsbergen as early as the last week of May. The main flocks begin to arrive at the beginning of June, and the last birds arrive about the middle of June.

The earliest recorded arrival is from Murchisonfjorden on Nordaustlandet where Glen saw the first Grey Phalarope of the year on 23 May, 1936 (520 : 299). The majority of the birds arrived at the beginning of June (521 : 304). In 1938 the trapper Arthur Oxaas, wintering at Kapp Wijk in Dicksonfjorden, saw two birds on 27 May (1937/38, 643). Walter saw the first bird of the year on Edgeøya on 29 May, 1889. On 1 June, six more birds arrived and several others came on 4 and 5 June (169 : 238). Kristoffersen observed the first birds in Hornsund on 30 May, 1924 (432 : 191).

Chapman records that Pike saw a single bird on Edgeøya on 3 June, 1889 (195 : 350), and on this date Kristoffersen saw the first birds on Sørkappøya in 1930 (472 : 254). Kjellman saw a fairly large number of Phalaropes arriving in Mosselbukta in the first week of June, 1873 (135 : 271). Peder Åm recorded the first Phalarope in Ny-Ålesund on 7 June, 1937 (1936/37, 646). Kolthoff saw several Phalaropes on Dunøyane on 9 June, 1900. The islands were then snow-covered (250 : 26). Alfred Svendsen saw the first Phalarope of the year in Lomfjorden on 11 June, 1929 (1928/29, 644 a).

Le Roi relates that Professor Koenig visited Isøyane on 13 June, 1908, Adventfjorden on the 15th and Colesbukta on the 16th. In all three places the birds were numerous, but they were not breeding, having possibly arrived only a few days earlier (316 : 171). Munsterhjelm found many Phalaropes when he visited Forlandet on 13 June, 1910 (313 : 14), and Malmgren states that the birds arrived in Sorgfjorden in the middle of June, 1861 (85 : 101).

The autumn migration begins early. Løvenskiold observed a fairly big population on Dunøyane from 14 to 20 July, 1952. To begin with there was a preponderance of females, but by 20 July the birds present were mostly males. Many of these seemed just to have arrived from the north (615 : 55). On the island Sørkappøya, where the Phalaropes bred in numbers in 1930, Kristoffersen did not see a single bird after 20 July (472 : 254). Løvenskiold saw 24 birds at Kapp Linné on 24 July, 1948, but the next day only 4 were left. In 1950 he saw only one bird on Sørkappøya on 25 July.

Longstaff found the Grey Phalarope to be surprisingly scarce on Reinsdyrflya in August 1923. Where they had been abundant in June and July in 1921, not a single bird was seen either on 28 July or between 21 and 24 August in 1923 (407 : 487).

In Sallyhamn in Birgerbukta (south of Norskøyane) where Løvenskiold had found the birds breeding at the beginning of July, none were left when the place was revisited on 29 July, 1949.

Binney saw a single Phalarope on 1 August, 1924, on one of the islands Gyldénøyane in Hinlopenstretet (413 : 184).

Mathey-Dupraz saw one bird on Blomstrandhalvøya in Kongsfjorden on 2 August, 1911, and another the next day in Signehamna in Krossfjorden (333 : 99).

At Brandalpynten near Ny-Ålesund in Kongsfjorden, where Løvenskiold had found Phalaropes to be abundant in June, not a single bird was seen on 3 August, 1949.

When Løvenskiold visited Dunøyane on 5 August, 1950 not a single Phalarope was seen.

Longstaff saw 4 birds feeding on one of Vaigattøyane in Hinlopenstretet on 5 August, 1923 (407 : 487). At Kapp Linné in Isfjorden G. and T. Sætersdal shot 3 birds on 6 August, 1947 (574 : no. 10436). Dalgety saw a flock of 8 birds on Edgeøya on 7 August, 1927. The birds were all in different stages of plumage (442 : 28). On the islands Tusenøyane in Storfjorden, Newton saw 3 male birds on 8 August, 1864 (96 : 215). Van Oordt saw the last Phalarope of the year on Bohemanneset in Isfjorden on 14 August, 1921 (370 : 155). At Kapp Martin in Bellsund, Løvenskiold saw one bird on 5 August, another on the 8th and 2 young birds on 17 August, 1949. On Edgeøya Walter records that by 18 August, 1889, the birds had disappeared from Kraussbukta (169 : 238). Römer and Schaudin say that the autumn migration had begun on the islands Ryke Yseøyane (east of Edgeøya) on 19 August, 1898 (246 : 103). The last Phalarope of the year was seen by Løvenskiold at Kapp Martin in Bellsund on 20 August, 1948.

In his paper "Further notes from Spitsbergen", Montague says: "The majority had left Spitsbergen by the beginning of September." (433 : 142) This may perhaps be a misprint for August, as nobody else seems to have seen a Phalarope in Spitsbergen later than 20 August. In fact they seem to leave on the autumn migration in the last half of July; small flocks and stragglers are found in the first half of August and by the third week of this month there are very few left.

G e n e r a l h a b i t s. — The Grey Phalarope is a pelagic bird, coming on land only in the breeding season.

In Spitsbergen it is mostly found on ponds, tarns, and small lakes situated on wet or boggy ground. Sometimes it has also been found in more arid places, with the nearest freshwater ponds at a considerable distance from the nesting site, but this is exceptional.

They are often found in small colonies, the biggest one I have seen consisting of 25 pairs. In the colony area, the birds fly back and forth to the various tarns where they feed, and they also go frequently to the sea where they feed close to the shore. They are very swift on the wing, flying extremely well. It is perhaps surprising, therefore, that swimming on ponds or on the sea they are not at all shy and will allow a person to approach very close to them.

Feilden, who observed the Phalarope bathing says: "The bird was standing in shallow water and with its wings raised and meeting above the back, skipping and flickering." (189 : 87)

Römer and Schaudin say that as long as the young are covered with down, they are unable to swim (245 : 103). Løvenskiold, however, saw that they were capable of swimming as soon as they were dry after hatching (615 : 54).

Kolthoff observed that when the land (islands) was covered with snow, the Grey Phalaropes spent most of their time on the sea along the shore, making occasional trips to the bare spots where the snow was melted (261 : 47).

Sometimes they drive other birds away from their young. Bertram and Lack saw the male at one nest repeatedly chasing an Arctic Tern away from the young, and once the same male swooped at an Arctic Skua (488 : 296).

The male will apparently not allow the female to approach the young. Løvenskiold saw on two occasions how a female would fly up to a male tending small chicks. He would then run or half fly towards her, beating her with his wings until she retreated.

B r e e d i n g. — Pairing takes place shortly after the birds have arrived in Spitsbergen. The female is the aggressive member of the pair. She will court the male and drive off other females. Sometimes she is assisted in this by the male, but his attacks are less energetic than hers.

Kristoffersen describes the courtship display as follows: "When they were pairing they remained long periods on the wing, sometimes rising to a great height, and then dropping like a stone until they were close to the ground" (432 : 191).

In *Phalaropus fulicarius* the copulation takes place on dry ground, in *Phalaropus lobatus* on the water. The spinning round on the water is no courtship pattern.

When breeding the Grey Phalarope quite often seeks the protection of the Arctic Tern and will then breed in the middle of, or at least near, the Arctic Tern colonies. However, Munsterhjelm found several nests on a small island near Salpynten, the south point of Prins Karls Forland, and in three nests the eggs were broken. The holes in them corresponded exactly with the size of a tern's bill (313 : 15). Løvenskiold found them breeding in tern colonies at Kapp Linné, Hotellneset in Adventfjorden, on Brandalpynten in Kongsfjorden, and at Sallyhamn south of Norskøyane (615 : 56). Other places where they are known to breed in tern colonies are. Hermansenøya in Forlandsundet, Dunøyane, and Sørkappøya. On Sørkappøya Kristoffersen found them breeding in great numbers among the terns (472 : 254).

Longstaff says that they are found not more than a mile from the sea, not more than 50 feet above sea-level, and are as common on the mainland as on islands (407 : 487).

The nest is often placed near a freshwater pond and it may be situated in a tussock in the water. More commonly, however, the nest is placed in high dry grass of the previous year's growth, either close to the water's edge, or at a distance of 20 to 40 metres from the edge of the ponds. The nests are mostly very deep, the old dry grass almost completely hiding the sitting bird. The blades of grass forming the nest-cup are often interwoven, but otherwise there is no lining in this sort of nest. In two nests Løvenskiold found the bottom of

the nest covered with small flattish stones, of which the largest was the size of a thumbnail.

When not placed in the grass, the nest is usually a scrape in the turf or in the soil. This scrape can be very shallow, but it can also be very deep indeed. It is then sooner or later lined with a cushion consisting of small bits of lichen. Dalgety and coll. speak of scrapes in the tundra, lined with leaves of *Salix*. In Murchisonfjorden, they say, the eggs were merely laid on the bottom of deep frost-cracks on the bare dry mud or in a scarpe on bare shingle (470 : 252).

On Sørkappøya a nest on shingle without any trace of lining was found by Løvenskiold in 1950. This kind of nest was also found by Dunér in Van Keulenfjorden in the summer of 1864 (98 : 55).

The nests mentioned by Dalgety (1931), were scrapes lined with leaves, but such nests can also be without any lining, and those found by Munsterhjelm on Forlandet, in 1910 for example, were just shallow scrapes in the turf. Munsterhjelm also found a nest which was only a shallow depression in a heap of sea-weed (313 : 14). A similar nest is mentioned by le Roi. On Dunøyane in 1908, he found a single egg in a small depression on the still soft and evil-smelling heap of sea-weed cast ashore by the waves. Very often, according to le Roi, the border of shingle along the shore is chosen as a nesting ground, the nests being placed on the inner side of the belt of stones where the vegetation begins. Its shape depends upon the amount of space between the stones amongst which it is placed, and a nest of this type is always lined with lichens and moss. Le Roi seems to have found more nesting material in the nests he examined than is usual for the species, and the material used included *Cladonia rangiferina,* stems of *Saxifraga caespitosa* and other Saxifrages, shafts of fairly long feathers, hairs of the Arctic Fox and small flattish stones (316 : 174).

The Grey Phalarope's nest is almost always placed in the vicinity of small freshwater ponds, but they can sometimes also be found where these are non-existent. Løvenskiold found two nests on two different islands in Kongsfjorden in 1956. These were placed on absolutely dry ground on hillsides among clumps of *Cassiope tetragona,* which completely hid the nest and the sitting male bird. There was no fresh-water in the vicinity of either of the nests (1956, 633).

The clutch normally consists of four eggs. In many cases where there are only two or three eggs, the missing ones will probably have been taken by skuas or other birds. Le Roi says that pieces of eggshell from the missing eggs were almost always present somewhere near the nests, and with this I agree. On one occasion on Dunøyane on 26 June, 1908, he found a nest with six eggs. Although these eggs matched one another completely in colour and size, le Roi thought that they must have originated from two females.

The time for egg-laying is dependent on climatic conditions. When the snow melts early in the year, egg-laying begins about 10 June; but if snow still covers the ground as late as 10 July, no nesting takes place and the birds become automatically non-breeders.

Normally clutches containing newly-laid eggs can be found up to 10 July,

but after that date only a few clutches in different stages of incubation have been found. One clutch of four well-incubated eggs has been found as late as 29 July.

About 1 July, normally, the young birds hatch. As it probably takes about twenty days for them to become fully fledged, this corresponds very well with the conclusion that the majority of the birds leave Spitsbergen about 1 August.

In some instances hatching may take place some days earlier, the first newly hatched chick having been found on 26 June. In this nest the first egg must have been laid as early as 5 June or thereabouts. On the other hand, newly hatched chicks have been found as late as 6 August. In this case there were only two young, and the first clutch had probably been destroyed. Half-grown, or almost fully fledged young birds have hardly ever been mentioned in the ornithological literature from Spitsbergen, and there is only one record of half-grown chicks, these having been found on 24 July.

F o o d. — The Grey Phalarope is often seen feeding on the sea, and in the shallow water along the shore, but it seems to feed mainly on shallow freshwater ponds. Longstaff says it feeds "on the sea, on the shore, on tidal lagoons, on shallow freshwater ponds and swamps on low land" (407 : 487).

When feeding they swim about in a manner reminiscent of the Moorhen, constantly picking things out of the water. They also sometimes spin round on the surface just as the Red-necked Phalarope does, possibly to induce their prey to move, so that it can be more easily seen.

The Grey Phalarope is known to eat algae. Chydenius found them feeding on not fully developed *Nostoc commune* in Sorgfjorden at the beginning of July in 1861 (89 : 138). Malmgren made the same observation on Depotholmen in Murchisonfjorden in 1861 (85 : 101). Newton states that they lived on *Diptera* (gnats and larvae) (96 : 506). Walter mentions freshwater algae and grass-seeds (169 : 241). Heuglin says that they live on small flies and their larvae, possibly also on spiders and molluscs. In the stomachs of the birds he shot he also found quantities of small stones (quartz) (132 : 121). Quennerstedt found pieces of snail-shell in the stomachs he examined (81 : 21). Trevor-Battye says that they live on mosquito larvae (203 : 589), and Römer and Schaudin mention *Crustacea* (245 : 68).

The most thorough investigation is that described by le Roi. Of 65 stomachs examined, 7 were empty of food and contained only small stones, the size of hempseed, which were almost always found, often in considerable quantities, and only 8 stomachs contained no stones. In 39, *Crustacea* were found. (In Vestspitsbergen these were mostly *Gammaridae,* in the east *Ostracoda.)* Twenty-seven stomachs contained molluscs, 9 larvae of *Diptera,* 3 *Arachnida* and 2 *Annelida;* in addition one spider and one beetle (*Orchestes salicitea*) were found. Thirteen stomachs contained algae and 1 moss (316 : 177).

Montague saw Grey Phalaropes feeding on *Lumbricillus aegialites* in early July (433 : 142). Summerhayes and Elton say that they act as a big check on aquatic flies (397 : 251, 255).

Table 19
Egg-laying

Date	No. of nests	No. of eggs	Condition	Place	Author
15 June 1931	many	?		Bellsund	Tomkinson (485: 81)
16 » 1930	1	4		Sørkapp Land	Kristoffersen (472: 254)
18 » 1924	many	?		Dunøyane	Kristoffersen (432: 191)
19 » 1900	1	4		Colesbukta	Kolthoff (250: 50)
19 » 1910	1	3		Forlandet	Munsterhjelm (313: 14)
19 » 1910	1	4		Forlandet	Munsterhjelm –»–
20 » 1930	1	1	fresh	Sørkapp	Kristoffersen (472: 254)
21 » 1910	1	2		Forlandet	Munsterhjelm (313: 14)
21 » 1910	2	3		Forlandet	Munsterhjelm –»–
21 » 1910	2	4		Forlandet	Munsterhjelm –»–
21 » 1931	many	?		Grønfjorden	Tomkinson (485: 83)
23 » 1910	1	4		Forlandet	Munsterhjelm (313: 14)
23 » 1931	many	?		Isfjorden	Tomkinson (485: 84)
24 » 1909	1	1	fresh	Dunøyane	Haag (293: 102)
26 » 1908	1	6	fresh	Dunøyane	Le Roi (316: 171)
26 » 1908	1	2	fresh	Dunøyane	Le Roi –»–
27 » 1908	2	3	fresh	Dunøyane	Le Roi –»–
27 » 1908	1	2	fresh	Dunøyane	Le Roi –»–
26 » 1931	many	?		Isfjorden	Tomkinson (485: 84)
26 » 1910	1	4	fresh	Forlandet	Munsterhjelm (313: 14)
27 » 1898	many	?	fresh	Kong Ludvig-øyane	Römer und Schaudin (246: 103)
27 » 1898	1	1	fresh	?	Kolthoff (261: 47)
27 » 1921	1	4		Isfjorden	Van Oordt (370: 155)
28 » 1954	1	3	fresh	Sassendalen	Løvenskiold (1954, 633)
28 » 1910	1	4	slightly incubated	Forlandet	Munsterhjelm (313: 14)
29 » 1910	1	3	slightly incubated	Forlandet	Munsterhjelm –»–
29 » 1910	1	3	slightly incubated	Forlandet	Munsterhjelm –»–
29 » 1930	1	incomplete	fresh	Isfjorden	Dalgety (470: 251)
30 » 1898	many	?		Recherchefjorden	Kolthoff (261: 47)
1 July 1910	1	4	fresh	Forlandet	Munsterhjelm (313: 14)
1 » 1910	1	4	fresh	Forlandet	Munsterhjelm –»–
1 » 1950		1	fresh	Isfjorden	Løvenskiold (615: 57)
3 » 1894	1	2		Grønfjorden	Feilden (189: 87)
4 » 1890	1	4		Isfjorden	Nordenskiöld (178: 22)
4 » 1908	1	4	slightly incubated	Kong Ludvig-øyane	Le Roi (316: 175)
4 » 1908	1	4	well incubated	Kong Ludvig-øyane	Le Roi –»–
5 » 1908	1	2	fresh	Kong Ludvig-øyane	Le Roi –»–
5 » 1930	many		egg-laying started	Murchisonfjorden	Dalgety (470: 251)

Date	No. of nests	No. of eggs	Condition	Place	Author
6 July 1949	1	4		Sallyhamn	Løvenskiold (615: 58)
8 » 1898	1	3	incubated	Recherchefjorden	Kolthoff (261: 47)
9 » 1864	1	4		Isfjorden	Dunér (98: 55)
9 » 1900		1	fresh	Dunøyane	Kolthoff (261: 47)
9 » 1921	1	4		Isfjorden	Van Oordt (370: 155)
10 » 1837		1	fresh	Isfjorden	Malmgren (94: 388)
10 » 1930	many		egg-laying started	Sørkapp	Kristoffersen (472: 254)
12 » 1921	2			Isfjorden	Van Oordt (370: 155)
17 » 1870	many			Dunøyane	Heuglin (116: 60)
21 » 1864	1	4		Van Keulenfjorden	Dunér (98: 55)
29 » 1948	1	4	well incubated	Bellsund	Løvenskiold (615: 55)

Table 20

Hatching

Date	No. of nests	No. of young	Age	Place	Author
26 June 1931	1	?	newly hatched	Isfjorden	Tomkinson (485: 81)
1 July 1950	1	1	newly hatched	Isfjorden	Løvenskiold (615: 57)
1 » 1950	1	2	newly hatched	Isfjorden	Løvenskiold –»–
2 » 1930	1	?	newly hatched	Liefdefjorden	Dalgety (470: 251)
9 » 1932	1	?	newly hatched	Bjørnøya	Bertram and Lack (488: 296)
10 » 1950	many	many	3–5 days	Isfjorden	Løvenskiold (615: 56)
20 » 1932	1	?	newly hatched	Bjørnøya	Bertram and Lack (488: 296)
22 » 1932	1	?	newly hatched	Bjørnøya	Bertram and Lack –»–
24 » 1948	many	many	about 10 days	Isfjorden	Løvenskiold (615: 55)
27 » 1932	1	?	newly hatched	Bjørnøya	Bertram and Lack (488: 296)
6 Aug. 1956	1	2	5 days	Forlandet	Løvenskiold (1956, 633)

P a r a s i t e s. — Waterston found the mallophage *Trinotum anserinum* on a male bird shot on 8 July, 1921, in Liefdefjorden. He says, however, that *Trinotum* is not a regular parasite on this host (388 : 252).

No. 49. *PHALAROPUS LOBATUS* (L.)[1]

The Red-necked Phalarope

The first Red-necked Phalarope seen in Spitsbergen was shot by Mr. Kjell Kolthoff in Colesbukta in 1900.

The species was found breeding for the first time by Løvenskiold in Adventfjorden in 1949.

Occurrence in Svalbard

The only place in which this species has been found is on the south shore of Isfjorden.

Kolthoff records that his son Kjell shot a single specimen in Colesbukta on 23 June, 1900. The bird was in the company of a flock of Grey Phalaropes (250 : 56) and (261 : 48).

Le Roi says that a pair (♂ & ♀) was found in the delta of the river in Adventdalen on 30 June, 1907. Both birds were shot. The ovary of the female was well developed and presumably therefore the bird was in breeding condition (316 : 171).

Mathey-Dupraz states that several specimens were shot both in Adventfjorden and in Sassenfjorden in the summer of 1910 (311 : 46). The same author saw a pair in a brook on Hotellneset in Adventfjorden on 4 August 1911 (333 : 99).

Congreve saw a Red-necked Phalarope on Hotellneset in Adventfjorden on 28 June 1922 (599 a : 37).

Dalgety saw two pairs in Isfjorden in the summer of 1930 (470 : 252).

Løvenskiold says that at least three pairs were present on Hotellneset in 1949. A pair was shot there on 25 June and in the oviduct of the female there was a fully developed egg (615 : 59). In the summer of 1950 no birds of this species were present at Hotellneset, but a single female was seen at Kapp Linné at the entrance of Isfjorden on 10 July.

In 1954, Løvenskiold saw two pairs on a bog in Sassendalen on 29 June. Copulation was observed and presumably therefore they were going to breed there.

Copulation in this case took place on the water; in the other species, the Grey Phalarope, is takes place on dry land (1954, 633).

No. 50. *CATHARACTA SKUA SKUA* Brünn.

The Great Skua

There are about 11 different records of this species from the Svalbard area. As the bird is easily recognizable and because it has been shot at least twice and seen several times, one would suppose that all of the records referred to here are valid. The first is from 1898.

[1] Contour map showing distribution, see backflap.

Mathey-Dupraz claimed to have seen a Great Skua north of Bjørnøya on 18 July, 1910 (311 : 41, 51).

Løvenskiold saw the bird in Herwighamna on Bjørnøya on 8 July, and on the island in the lake Haussvatnet on 1 August, 1958 (1958, 633).

Kristoffersen shot an adult male bird on Sørkapp Land on 30 July, 1930 (472 : 251).

Løvenskiold saw a specimen in Hyttevika north of Hornsund on 29 July, 1952 (615 : 109).

Hartlaub says that Capt.-Lieut. v. Uslar shot a Great Skua on Reinholmen in Recherchefjorden on 25 July, 1898 (223 : 9) and (239 : 177, 189).

Le Roi relates that one bird was seen in Van Keulenfjorden on 23 June, 1907, and another in Kongsfjorden on 26 June the same year (316 : 195).

Blurton Jones relates that members of the Reading University Zoological Expedition to Spitsbergen in 1957 were told of a pair seen in Van Mijenfjorden, and saw two birds flying together in Sassendalen (1959, 652).

Bateson saw a specimen at Biskayerhuken on 30 June, 1957 (1957, 650).

Løvenskiold saw a Great Skua near Krosspynten in Wijdefjorden on 18 August, 1954 (1954, 633).

Römer and Schaudin saw a pair on Kong Karls Land during the summer of 1898, and also another pair on Storøya E of Nordaustlandet (246 : 137).

Kolthoff does not believe that either Dr. Hartlaub or Römer and Schaudin saw the bird. But Kolthoff did not see the species himself during the summer of 1898 (261 : 99).

No. 51. *STERCORARIUS POMARINUS* (Temm.)[1]

The Pomatorhine Skua

Geographical distribution

In Europe the Pomatorhine Skua breeds only on Novaya Zemlya and on the Kanin Peninsula, in Asia on Yamal and Gyda Peninsulas and along the coast from Taimyr Peninsula eastwards. In N America it breeds on Point Barrow, on several of the Canadian arctic islands and in Greenland. It migrates chiefly offshore through the Atlantic and Pacific to wintering areas off the W coast of Africa, E coast of Australia and W coast of America.

In Norway the bird is mainly seen in the autumn and winter. It is then chiefly found along the coast; ordinarily only a few are seen, but in some years it con be numerous. Such years were 1834, 1837, 1874, 1876–1877, and 1879. In 1912 it was very numerous on migration from September to November, and in some instances more than one hundred birds were seen together. The bird came again in 1924, 1925 and 1926. This last year was a lemming-year.

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[1] Contour map showing distribution, see backflap.

Occurrence in Svalbard

The species has never been found breeding in Svalbard. Generally it passes over Vestspitsbergen and the other islands while on the autumn migration, though it has also been observed a few times during the summer-time. During the spring migration there are no records from Svalbard, and the reason is perhaps that the trappers do not know the difference between this species and the more common Arctic Skua. It is also possible, however, that the bird does not visit Spitsbergen on the migration north.

With the exception of Kongsfjorden, Wijdefjorden and Kvitøya, this skua has been observed in all districts of Svalbard.

Birds in aberrant plumage

The dark phase. — In only three instances have dark birds been recorded from the Svalbard area.

Le Roi relates that a specimen belonging to the dark phase was shot on Bjørnøya on 14 July, 1907 (316 : 196).

Longstaff saw a pair of these birds in Ulvebukta on the south side of Nordaustlandet on 7 August, 1923. One of them belonged to the dark phase. Two days later he saw another dark bird at sea to the south of Nordaustlandet (407 : 491). See also Southern (564 : 1–16).

First records

Parry did not see the birds in Spitsbergen in 1827. The only specimen seen on the expedition flew past the boats in latitude 82° N (46 : 196). Malmgren, who did not see the bird in Spitsbergen in 1861, denies that the bird was seen either by Captain Parry or any of his officers. He says that he would just as soon believe that Scoresby saw the bird there (85 : 117). But Scoresby mixes up two distinct species viz. the Arctic Skua and the Long-tailed Skua. He does not mention any observation of the Pomatorhine Skua at all (40 : 534).

A few years afterwards Malmgren saw the species several times on his journey south, between Bjørnøya and Spitsbergen in September 1864. Malmgren was also informed by Professor Newton that he had seen the bird in Spitsbergen at the end of July in 1864. These are the first absolutely reliable records for the Svalbard area.

Distribution. Sections I–XIV

Section I. Bjørnøya. — The bird has often been seen on the sea around the island, especially in the autumn, but it has also been observed on the island during the summer. At least in one instance the birds behaved as if they were breeding.

Section II. Hornsund. — The species has been found on the mainland not far from the entrance to the fjord Hornsund, on Dunøyane, in the ice west of the district and at sea to the south of Sørkapp.

Section III. Bellsund. — The only place where the species has been observed in this district is at Kapp Martin on the north side of the entrance to Bellsund.

Section IV. Isfjorden. — The bird has been seen in Grønfjorden, in Sassendalen and on Bohemanneset.

Section V. Prins Karls Forland. — The bird has been seen once on Forlandet.

Section VII. NW Spitsbergen. — The species has been seen in Magdalenefjorden and in Liefdefjorden.

Section IX. Hinlopen. — On a single occasion several individuals were seen in this strait.

Section X. Nordaustlandet. — The bird has been observed on Storøya, in Ulvebukta, to the south of this bay, and in Olgastretet.

Section XI. Storfjorden. — On a single occasion a great number of birds were seen on the east side of Barentsøya.

Section XIII. Kong Karls Land. — The bird has been seen several times on these islands.

Section XIV. Hopen. — The species has been observed on and near the island.

Records from the sea around Svalbard

The North. — According to Collett and Nansen the species was seen repeatedly in the ice north of Spitsbergen in the middle of June, 1896. As a rule, small flocks of three to six birds were seen, but once as many as nearly 20 birds. On 19 June in latitude 82° 57′ N, one specimen was obtained. Another was shot on 21 June in latitude 82° 53′ N, out of a flock of 16 birds (237 : 50). See also "First records".

The South. — Dalgety travelled from Norway to Spitsbergen in August 1927. From Nordkapp (the North Cape) and almost to Edgeøya, this bird was very common among the ice. Once as many as seven of them were seen together (442 : 30).

Biological

Migration. — In the Svalbard area the species has been observed from May to September.

Munsterhjelm saw several of them west of Bjørnøya on 16, 19, and 20 May, 1910 (313 : 33). These may have been on migration north and east.

For June there are 6 records, two on the 8th, then on 9, 10, 17 and 30 June. From July there are only 4 records from the 2nd, 4th, 8th and 31st. From August there are 10 records, one on the 4th, two on the 5th, then on 6, 7, 9, 11, 12, 13 and 20 August. In September it has been seen 4 times, on the 6th, 9th, 13th and 15th.

The birds from June and July are probably, at least some of them, non-breeding stragglers. Kolthoff obtained 6 birds on Kong Karls Land during the summer of 1900. None of these had the sexual glands developed (261 : 102).

Walter says that the species was abundant in Olgastretet after the first days of August in 1889. But he could not see if any of them went south. In the night between 5 and 6 August he visited Kapp Barth on the east side of Barentsøya.

Here flocks of from 5 to 15 birds went north, but he could not understand why they should go in that direction at that time of the year (169 : 251).

When Dalgety went from Nordkapp in Norway to Edgeøya in August 1927, he met them wherever there was ice, and saw as many as 7 sitting together. These birds would have been on migration south.

Løvenskiold saw the species at Kapp Martin in 1948 and 1949, in both years in the first half of August. The birds came from the east and flew out to sea. They were also seen many times between Spitsbergen and Bjørnøya and also south of this island in the last days of August and the first days of September when the expeditions went south. All of these birds were flying south with a purposeful flight.

It is probable that a part of the population breeding east of Spitsbergen, especially on Novaya Zemlya, will go west to Spitsbergen in August and September and turn south from there.

Breeding

As mentioned before, the species has never been found breeding in the Svalbard area. There are, however, two records from Bjørnøya, which are quite interesting.

Swenander saw two birds near Kapp Elisabeth on 7 June, 1898. He shot one of them, the male, which had well-developed testes. Swenander could find no brood-patches on this specimen and therefore did not think that the birds were breeding (247 : 46).

Hencking found a pair close to a little tarn on Bjørnøya in the summer of 1900. The birds tried to lure him away from the place by shamming lameness. When they failed in this, they attacked in a very determined manner, so furiously indeed that they had to be shot. A nest could not be found (249 : 75).

No. 52. *STERCORARIUS PARASITICUS* (L.)[1]

The Arctic Skua

Geographical distribution

The species breeds in Europe from Jan Mayen, Franz Josef Land and Novaya Zemlya south to Iceland, the Færoe Islands, Scotland, Norway, Sweden, Finland and N Russia. In Siberia it is found in several places, especially along the great rivers, and it also breeds on the Commander Islands. It is found breeding in N America and in Greenland. The species winters on the sea in the southern hemisphere.

Malmgren thought that the Spitsbergen birds were different from the Scandinavian ones, and proposed the name *Stercorarius tephras* for the species (93 : 392). Newton, however, found the Spitsbergen birds to be identical with those from Norway and Scotland (96 : 510).

[1] Contour map showing distribution, see backflap.

Occurrence in Svalbard

The species is found on all the islands in the Svalbard area, and it has been found breeding in all districts with the exception of Kvitøya.

The colour phases of the Arctic Skua in the Svalbard area

In his paper "The Two Phases of *Stercorarius parasiticus* (Linnaeus)", Southern concludes: "... and the distribution pattern shows that dark birds are much commoner in the oceanic and southern areas, while in the high north and the continental areas of the range pale birds predominate, sometimes to the exclusion of the dark." (55) : 479)

For Svalbard this is absolutely valid, as dark birds are decidedly rare here. Since 1855, when the first one was observed, there have been 45 dark birds recorded from Svalbard (see table 21), and as seen on the map, they are evenly distributed over the area.

In restricted areas, where it is possible to count the pairs in the breeding season (as on Bjørnøya), there has once been recorded 0.95 % and another time 2 % dark birds.

Some authors have found the dark phase more frequent in the east than in the west of Spitsbergen. Walter says that both phases were found together in the Storfjord area, and that they increased in numbers at the beginning of August (169 : 251). It is quite obvious that these were birds on migration. Römer and Schaudin relate that the light phase was more common than the dark, which they had found to increase towards the east, i. e. Svenskøya on Kong Karls Land and Storøya (245 : 77). But these ornithologists are alone in their opinion of this. Heuglin found only a single dark bird in the east (132 : 317). Le Roi has recorded only a single dark bird from the east part of the area, and he is of the opinion that the dark phase does not breed regularly in Spitsbergen. He also relates a rather curious thing. Of the 68 light birds which were obtained, not a single specimen showed any traces of earlier wounds. But of the 4 dark birds, one had lost the left leg and another had lost the front toes on the left leg. He says that the dark birds must be more liable to be pursued than the light ones, but he does not reveal by whom (316 : 198).

Only in two instances has the dark phase been found nesting in Spitsbergen. Trevor-Battye obtained a dark bird from Akseløya in Bellsund, "where it was nesting". Of the breeding pair found here in 1896 one bird was light, the other dark (203 : 594). The second time, a pair consisting of the two phases was found on Dawespynten south of Selvågen on Prins Karls Forland by Løvenskiold. This pair had a single chick, perhaps ten days old, on 23 July, 1956. Both birds attacked furiously, especially the light one. Other instances where dark birds have bred have not been recorded (1956, 633).

In 1932, when three dark birds were found on Bjørnøya, there were in all 157 pairs breeding on the island, i. e. 0.95 % of the birds were dark phase. In 1948 four dark birds were found here. There were then 200 breeding birds on Bjørnøya, i. e. 2 % were dark phase.

The dark Arctic Skuas seen in Hornsund on 10 August, 1952, were a pair which came flying together.

Table 21

Distribution of the dark phase of Stercorarius parasiticus in the Svalbard area

No. of birds	Date	Place	Author
1	30 June 1855	Colesbukta	Evans and Sturge (72: 172)
1	1858	Bellsund	Quennerstedt (81: 23)
1	15 Aug. 1870	Freemansundet	Heuglin (116: 61)
1	23 June 1886	Russekjeila, Isfjorden	Kükenthal (163: 16)
1	30 July 1889	Ryke Yseøyane	Walter (169: 249)
1	1896	Akseløya, Bellsund	Trevor–Battye (203: 594)
1	25 Aug. 1897	81° 45′ N. lat. north of Spitsbergen	Andrée (461: 272)
1	1898	Kong Karls Land	Römer und Schaudin (246: 136)
1	1898	Storøya	Römer und Schaudin (246: 136)
2	1898	Kong Karls Land	Kolthoff (261: 71)
2	1907	Bjørnøya	Koenig (286: 130)
2	1907	Spitsbergen	Koenig (286: 136)
1	1908	Bjørnøya	Le Roi (316: 198)
1	1908	Isfjorden	Le Roi (316: 198)
1	1908	Kong Ludvigøyane	Le Roi (316: 198)
1	1910	Forlandet	Munsterhjelm (313: 33)
1	1910	Bellsund	Munsterhjelm (313: 33)
1	23 July 1910	Krossfjorden	Zedlitz (319: 308)
1	26 July 1921	Bohemanneset, Isfjorden	Van Oordt (370: 161)
1	15 Aug. 1923	Nordkapp, Chermsideøya	Longstaff (407: 491)
1	1930	Sørkapp	Kristoffersen (472: 251)
1	29 June 1930	Isfjorden	Dalgety (470: 254)
3	1932	Bjørnøya	Bertram and Lack (488: 298)
2	1936	Gråhuken	Jung (539: 133)
4	1948	Bjørnøya	Duffey and Sergeant (586: 560)
1	1948	Isfjorden	Løvenskiold (615: 106)
1	3 Aug. 1948	Kongsfjorden	Løvenskiold (615: 106)
2	10 Aug. 1952	Hornsund	Løvenskiold (615: 106)
1	30 June 1954	Sassenfjorden	Løvenskiold (1954, 633)
1	8 Aug. 1954	Wijdefjorden	Løvenskiold (1954: 633)
1	16 Aug. 1954	Wijdefjorden	Løvenskiold (1954, 633)
1	3 July 1955	Isfjorden	Pennie and Andrew (623: 58)
1	9 July 1955	Sassenfjorden	Pennie and Andrew (623: 58)
1	11 July 1956	Kongsfjorden	Løvenskiold (1956, 633)
1	23 July 1956	Forlandet	Løvenskiold (1956, 633)
1	21 Aug. 1956	Krossfjorden	Løvenskiold (1956, 633)

It seems that the dark phase is a relatively rare bird in the Svalbard area, and that the population of the light birds must be > 90 %.

First records

The first time the Arctic Skua is mentioned from Spitsbergen is in 1611, when Jonas Poole visited the islands. About the bird he writes as follows: ". . . and many other Fowles. Among which I noted the nature of one, which we called an Allen; who (like the great fishes, which eate up the small, or

like some great men, which devoure all the labours of the poore) when some smaller Birds have gotten any thing then he leaveth not beating of them, till they have cast up what they have eaten, which he laying hold of devoureth up: and so with little meate in their gorges, and few feathers on their backes, he leaveth them to get more, not for themselves but for him". (5 : 41) This is probably one of the first genuine descriptions of the Arctic Skua.

Martens saw the bird in Spitsbergen and gives a good description of the species (12 : 63). Phipps described finding the species on the coasts of Spitsbergen in 1773 (23 : 187). Pennant mentions the bird as an inhabitant of Spitsbergen (24, Vol. 2 : 530). Laing saw the species there in 1806 (31 : 112). Scoresby says that the species occurs in Spitsbergen. He describes how it pursues other birds and takes their food from them, as earlier authors have also written, but he adds that the bird also devours eggs and young of other birds (40 : 543). Mandt mentions the species among the birds he saw in Spitsbergen (42 : 4).

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — The species breeds on the island, but the number of breeding pairs seems to vary much in different years.

S e c t i o n II. H o r n s u n d. — The birds are very common and are found along the coast and in the valleys, and also on the islands when there is a suitable ground for their nests. In these places the pairs seem to be evenly distributed, and they also seem to stay here even if they are not breeding.

S e c t i o n III. B e l l s u n d. — Apart from a nest found once in Van Keulenfjorden, all other nests found have been around the entrance to Van Mijenfjorden, on Midterhuken, Måseneset, Akseløya and near the glacier Fridtjofbreen. From the coasts of Van Mijenfjorden and from the head of this fjord, there are but a few records. In the outer parts of the district, in Bellsund, Recherchefjorden and Van Keulenfjorden, there are many more observations, even if only a few nests have been found.

S e c t i o n IV. I s f j o r d e n. — The species breeds in Colesbukta, on Hotellneset near Longyearbyen, in Adventdalen, De Geerdalen, Sassendalen, at Kapp Schoultz in Tempelfjorden, Petuniabukta and Ebbadalen at the head of Billefjorden and at Bohemanneset. There are records, but not of breeding, from Kapp Linné, Festningen, Grønfjorden, Sassenfjorden, Gipsdalen, Gåsøyane, Brucebyen in Billefjorden, Skansbukta, Dicksonfjorden and from Hermansenøya in Forlandsundet.

S e c t i o n V. P r i n s K a r l s F o r l a n d. — The birds have been found breeding on Forlandsletta, on Dawespynten, and also in the north of the island at Fuglehuken and farther east. On Forlandsøyane they have been found, but not breeding.

S e c t i o n VI. K o n g s f j o r d e n. — The species has been observed in many places in Kongsfjorden and Krossfjorden. It has been found breeding at Kvadehuken, between Ny-Ålesund and the head of Kongsfjorden, on Blomstrandhalvøya, at Kapp Guissez at the entrance to Krossfjorden and in the vicinity of Signehamna in this fjord.

Section VII. NW Spitsbergen. — The birds have been seen, but no nests found, in Magdalenefjorden, on Moseøya in Sørgattet, in several places on Danskøya and on Amsterdamøya. They have also been seen on Albertøya, an islet at the NE corner of Danskøya, on Norskøyane, in Raudfjorden, Biskayerhuken, Breibogen, Reinsdyrflya and near Siktefjell in Liefdefjorden.

The species has been found breeding in Fuglefjorden south of Fugløya, on Arneliusneset south of Norskøyane, on the islands Stasjonsøyane and Måkeøyane and on Roosneset in Liefdefjorden. The bird has also bred on Gråhuken and on the island Moffen.

Section VIII. Wijdefjorden. — On the west side of the fjord there is normally at least one breeding pair at the mouth of each of the bigger valleys from Gråhuken and down to Krosspynten. On the east side they have been found breeding at Austfjordnes and in Mosselbukta. The birds have been seen all along the west side of Vestfjorden, on Ræstadholmen outside Krosspynten, at Kapp Petermann, on Gyllensköldholmane, in Zeipeldalen at the head of Austfjorden, Reinbokkdalen, Dirksodden and Verlegenhuken.

Section IX. Hinlopen. — The species has been observed in Sorgfjorden, Lomfjorden and on a ness below the mountain Eremitten. The bird has been found breeding on Tommelpynten, south of the entrance to Lomfjorden, and on Bastianøyane.

Section X. Nordaustlandet. — The species has been found breeding in Wahlenbergfjorden, at Sparreneset, Russøya, Depotøya, Celciusodden, Lågøya, Karl XII Øyane and on Storøya. The birds have been seen in Bodleybukta at the head of Wahlenbergfjorden, on Kållandodden, Vesle Tavleøya, Parryøya, Rossøya, Ekstremhuken, at the head of Rijpfjorden and at 650 m above sea-level in the middle of the glacier Vestfonna.

Section XI. Storfjorden. — The birds have been found breeding on Kong Ludvigøyane and in two places on Edgeøya, viz. on Kapp Lee and on Kvalpynten. They have been observed at Agardhfjellet, at the glacier Hayesbreen, in Ginevrabotn, on the east side of Barentsøya, at the eastern entrance to Freemansundet, in Kraussbukta, on Zieglerøya in Tjuvfjorden, on Negerpynten and on Ryke Yseøyane.

Section XII. Kvitøya. — There is one record from Kvitøya.

Section XIII. Kong Karls Land. — The bird has been found breeding on these islands.

Section XIV. Hopen. — The species breeds on the island.

Records of birds north of Spitsbergen

In the ice north of Spitsbergen, Parry saw a single Arctic Skua on 17 June, 1827, at 82° 3′ N, 23° 17′ E. North of this the species was not seen (46 : 78).

Andrée saw a specimen on 2 August, 1897, at 82° 25′ N, 29° E (461 : 272).

Biological.

Migration. — Not much has been written on the migration of the species, either in spring or autumn. From the few records that are available, however, it seems that the birds can sometimes arrive as early as 24 May, and that the

spring migration usually begins in the last days of this month. It probably lasts only for a few days and stops about 15 June. The earliest record originates from Kristoffersen, who saw an Arctic Skua in Hornsund as early as 12 March, 1924. The bird disappeared and the species was not seen again until the real spring migration in the last days of May. He says that the northward movement only lasted for a couple of days (432 : 190).

How early or how late the bird will be able to arrive depends of course upon the climatic conditions and especially upon whether snow is still lying on the breeding grounds or not. For the Arctic Skua, which is a pelagic bird, the snow in itself is no hindrance, as the bird can very well live on the ocean, but it will not come to land before the snow has disappeared.

In table 22 the dates for migration are put down as late as 15 June, because the species is known to have arrived as late as that. It is possible, however, that many of the birds arrived earlier than the dates for observation will show.

Table 22

Spring migration

Date	Place	Author
24 May 1930	Sørkappøya	Kristoffersen (472: 251)
25 » 1938	Selvågen, Forlandet	Normann Andersen (1937/38, 634)
28 » 1924	Hornsund	Kristoffersen (432: 190)
29 » 1889	Edgeøya	Walter (169: 241)
3 June 1937	Kongsfjorden	Peder Åm (1936/37, 646)
4 » 1930	Edgeøya	Alfred Svendsen (1929/30, 644a)
4 » 1935	Hopen	Børre Trøhaug (1934/35, 645)
6 » 1936	Nordaustlandet	Godfrey (529: 165)
10 » 1861	Wijdefjorden	Chydenius (89: 317)
10 » 1900	Grønfjorden	Kolthoff (250: 32)
11 » 1873	Mosselbukta	Kjellman (135: 88)
11 » 1905	Norskøyane	Mathey–Dupraz (333: 110)
11 » 1929	Lomfjorden	Alfred Svendsen (1928/29, 644a)
12 » 1897	Billefjorden	Conway (208: 9)
15 » 1890	Dunøyane	Klinckowström (172: 39)

The autumn migration is even more difficult to delineate than that of the spring. There is no doubt that Arctic Skuas begin their journey south as early as the first half of August. At that time it happens that new birds will arrive and disappear again, while the birds that have been breeding will continue to stay. It is, however, a difficult task to bring proof of this. The fact is probably that the adult non-breeding birds and possibly also immature birds will start on the journey southwards earlier than the breeders, which may stay right through September and even longer.

How long they will stay can possibly depend upon how many birds remain for them to pilfer from so late in the autumn.

In table 23 the dates for September are the only ones which have been taken into consideration.

Table 23

Autumn migration

Date	Place	Author
2 September 1921	Isfjorden	Van Oordt (370: 161)
3 » 1872	Mosselbukta	Kjellman (135: 88)
8 » 1868	Parryøya	Fries and Nyström (109: 147)
9 » 1827	Edgeøya	Keilhau (48: 138)
14 » 1870	Isfjorden	Heuglin (123: 274)
15 » 1882	Sassenfjorden	Cocks (151: 408)
26 » 1899	Hornsund	Bianchi (253: 307)
28 » 1929	Sørkapp	Kristoffersen (472: 251)
30 » 1882	S of Bjørnøya	Cocks (151: 442)

General habits

As the Arctic Skua gets its food by robbing other birds, it is fairly often found near bird-cliffs or more likely on plains where birds will pass on their way to and from their colonies on the cliffs. But if the conditions are good they will settle almost anywhere along the shores, as in most cases there is a sufficient number of birds for them to rob.

In most cases the pairs are widely distributed over the areas, and there can be several kilometres between the nests. But sometimes one can also find several pairs together in something that can resemble a colony, although with a fair distance between the pairs.

In the summer of 1956 Løvenskiold visited Kapp Guissez at the entrance to Krossfjorden in the company of Professor de Naurois. They found there nine pairs of Arctic Skuas within a rather small area, but the nests had a distance of about one kilometre between them (1956, 633).

In their territory the skuas will sit on a tussock or mossbank waiting until a bird comes in from the sea laden with food for its young, and will then attack. Sometimes they go out to sea, patrolling certain areas, or waiting on ice-bergs or ice-floes.

When somebody approaches the nest, one or both birds will come and soon begin to cry. If now the intruder comes closer to the nest one or both birds will settle on the ground, very often in such a position that they have the person between themselves and the nest. Here they will try to lure him away from their eggs or young by running about flapping their wings and crying. Sometimes they will even jump from the ground. If one follows the birds, one is led a long way before they take wing and disappear.

If the intruder goes on towards the nest the birds will attack. They go up in the air, turn, and then go straight for the head of their enemy, putting down their feet when they are close, but very rarely actually touching with feet or wings. In passing they go up, turn, and attack from the opposite direction. As mentioned they will seldom make an actual hit, but it may happen they strike off a hat with their feet.

If there are young in the nest they seem to be more furious than if there are only eggs. During the whole performance there is some crying going on, but when more skuas arrive to see what is the matter, loud cries are heard both from the nesting birds and from the neighbours. These, however, are in most cases driven away from the territory.

The Arctic Skua seems to be more or less dependent on other birds for food, and in Spitsbergen Løvenskiold never saw them fishing or in any other way trying to get their food directly. They attack other birds and strike them until they disgorge their food which the skuas usually take before it reaches the ground or the water.

The bird mostly preyed upon is without doubt the Kittiwake. But Black Guillemots and Little Auks are also sometimes pursued. When one of the two latter species is attacked the hunt goes on with a tremendous speed, usually with no success for the skua, as the birds immediately go for the sea where they dive. They are also said to pursue the Ivory Gull, which, however, should easily be able to evade the attacks. On occasions the Red-throated Diver also is preyed upon by these black marauders.

The first to describe their mode of hunting in Spitsbergen was Jonas Poole (5 : 41), and after him many a visitor to the islands has written upon the activity of this bird. Scoresby is the first to mention that it also takes and devours eggs of other birds in the area (40 : 534). Eaton writes: "Foxes, dogs and deer, are objects of their most inveterate animosity . . . This skua pursues rotches (Little Auks) and dovekies (Black Guillemots) on their passage to and from the cliffs, it sometimes also chases looms, and more rarely still snow-birds and kittiwakes. On ice they repose on their breast as mollies. During the whole of our voyage we saw only three of them settle on the water to swim." (130 : 3813)

The Arctic Skua will seldom attack terns, and most authors agree that they are driven away from the breeding grounds of the species.

The nuptial display described by Römer and Schaudin is probably nothing but the birds trying to lead the observer away from the nest (246 : 136). Swenander saw them attack a Red-throated Diver, but says that they do not pursue the Glaucous Gull (247 : 26). Kristoffersen describes how one pair which had their nest near a little lake, threw themselves into the water, threshing it with their wings and crying all the time. Another pair actually hit his head so he had to defend himself with a stick. He often saw skuas pursue Black Guillemots, but only in two instances did they overtake one, which then immediately gave up its food (472 : 251). Hartley and Fisher relate that the unfortunate Kittiwakes in Billefjord had to run a gauntlet of three pairs of skuas on their flight line from the glacier Nordenskiöldbreen to Gipshuken. They were also seen sitting on ice-floes waiting to chase Kittiwakes from them. They never attacked terns on their breeding grounds, but near the glacier "terns were successfully victimised". (513 : 384)

Marshall speaks of a daily period of quiescence. In Billefjorden this period appeared to extend for a couple of hours after 1 a. m. each day. It coincided

roughly with the time during which the sunlight, temperature and wind velocity were at a minimum (533 : 248).

Tiedemann, who made the bird an object of special study in Spitsbergen in 1937 and 1938, speaks of three different alarm-zones around the nest, although the extension of each of these may vary a great deal. When the intruder comes within zone I, the birds will come, settle on a tussock or a stone, but they will not utter a sound. If the intruder leaves this zone, nothing will happen, but if he comes into zone II, the birds will begin to run flapping their wings and cry, the louder the nearer the nest he comes. The contact of the innermost zone (III), will release the immediate attack of the birds. This zone will usually have a diameter of 5–10 m. Here they will sometimes even hit the head of their enemy and Tiedemann thinks it is the feet and not the bill which are used (560 : 259).

Williamson concludes that the skuas on the Faeroe Islands will attack when breeding in a colony, but single pairs will not do so. Williamson also states that sheep coming near the nest will be attacked (582 : 312). This is confirmed by Løvenskiold who has witnessed the same thing time and again in Norway.

Dalgety and coll. relate a rather amusing incident in describing how a pair of Arctic Skuas on Storøya stooped at a Polar Bear which was passing near their young (470 : 254).

B r e e d i n g. — The Arctic Skua breeds over the whole of the Svalbard area when the conditions are favourable.

As stated under "General habits" there is usually a fairly big distance between the breeding pairs, and they can also breed in what might be called a sort of colony, although there will always be several hundred metres between the nests, but they have never in this area been found in colonies like those in the Faeroe Islands.

The nest is often placed on wet ground such as a bog, but it has also been found in arid surroundings. It can be placed on a hummock, on level ground and even sometimes in a slight depression.

As a rule the Arctic Skua will choose its nesting site within sight of the sea. Most often it is found on the plains between the mountains and the coast, both along the sea-shore and in the fjords. But sometimes it happens that the nest is far into the valleys, and it has been found at least 15 km from the nearest shore.

The Arctic Skua is a common bird on the west and north coasts of Spitsbergen, but although it is not rare, it is by no means as frequent on the east side of the archipelago.

These skuas build no nests, the eggs are laid directly on moss or other vegetation and the birds very rarely collect any nesting material. The number of eggs is usually two, but in some instances only one egg is laid.

In the following tables, 24 and 25, the available dates for eggs and chicks have been collected:

Table 24

Egg-laying

Date	No. of nests	No. of eggs	Condition	Place	Author
17 June 1921	2	2	inc. 10 days	Bjørnøya	Jourdain (381: 176)
18 » 1864	1	2	fresh	Bjørnøya	Malmgren (92: 390)
22 » 1923	1	2		Dunøyane	Kristoffersen (432: 190)
24 » 1907	1	2		Forlandet	Le Roi (316: 200)
24 » 1930	1	2	fresh	Isfjorden	Dalgety (470: 254)
25 » 1930	1	2		Sørkapp	Kristoffersen (472: 251)
26 » 1908	1	2		Dunøyane	Le Roi (316: 200)
26 » 1930	1	2		Wijdefjorden	A. Svendsen (1929/30, 644a)
26 » 1935	1	1		Hopen	B. Trøhaug (1934/35, 645)
26 » 1935	1	2		Hopen	B. Trøhaug (1934/35, 645)
27 » 1892	1	2		Isfjorden	Hamberg (193: 38)
27 » 1930	1	1		Edgeøya	G. Bjørnnes (1929/30, 636)
29 » 1931	many	2		Liefdefjorden	Tomkinson (485: 85)
29 » 1955	1	2		Sassenfjorden	Pennie (623: 58)
30 » 1956	1	2		Kongsfjorden	Løvenskiold (1956, 633)
1 July 1900	1	1	slightly inc.	Hornsund	Bianchi (253: 307)
1 » 1908	1	2		Bjørnøya	Le Roi (316: 200)
1 » 1954	1	2		Adventdalen	Løvenskiold (1954, 633)
2 » 1930	1	2	fresh	Liefdefjorden	Dalgety (470: 254)
2 » 1950	1	1		Adventfjorden	Løvenskiold (615: 106)
3 » 1930	2	2	fresh	Sørkapp	Kristoffersen (472: 251)
4 » 1927	1	2		Wijdefjorden	G. Bjørnnes (1927/28, 636)
5 » 1908	1	2	fresh	Kong Ludvigøyane	Le Roi (316: 200)
5 » 1954	1	2		Kvadehuken	Løvenskiold (1954, 633)
7 » 1900	1	2	fresh[1]	Hornsund	Bianchi (253: 307)
7 » 1910	1	2	well inc.	Bellsund	Munsterhjelm (313: 33)
7 » 1910	1	1	fresh	Bellsund	Munsterhjelm (313: 33)
9 » 1900	1	1		Forlandsundet	Roth (257: 83)
9 » 1936	1	2		Smeerenburgfj.	Jung (539: 133)
12 » 1952	1	2		Hornsund	Løvenskiold (615: 104)
12 » 1954	1	2		Wijdefjorden	Løvenskiold (1954, 633)
12 » 1956	2	2	fresh	Krossfjorden	Løvenskiold (1956, 633)
14 » 1907	1	2		Bjørnøya	Le Roi (316: 200)
14 » 1956	4	2	slightly inc.	Krossfjorden	Løvenskiold (1956, 633)
15 » 1900	1	1	fresh	Hornsund	Bianchi (253: 307)
15 » 1900	1	1	inc. 10 days	Hornsund	Bianchi (253: 307)
15 » 1956	1	2	well inc.	Krossfjorden	Løvenskiold (1956, 633)
15 » 1956	1	1	fresh	Krossfjorden	Løvenskiold (1956, 633)
17 » 1952	1	2		Hornsund	Løvenskiold (615: 104)
17 » 1956	1	1	well inc.	Krossfjorden	Løvenskiold (1956, 633)
19 » 1864	1	2		Van Mijenfjorden	Dunér (98: 78)
23 » 1950	1	2		Sørkapp Land	Løvenskiold (615: 103)
28 » 1900	1	2	fresh	Forlandet	Zedlitz (319: 308)
28 » 1905	1	1		Moffen	Mathey–Dupraz (333: 111)
31 » 1948	1	2		Bjørnøya	Duffey (586: 560)
1 Aug. 1923	1	2		Hinlopenstretet	Longstaff (407: 492)

[1] One egg fresh, the other slightly incubated.

Table 25

Hatching and young birds

Date	No. of young	Age	Place	Author
12 July 1930	2	in down	Keilhaufjellet	Kristoffersen (472: 251)
17 » 1952	1	newly hatched	Hornsund	Løvenskiold (615: 104)
20 » 1952	2	10 days	Dunøyane	Løvenskiold (615: 105)
22 » 1930	many		Kong Karls Land	Dalgety (470: 254)
22 » 1952	1	half grown	Hornsund	Løvenskiold (615: 104)
23 » 1956	1	8 days	Forlandet	Løvenskiold (156, 633)
24 » 1936	2	newly hatched	Gråhuken	Jung (539: 133)
26 » 1898	2		Nordaustlandet	C-Gyllensk. (236: 84)
26 » 1954	1	3 days	Mosselbukta	Løvenskiold (1954, 633)
27 » 1899	1	in down	Hornsund	Birula (298: 168)
28 » 1923	2	in down	Liefdefjorden	Longstaff (407: 492)
1 Aug. 1948	1	newly hatched	Van Mijenfjorden	Løvenskiold (615: 105)
1 » 1948	1	newly hatched	Van Mijenfjorden	Løvenskiold (615: 105)
3 » 1930	many	fully fledged	Keilhaufjellet	Kristoffersen (472: 251)
3 » 1950	1	half grown	Hornsund	Løvenskiold (615: 104)
3 » 1952	1	newly hatched	Hornsund	Løvenskiold (615: 104)
4 » 1910	2	newly hatched	Magdalenefjorden	Zedlitz (319: 308)
5 » 1952	1	fully fledged	Hornsund	Løvenskiold (615: 104)
9 » 1936	?	fully fledged	Wijdefjorden	Jung (539: 133)
11 » 1870	?	in down	Edgeøya	Heuglin (123: 172)
12 » 1956	1	half grown	Signehamn	Løvenskiold (1956, 633)
12 » 1923	2	in down	Nordaustlandet	Longstaff (407: 492)
14 » 1870	1	10 days	Barentsøya	Heuglin (132: 192)
14 » 1927	2	fully fledged	Edgeøya	Dalgety (442: 29)
15 » 1861	1	newly hatched	Hinlopenstretet	Chydenius (89: 282)
16 » 1950	1	fully fledged	Sassenfjorden	Løvenskiold (615: 106)
19 » 1923	?	fully fledged	Wijdefjorden	Longstaff (407: 492)
20 » 1910	1	fully fledged	Van Mijenfjorden	Munsterhjelm (313: 33)
22 » 1898	2	fully fledged	Sorgfjorden	Nathorst (243: 302)
24 » 1923	?	fully fledged	Liefdefjorden	Longstaff (407: 492)
12 Sept. 1870	?	fully fledged	Adventfjorden	Heuglin (123: 274)

If we reckon on an incubation period of 26 days, and the dates for eggs and young birds given in the tables 24 and 25 are taken into consideration, we find that the egg-laying must take place within the following period, and that the first egg must have been laid on:

Date, June	7	14	16	18	19	21	24	28	29				
Clutch	1	1	1	1	1	1	1	1	1				
Date, July	1	2	3	4	5	7	8	9	12	15	16	28	
Clutches	1	1	1	2	2	3	2	2	1	3	1	1	

Thus it is shown that egg-laying can start as early as the first week of June, but this must be exceptional as in most years snow will cover the ground at that time. Usually only a few clutches will be found before midsummer. The ordinary time for the birds to lay will be in the first fourteen days of July;

fresh eggs found later than this will probably belong to a second clutch when the first have been taken or destroyed.

It seems that the eggs can be laid within an interval of some days and also that incubation must begin with the first egg. In the clutch of 7 July, 1900, one egg was fresh and the other slightly incubated.

If we reckon in the same way as above and estimate the fledging period of the young bird to be 26 days, we get the following dates for the hatching:

Date, July	7	9	10	15	16	17	18	20	22	23	24	28	30
Clutch	1	1	1	1	1	1	1	1	2	2	1	1	1

Date, August	1	3	4	6	7	9	11	15
Clutch	3	1	1	2	2	1	1	1

The majority of the young seem to be hatched within a three-week period from 20 July to 10 August. Fully fledged young have been found from 3 August onwards, and almost all young skuas will be able to fly at the end of this month.

Eaton found a nest where the material consisted of: "Three dead and wiry stalks of *Papaver alpinum*." (130 : 3813) Bianchi relates that in a nest in Hornsund there were found a few dry leaves and some small stones (253 : 315). Le Roi says that nesting material is sometimes found. On Bjørnøya there was a nest from which were taken two handfuls, consisting of a few leaves of *Salix polaris* and much moss and lichens (316 : 199). Summerhayes and Elton give a description of "Skua Hummocks" from Bjørnøya, but these can be found also in Spitsbergen anywhere where the birds breed. To quote: "Skua Hummocks. We have given this name to what is perhaps the most striking type of herb-mat occurring in the region. The Skua Hummocks are small grassy patches scattered over the "fjaeldmark". They are the result of constant manuring by the Arctic Skua (*Stercorarius parasiticus* L.), which nest on the top of hillocks which are the first to be clear of snow in the spring. The male stands on neighbouring hummocks during the breeding season watching for enemies. . . Thus the hummocks are well manured by the birds". A list of plants growing on these hummocks is given (397 : 223). Bertram and Lack also mention these tussocks (528 : 31). Jung, however, does not agree with the above authors and says that no proof has been brought to show that the manure from the skuas helps to build these hummocks. He also remarks that in the literature on the Arctic one often finds that the abundance of plants in some place is due to bird-manure, but that no proof has been provided that this is true (539 : 134). But then Jung can never have seen the vegetation beneath a colony of Guillemots and Kittiwakes, where the leaves of *Cochlearia officinalis* can be more than a foot long, whereas commonly on unmanured ground they are not much bigger than mouse-ears. See the illustration of *Catabrosa algida* in Summerhayes and Elton (450 : 241).

Usually the nest is found not far from the sea. In some instances, however, the bird has also been found breeding far inland. Conway saw a pair which was without doubt nesting near Breinosa on the watershed between Adventfjorden and Van Mijenfjorden, about 15 km from the nearest shore (196 :

89). Longstaff found them from three to five miles (5–8 km) from the sea on Nordaustlandet in the summer of 1923 (407 : 492).

Tiedemann found the nests near running water. The nest itself was usually placed on some moss or other vegetation, often between shingle or naked clay. It was never found on hummocks higher than the surrounding ground. Most nests were not far from the fjord (Hornsund), but in one instance a nest was found 6 km from the shore and about 200 m above sea-level. Nesting material was not seen in any of the nests. He found that both male and female took part in the incubation (560 : 254).

F o o d. — As mentioned before, the Arctic Skua has only in very few instances been seen fishing or catching food itself in Spitsbergen. Therefore the composition of its diet will largely depend upon what kind of food the Kittiwake can get. This bird is without doubt the one that is pursued by the skua more than any other species in the Svalbard area. The main source of food will therefore be small fish and pelagic *Crustacea* which are caught by the Kittiwake. What the skua can steal from an occasional Black Guillemot or a Little Auk is not of any importance.

Another important part of the skuas' food is the eggs and young of the Common Eider. Here the skua does a great deal of damage, even if it is by no means as destructive as the Glaucous Gull.

In places where the Little Auk breeds, the skua takes a great toll of the young when they are leaving the nests, and in those places a massacre takes place which has to be seen to be believed. Besides this the Arctic Skua will of course take any eggs it happens to find and it will also kill and eat all the birds which it can overcome.

In earlier years, when reindeer were abundant, the skuas would often come when such an animal was shot, to get their part of the spoil. Chydenius and a great many others have described this from the Svalbard area (89 : 94). Heuglin saw the bird catching flying insects along the borders of bogs (132 : 193). Walter found in the stomach of one bird, the spinal column and humerus of a snipe (*Calidris*) and a piece of shell of a mollusc (169 : 241). Römer and Schaudin relate that the skuas attacked all kinds of birds and that they took their eggs and young. In the stomachs they found "all kind of things", mostly remains of eggs, bones and also remains of fish and *Crustacea* (246 : 136).

Kolthoff saw skuas plunder the nests of *Anser f. brachyrhynchus* in Colesbukta on 15 June, 1900 (250 : 47). When he came to the island Eholmen in Van Keulenfjorden on 26 June, 1898, there were three or four skuas there. These birds took the eggs of an Eider as soon as the duck left her nest. Kolthoff and his friends now began to shoot the skuas, but although these did not breed on the island, they arrived continuously, and in all they shot twenty (261 : 71). Swenander found the following stomach contents: remains of fish, sometimes gammarids, but also vegetable matter such as *Saxifraga oppositifolia* (247 : 26).

Le Roi found in the stomachs remains of eggs, bones of birds, meat of reindeer, remains of fish, molluscs, annelids and once a *Hymenoptera*. Of vegetable matter there were leaves and twigs of *Salix polaris* (316 : 201).

Van Oordt reports that the skuas caught young Eiders. On Bohemanneset they principally chased young King Eiders. On 26 August, 1921, he saw two skuas chasing Purple Sandpipers in Ekmanfjorden. One sandpiper flew between his legs into the tent and thereby saved itself. "Another specimen, chased above the sea, suddenly received a wing-stroke from one of the skuas, fell into the sea, was immediately seized by the Skua and devoured on the beach." (370 : 161.)

Summerhayes and Elton say: "The Skua lives by robbing other birds. It attacks sea-birds (Guillemots and Kittiwakes etc.) causing them to disgorge their food, and also sucks the eggs both of the cliff-birds and of the Red-throated Diver (*Colymbus stellatus* Pontop.) and the Northern Eider." (397 : 224)

Longstaff saw skuas feeding on the carcass of a Little Auk on Reinsdyrflya, about three miles from the sea. In two other places, five miles inland, they found Little Auk's feathers where a bird had been plucked, as if by a hawk. This they attributed to skuas. A flock of seven was found frequenting a lake five miles inland, apparently fishing for char, whose remains were scattered along the edge of the lake (407 : 491).

Hartley and Fisher found in the stomach of a young bird a few plant stalks, some pebbles and mosquito remains. Otherwise they found that the food of the skuas consisted of *Thysanoëssa inermis, Eutomisto libellula* and mosquitoes (513 : 384).

Løvenskiold saw a skua pursuing a fox cub which was carrying a piece of meat, but it did not drop it (615 : 103). Another skua pursued a Kittiwake, which disorged a great deal of "Krill", a small prawn-like eupheusid. From the second week of August 1952, the skuas began to catch young Little Auks in Hyttevika north of Hornsund. This went on daily until the 18th when the last one had left the colonies. On this date a skua caught a young bird and began to pluck it just as a hawk would do but without killing the bird. When the Little Auk was rescued, it had lost some feathers, but otherwise it was unharmed.

On 31 July, 1948, a pair of skuas robbed the nest of a Red-throated Diver on Akseløya in Bellsund. They took the single egg, flew away with it and ate it.

On 12 July, 1954, the shells of two eggs of Ptarmigan, probably eaten by skuas, were found near Dirksodden in Wijdefjorden (1954, 633).

No. 53. *STERCORARIUS L. LONGICAUDUS* Vieill.[1]

The Long-tailed Skua

Geographical distribution

The species breeds in Europe on Jan Mayen, in Norway, N Sweden, N Finland and N Russia, and in Siberia from the Yamal Peninsula to the New Siberian Isl. Its winter habitat is uncertain.

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[1] Contour map showing distribution, see backflap.

According to Salomonsen the species breeds in Greenland and from Ellesmere Isl. and Baffin Isl. to west of Alaska and E Siberia. This is the American form *Stercorarius longicaudus pallescens* Løppenthin (588 : 278, 285).

Occurrence in Svalbard

The species has been observed in all districts of the Svalbard area with the exception of Hopen, but until recently only a few individuals had been seen and only now and then. Now it breeds both in Isfjorden and in Kongsfjorden. In these two districts and also in Wijdefjorden it seems to be fairly numerous. In coming years it will no doubt be found breeding in many more places.

Birds in aberrant plumage

The dark phase? — There are two different records of dark Long-tailed Skuas from Spitsbergen. Professor Alfred Newton saw a bird of this species in Trygghamna on 14 August, 1864. He says that the bird had dark brown plumage all over. Judging from the length of tail, he thought it was an adult bird (96 : 217). Curiously enough, Newton does not mention this specimen on p. 511, where he discusses the species in more detail. Løppenthin says that this bird was somewhat carelessly and therefore erroneously identified (557 : 7).

On the island Storøya (east of Nordaustlandet) Römer and Schaudin saw such a bird in the summer of 1898. It was of a sooty brown colour and they regarded it as belonging to the dark phase (246 : 137).

A few dark-coloured individuals have also been seen in other places. Professor Wynne Edwards saw one in the Atlantic on 25 May, 1933, at 49° 25′ N, 49° W (512 : 308).

Salomonsen says: "The scattered records have all been based on semi-adult birds or on sight-records . . . No fully adult specimens have ever been collected, and we must conclude that the rare cases of dimorphism are restricted to the immature plumages." (588 : 278)

Løppenthin says: "In its dark juvenile plumage the Long-tailed Skua shows some individual variation, but among the hundreds of adult birds which the author has seen in the field (Northeast Greenland) and in different museums, it has not been possible to find a single one which deserved the designation "dark phase" like that known from the two dichromatic species, Arctic Skua and Pomatorhine Skua." (557 : 6)

It is therefore highly possible that the two dark individuals seen in Spitsbergen, if they belonged to this species, were birds in the juvenile plumage.

First records

The first to mention the Long-tailed Skua from Spitsbergen, was Martinius G. Mandt, who visited the islands in 1821 and wrote about the birds he saw there (42 : 4).

Others who have written of the bird as an inhabitant of Spitsbergen are Swainson and Richardson (40 : 432), and Temminck (41, Vol. II : 503). Gray

relates that in the collection of the British Museum there is a specimen of this bird from Spitsbergen, presented by the Admiralty (58 : 167).

The first instance of a bird being shot and taken to a museum, was in 1864, when Malmgren obtained a Long-tailed Skua in Isfjorden. The first record of breeding is from 1931, when Tomkinson found a nest of this species in Adventdalen, Isfjorden.

Distribution. Sections I–XIII

Section I. Bjørnøya. — On the island and on the sea around it, the bird has been observed several times during the summer from 12 June to 3 September.

Section II. Hornsund. — From this district there are but two records, one from Dunøyane and the other from Isøyane.

Section III. Bellsund. — The bird has been seen at Kapp Lyell, in Recherchefjorden, at Braganzavågen, at Blåhuken and in Reindalen in Van Mijenfjorden, and in several places in Bellsund. In 1898 the species was relatively common in Reindalen, where 10 specimens were shot.

Section IV. Isfjorden. — In this district the bird has been observed many times on the fjord itself, but also on land in the following places: Grønfjorden, Colesbukta, Hotellneset and Longyeardalen, Adventdalen, Sassendalen, Gåsøyane, Brucebyen and other places in Billefjorden, Kapp Thordsen, Dicksonfjorden, Bohemanneset and Trygghamna. It has been found breeding in Adventdalen and on Hotellneset not far from Longyearbyen.

Section V. Prins Karls Forland. — The species has been seen once in Selvågen.

Section VI. Kongsfjorden. — The species has been observed both on the islands and on several places on the mainland in Kongsfjorden, but it has never been found in Krossfjorden. In 1956 the first nest was found at the head of Kongsfjorden.

Section VII. NW Spitsbergen. — In this district the bird has been observed in Magdalenefjorden on Amsterdamøya, in Raudfjorden and in Liefdefjorden.

Section VIII. Wijdefjorden. — The first observation is from 1873. Since that time there are no records until 1954, when several birds were seen during the summer. In 1957 several specimens were seen at the head of Austfjorden.

Section IX. Hinlopen. — From this district there are but two records, from Lomfjorden.

Section X. Nordaustlandet. — The bird has been seen in Wahlenbergfjorden, in Bodleybukta at the head of this fjord and 10 km farther east, at Torellneset, near Nordkapp, at the head of Rijpfjorden and on Storøya.

Section XI. Storfjorden. — The bird has been observed on Barentsøya and in the ice south of Edgeøya.

Section XII. Kvitøya. — From this island there is only one record.

Section XIII. Kong Karls Land. — From these islands there is also but one record.

Biological

M i g r a t i o n. — There is very little information to be found on the migration of this species in Spitsbergen. The trappers do not distinguish between this bird and the Arctic Skua, and therefore there are no dates for the migration of the long-tailed species in their diaries.

No Long-tailed Skua has been recorded from Spitsbergen before 12 June, therefore we can reckon that the birds seen in the first half of this month are on their spring migration.

One bird was seen south of Bjørnøya on 12 June, 1898, shortly before the island was sighted, and in the same summer ten birds were shot in the first half of June. From the same source (Kolthoff) we know that two birds were seen in Colesbukta in Isfjorden on 16 June, 1900, and four birds were obtained in Adventfjorden in the middle of June. One bird was seen on the islands Isøyane, north of Hornsund, on 13 June, and three birds were shot on the 15 June, 1908, in Adventfjorden (le Roi).

Some Long-tailed Skuas will probably start on their autumn migration as early as in August, and there are many records of the bird in Spitsbergen for this month. Some of them certainly stay until September, but there are only a few records.

In 1868 the bird was found both at Castrénøyane (east of Nordkapp, Nordaustlandet), and in Lomfjorden in September.

Cocks thought he saw a pair of these birds north of Bjørnøya on 3 September, 1882, and a single bird in Grønfjorden on the 9th. One bird was probably seen in Adventdalen on 11 September, 1870, by Heuglin.

G e n e r a l h a b i t s. — Most of the authors writing on this subject agree that the Long-tailed Skua does not pursue other birds, robbing them of their food as the Arctic Skua does. Malmgren writes: "These skuas did not pursue gulls. They were sitting on high stones on the lookout for flying insects." (92 : 392) Newton is of the same opinion and le Roi did not see this bird attack Kittiwakes or take eggs or young birds. Løvenskiold says: "Neither in Norway nor in Spitsbergen have I seen it attack gulls, terns or other birds to take their food from them." (615 : 107)

At the nest the birds, both male and female, are very aggressive and bold in defending eggs and young. They stoop down from a height at the intruder's head, almost always attacking from the front. A couple of feet from the head of the enemy they turn upwards, sometimes touching the top of the head with their feet. During these attacks the birds cry unceasingly until the moment they aim straight at their enemy. Then they come silently with a very swift rush.

If the intruder is a human, this form of attack will last for a while, and then if it does not succeed in driving him away, the bird will try something different. They will then, at least in Spitsbergen, settle on the hat or cap of one of the persons nearest to the nest and peck at his headcovering. When one leaves off, the other will in most cases come and continue. Between the peckings the bird will cry excitedly. In one instance when one of Dr. Løvenskiold's assistants was attacked in this way, the skua was so intent on pecking that he could walk

about with the bird sitting on his head, and in the end he caught it with his hand.

If a pair with a nest is disturbed by photographing etc., it can happen that other birds of the species will come to investigate. They will then help the owners of the nest in their manifestation of disapproval, although they will not attack. Once when taking a photograph of a nest on Hotellneset in Adventfjorden, the author had an audience of five Long-tailed Skuas sitting around, as well as the pair which owned the nest.

B r e e d i n g. — The Long-tailed Skua has been suspected of breeding in Spitsbergen for a long time, but the first proof was provided by Tomkinson in 1931. Since that time the species has been found nesting in 4 different years by Løvenskiold. We can therefore now look on the species as a more or less regular breeder in certain districts of Spitsbergen, and Løppenthin's objection that Tomkinson's observations only show an attempt at breeding cannot be valid any longer (557 : 17).

It is known that in places where the Long-tailed Skua breeds, like Greenland, N Scandinavia, N Finland, N Russia and Novaya Zemlya, the bird is completely dependent on lemmings. In years when there are no rodents, the species will not breed and in lemming-years it breeds abundantly.

As stated in the description of the Snowy Owl, there are no endemic rodents in Spitsbergen. But there are rats and mice in the settlements of the mining towns. These rodents have come with ships from European harbours, and are not found outside the settlements and their surroundings. In summer-time these animals may spread out in the vicinity of their winter-quarters, and the skua may catch some of them.

It must only be accidental, however, that the bird is found near the two Norwegian collieries Longyearbyen and Ny-Ålesund, for as early as 1873 Eaton states that several birds were shot in Wijdefjorden and several more birds were seen there. He did not find them breeding there and neither did Løvenskiold, who stayed there for six weeks in 1954. That year the birds were fairly common there, three and four skuas being seen simultaneously, and on different occasions. If the species should be found breeding outside Adventfjorden and Kongsfjorden in the coming years, the place will most likely be Wijdefjorden.

Several authors, among them Palmén (159 : 382) and Nathorst (230 : 168) have said that the bird breeds in Spitsbergen, without having the slightest proof for this assertion. In many cases, however, the authors who saw the birds have also stated that they were not breeding. Thus Kolthoff, who shot ten birds in Vestspitsbergen in July 1900, stated that these skuas neither had bred nor were about to breed, as their sexual glands were not developed (261 : 70). Mathey-Dupraz saw a pair near Kapp Lyell in Bellsund on 18 July, 1906, but could not find any sign of breeding (311 : 51). Le Roi, who had at least 27 birds shot in Vestspitsbergen in summer-time, says that although he found males and females together in pairs and even with fully developed sexual glands, none of them had brood-patches and there were no signs of breeding (316 : 202).

Jourdain states that a pair in Liefdefjorden showed some signs of attach-

ment to a particular locality, but disappeared without signs of having bred. In this place a young bird of the previous year was obtained in 1921. In Billefjorden he saw another pair, but up to the end of July 1921, the birds showed no signs of nesting (381 : 176).

Dalgety and coll., who saw the birds in Isfjorden and on Storøya in 1930, are absolutely sure they were not breeding (470 : 254).

In the summer of 1896 Trevor-Battye stayed in Dicksonfjorden (Isfjorden) for some days, and found two pairs nesting there. From what he says, these birds were astonishingly valiant (203 : 594). Several authors say that he mistook the Arctic Skua for the other species and this seems to be true. The way he was attacked by the birds, which came in a level flight and not stooping from a height, is far more characteristic of the Arctic than of the Long-tailed Skua.

Of actual breeding there are only five cases. Tomkinson saw two pairs in the valley Adventdalen on 19 June, 1931, but these did not appear to be nesting. The next day he found a pair with one egg, incubated for about a week. These birds made a noise and swooped down on him (485 : 83). Løvenskiold saw a Long-tailed Skua on 22 July 1948, near Longyearbyen in Adventfjorden. The bird behaved as if nesting and shortly afterwards a single young bird, about eight days old, was found. In 1950 a nest with two eggs was found on Hotellneset near Longyearbyen on 5 July, (615 : 108), and two years later a nest with one egg was found in the same place on 25 June. This was a clutch of only one egg, as there still was only one egg on 2 July (1954, 633). The bird with the two eggs had no nest, but the eggs were laid on a slightly concave stone, whose surface was level with the surrounding ground, its size being about one foot square. There was no trace of nesting material to be seen. In the case of the single egg, there was also no nest. It looked as if the scrape of an Arctic Tern from the previous year had been used for a nest. On 5 July 1956, Løvenskiold found a nest with one egg in a valley on the south side of the mountain Ossian Sarsfjellet at the head of Kongsfjorden (1956, 633).

F o o d. — In the places where the Long-tailed Skua usually breeds, it seems to be entirely dependent on small rodents, especially the various species of lemming. Løppenthin has shown that in seven instances in Greenland, Finnmark and Novaya Zemlya, the lemming-maxima and the breeding of the Long-tailed Skua coincide. Likewise he has 25 records from the same districts with lemming-minima and no breeding of the skua at all (557 · 14).

What he says about the food of the bird seems, as far as can be seen, to cover everything that is known about the matter: "When the Long-tailed Skua stays in the breeding area it seeks its food on land, and here it is primarily dependent on lemmings. It takes, however, also many insects and birds and eggs. Fishes and other aquatic animals are also taken to some extent, but in the breeding season the products of the sea seem to come second in rank. Moreover it is not reluctant to feed on carcasses of any kind whatever."

What we know of the food of the Spitsbergen birds is as follows: In one bird shot by Malmgren in 1864, were found remains of insects (92 : 392). In 1898 the birds came to Kolthoff's camp and ate meat and fat from reindeer shot there. They also were seen to take fish and *Crustacea* (261 : 70). In the

summer of 1900, Roth found three birds in a spot where reindeer had been killed, and here they were also taking carrion (257 : 148). Zedlitz also refers to this incident (319 : 309). Le Roi had more than 27 birds at his disposal for investigation, but did not find very much. There were remains of eggs and eggshells, pieces of leaves, and pieces of bones from a biggish mammal (perhaps a whale?) and some small stones.

Duffey and Sergeant saw two pairs on Bjørnøya on 8 August 1948, and obtained one bird. The contents of the stomach were 20 polychaetae jaws (marine worms), and they say: "This may indicate pelagic feeding while on migration." (586 : 561) But it is questionable whether they are on migration as early as 8 August.

Løvenskiold found a young bird in down in 1948. When the chick was caught, the adult bird came and settled close to the captors and disgorged a pellet about the size of a walnut. The pellet consisted of compressed blowflies, and it seems that the young bird would have been fed with them. The flies may have come from carrion close by (615 : 108). In the throat of a specimen shot in Wijdefjorden on 16 August 1954, there was a fairly big moth (1954, 633).

No. 54. *LARUS HYPERBOREUS* Gunn.[1]

The Glaucous Gull

Geographical distribution

The Glaucous Gull breeds in Europe from Jan Mayen, Svalbard, Franz Josef Land and Novaya Zemlya south to Iceland, Bjørnøya and N Russia (Murman coast, Kanin Peninsula, Kolguev, Petchora delta and Waigatz), in N Siberia from Yamal Peninsula, Sibiriakov Isl., Taimyr Peninsula and New Siberian Isl. south to 70° N on the Lena and Kolyma deltas, and in N America from NW Alaska, Ellesmere Isl. and N Greenland south to Pribilof Isl., N Mackenzie, James Bay, E Labrador and Newfoundland. In winter it ranges south to France, Germany, Japan, California, the Great Lakes and Long Isl. (New York), and occasionally to Portugal and Spain, Black and Caspian Seas, China, Hawaii, Wisconsin, Missouri, Texas, N Carolina and Bermuda. It is occasionally found in the Azores, Madeira, central Europe, Sardinia, Malta, N Morocco, Egypt (Gulf of Akaba) and Alberta.

The Svalbard population

The Glaucous Gull breeds in all parts of the Svalbard area with the exception of Kvitøya, but it has been reported from this island.

Birds in intermediate plumage

A most interesting fact is that immature birds in the 2nd and 3rd year plumage, which can be easily distinguished from that of the adults, are rarely found along the coasts of Spitsbergen during the summer-time. They have,

[1] Contour map showing distribution, see backflap.

however, often been seen on Bjørnøya. Here quite a number of them seem, at any rate in certain years, to spend part of the summer.

Walter stayed on Kvalpynten, Edgeøya, from 29 May to 6 June 1889. In the first days he saw mostly adult birds in full plumage. On 30 May the first young birds in the 2nd and 3rd year plumage arrived, in all 7 birds, which all flew directly northward. From now on many young birds in all stages of intermediate plumage arrived, the biggest flocks numbering between 20–30 individuals. Sometimes adult birds were seen among them (169 : 243).

Trevor-Battye saw only one young bird during the summer of 1896. He judged it to be in the 2nd year (203 : 593).

Swenander reports that he never saw birds in intermediate plumage on Bjørnøya during the summer of 1899 (247 : 24).

Bianchi obtained 2 birds in Hornsund on 18 May 1900, which from his description must have been in their 2nd summer (253 : 318).

Koenig records that he obtained a few young birds in Russehamna on Bjørnøya in June 1907. They were in the 1st and the 2nd year (286 : 130).

Le Roi records that 12 young birds were obtained in 1907 and 1908. They were of both sexes and 5 specimens were 1 year old, 2 were 2 years and 5 were 3 years old. Most of them were shot in Kvalrossbukta on Bjørnøya. Single specimens were obtained in Spitsbergen at Dunøyane, Van Keulenfjorden and Magdalenefjorden (316 : 191).

Zedlitz shot two birds in intermediate plumage, one on Bjørnøya on 12 June, 1900, and the other in Grønfjorden on 17 July, 1910 (319 : 313).

Dalgety reports that he saw a few one-year-old birds on Edgeøya in August 1927 (442 : 29).

Kristoffersen records that he found big flocks of young birds on Tokrossøya (close to the S point of the mainland) throughout the breeding period of 1930, i. e. June–July. This is the only instance when this has been observed (472 : 252).

Løvenskiold says that along the north coast of Bjørnøya, big flocks of Glaucous Gulls were seen from 24 June to 9 August 1958. These flocks numbered from 100 up to 300 birds, of which only a few were adults. The rest were in various stages of intermediate plumage. Some of the immature birds sometimes visited the refuse heaps of the meteorological station in Herwighamna. When the first young of the year were seen on the wing in the second week of August, the flocks of immature birds disappeared (1958, 633).

Birds in aberrant plumage

According to le Roi a bird in perfect white plumage was shot on Prins Karls Forland on 24 June 1907. It was not an albino as the iris was yellow and the orbital ring orange red. The bill and feet were more intensively coloured than in normally coloured birds (316 : 191).

Ringed birds

Rieche relates that two birds ringed in Spitsbergen in 1937 were recaptured, one in Norway and one in Iceland (542 : 127). This ringing, which was under-

taken in 1937, is described in more detail by Tiedemann. One young bird ringed in Hornsund on 24 July was recaptured at Varnes, Lista in South Norway, on 12 August 1937. Another young bird, ringed in the same place and on the same date, was recaptured at Vogsosar in Sellvogur, South Iceland, on 5 April 1938. Tiedemann also relates that a bird ringed by the Russians in Barentsburg, Grønfjorden, in July 1936 was recaptured at Grindarvik, SW Iceland, on 15 November 1936 (560 : 250).

First records

Poole relates that he saw "Gulles" at Bjørnøya on 8 July 1604 (2 : 267). In 1610 he saw "Gulls and Sea-mews" in Spitsbergen, and here the gulls are obviously Glaucous Gulls (4 : 23). Baffin saw the species in Spitsbergen in 1613 (6 : 71). Gerritszon also saw them there in 1613 (7 : 19). Fotherby saw the birds in Spitsbergen in 1622 (8 : 33). Martens saw the species in Spitsbergen in 1671 and gives a good description of the bird. He says that it is very fond of blubber, and that it kills and eats young Guillemots (12 : 60). Martin saw the species in Spitsbergen in 1758 (17 : 125). Bacstrom mentions the species from Spitsbergen in 1780 (28 : 617). Phipps does not mention the species in his list of birds from Spitsbergen in 1773 (23 : 187), but Engel, who cites his diary in German translation, has inserted a piece of information on animals, between the dates 20 and 21 July. Here the "Bürgermeister", i. e. the Glaucous Gull, is mentioned (27 : 32). But the description seems to have been taken from Martens (see above) and nothing of this is to be found in Phipps's original paper. Pennant mentions the bird as an inhabitant of Spitsbergen (24 Vol. II : 532). Schleep describes a "new" species of gull, *Larus leucertes* (36 : 314). Le Roi declares that the bird which he obviously thinks originated from Spitsbergen is nothing but the Glaucous Gull (316 : 118). However, there is nothing in Schleep's paper which indicates that the material he had for investigation came from Spitsbergen. One of the birds referred to was obtained in Greenland, but Spitsbergen is not mentioned at all. Gaimard has an illustration of a young Glaucous Gull, but a legend to this picture has never been published (59).

Records without any distinct locality

Torell mentions the bird as breeding in Spitsbergen (73 : 63). Quennerstedt mentions that he saw the species there (81 : 26). Malmgren relates that the species can be found along all coasts of Spitsbergen (85 : 105). Cocks acquired eggs of the bird there in 1863 from a Norwegian, Mr. Dreyer (153 : 18). Salvadori relates that four specimens shot in Spitsbergen in 1898 are in the collections of the Museum in Torino (252 : 4).

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — The Glaucous Gull breeds in single pairs here and there around the coast of the island. But in the south, where the big bird-cliffs are, there are great numbers breeding.

Section II. Hornsund. — The species breeds on all the bigger islands, Sørkappøya, Stjernøya, Tokrossøya, Dunøyane and Isøyane. Then on islets and isolated rocks along the shore as in Stormbukta, at Suffolkpynten at the southern entrance to Hornsund, in Gåshamna, along the coast from the northern entrance to the fjord up to Hyttevika and from Kapp Borthen and northwards. On the mainland they breed on Keilhaufjellet in the extreme south, in a colony of Kittiwakes in Stormbukta, on Sofiakammen in Hornsund, on Rotjesfjellet and Torbjørnsenfjellet near Hyttevika.

Section III. Bellsund. — The birds can be seen almost everywhere in Bellsund, Recherchefjorden, Van Keulenfjorden and in Van Mijenfjorden. In Sveagruva, at the head of the latter fjord, they assembled in hundreds and lived on refuse from the settlement while the mines there were still worked. The species has been found breeding in the following places: Calypsobyen in Bellsund, in several places on the mountain Midterhuken, at Måseneset at the southern entrance to Van Mijenfjorden and on Mariaholmen on the other side of Mariasundet and on Reiniusøyane a little to the west of Akseløya.

Section IV. Isfjorden. — In this district too the species can be seen almost everywhere on the sea and along the shores. In Longyearbyen where they are protected, there are several hundreds of them and here they live on refuse.

There are breeding places in Grønfjorden, at Deltaneset, on Diabasodden at the entrance to Sassenfjorden, on the south side of this fjord, on a bird-cliff where Tempelfjorden branches off from the main fjord, on Tempelfjellet, on Gåsøyane, at Phantomodden in Billefjorden, on Wordiekammen and in Ebbadalen at the head of the fjord. They also breed in numbers on the bird-cliffs of Skansbukta.

On the north side of the fjord they breed on the coast of Bohemanneset and Erdmanodden and in Trygghamna near the mountain Alkhornet. In Forlandsundet there is a colony to the east of Sarstangen.

Island they have been observed in numbers on the mountain range Terrierfjellet, a great nunatak to the east of the head of Billefjorden; they have also been seen on mountains far into the valleys Adventdalen and Sassendalen.

Section V. Prins Karls Forland. — On this island the species of the southern half of the island, on the mountain Methuenfjellet north of the Kaldneset on Forlandsøyane, on isolated rocks along the coast on the west side of the southern half of the island, on the mountain Methuenfjellet north of the big plain Forlandsletta and on mountains around Selvågen. They are seen everywhere on the sea around the island.

Section VI. Kongsfjorden. — In the colliery at Ny-Ålesund there are great numbers of Glaucous Gulls. As in the other mining towns of Spitsbergen they here live on refuse.

The species can be seen everywhere along the coasts and in Kongsfjorden and Krossfjorden. These gulls breed on the mountain Ossian Sarsfjellet at the head of Kongsfjorden and on the nunatak Pretender, 14 km further east.

They breed on Lovénøyane and on Gerdøya, in Blomstrandhamna, on Kapp Guissez and on a small island just off this point.

In Krossfjorden there is a rather big colony on a steep hillside close to Fjortende Julibreen. They also breed on a bird-cliff on the south point of Kong Haakons Halvøy, on Nilsfjellet in Signehamna and at Kapp Mitra at the entrance to Krossfjorden.

Section VII. NW Spitsbergen. — The birds can be seen everywhere along the coast and in the sounds between the islands, but there is a marked difference in their numbers in the west and the east of this district. In Liefdefjorden there are not nearly so many of them as on the stretch from Magdalenefjorden to Biskayerhuken.

They breed in Magdalenefjorden, on Moseøya in Sørgattet, on the SW side of Danskøya and on its north shore in Virgohamna. Then on all the other big islands such as Amsterdamøya, Fuglesangen, Klovningen, Norskøyane and Moffen. Further breeding has been recorded in Birgerbukta south of Norskøyane, on Flathuken at the entrance to Raudfjorden and on Buchananhalvøya in the same fjord, on the mountain Montblanc on Jermaktangen and on Gråhuken at the entrance to Wijdefjorden.

Section VIII. Wijdefjorden. — Although the species can be seen almost everywhere, there are even less of them in this fjord than in Liefdefjorden. They have been seen crossing the area between Wijdefjorden and Billefjorden. Just in front of the glacier Mittag-Lefflerbreen at the head of the fjord there is a feeding ground and here hundreds can be seen sitting on the shingle of the beach. They breed on Gyllensköldholmane, on Ræstadholmen near Krosspynten, at Sørbreen, on mountains near Femmilsjøen and probably also on bird-cliffs in Mosselbukta.

Section IX. Hinlopen. — Although one would suppose that the species might be found everywhere in the district, there are reports only from Sorgfjorden, Lomfjorden and Bastianøyane. They breed on the enormous bird-cliff Alkfjellet south of the entrance to Lomfjorden, on Tommeløya a little farther south and on Fosterøyane.

Section X. Nordaustlandet. — The birds have been reported from Murchisonfjorden, Lågøya, Brennevinsfjorden, Parryøya (one of Sjuøyane), and from Rijpfjorden. They have been found breeding on Gyldénøyane in Wahlenbergfjorden, Storsteinhalvøya, Karl XII Øyane and on Storøya.

Section XI. Storfjorden. — In this district the birds have been observed at Kvalhovden, in Agardhbukta and in Dunérbukta and Ginevrabotn. They have also been seen in Heleysundet between Barentsøya and the mainland, on the NE corner of Edgeøya, in Freemansundet, at Kapp Lee, in Diskobukta, Kraussbukta, on Zieglerøya, and a few have also been seen in Olgastretet east of Edgeøya. They have been found breeding on Tusenøyane, Kong Ludvigøyane, Negerpynten and on Kvalpynten.

Section XII. Kvitøya. — From the sea just south of the island there is only one report.

Section XIII. Kong Karls Land. — The species breeds both on Kongsøya and on Svenskøya.

Section XIV. Hopen. — The species breeds on this island.

Records from the sea around Svalbard

The North. — Parry did not see any Glaucous Gulls north of 81° N in 1827 (46 : 194). Collett and Nansen report that single specimens were observed in the ice north of Spitsbergen two or three times during the summer of 1896. One bird was seen on 13 May, flying over the channels in the ice at 83° 51′ N, the first sea-bird which appeared that year. A single specimen was seen on 9 June, and another on 31 July, when *Fram* had already begun to approach the northern shores of Spitsbergen (237 : 46). Andrée shot a Polar Bear on 1 August 1897 at 82° 30′ N and 28° 25′ E and soon two Glaucous Gulls were circling over the carcass. On the 3rd another was seen. On 9 August a fourth gull was observed at about 82° N (461 : 405, 413).

The West. — Kolthoff reported that on the journey from Spitsbergen to Greenland in 1900, the species was common until 0° 30′ W. Further west it became scarce and only a few young birds were seen between 74° and 76° N and 0°30′–3° W. West of this area they again became common and near Greenland and Jan Mayen adult birds were seen again (261 : 68). Orléans, who travelled between Spitsbergen and Greenland in 1905, saw the species:

On	8	June	at	80°	5′	N	and	8° 34′	E
»	9	»	»	80°	17′	N	»	5° 33′	E
»	10	»	»	80°	5′	N	»	2° 52′	E
»	11	»	»	79°	55′	N	»	1° 52′	E
»	12	»	»	79°	34′	N	»	2° 37′	E

(277 : 339).

Quennerstedt was a passenger on board a Norwegian sealer in the year of 1863. On the sea between 71°–74° N and 7° 30′ W to 5° E he saw numbers of Glaucous Gulls in the places where seals were killed. They were often seen sitting singly or in pairs on high hummocks of ice (106 : 29).

Biological

Migration. — When there is open water along the coasts of Spitsbergen early in the year, the big gulls may arrive as early as in February and the first half of March. In years with normal conditions, one can speak of a spring migration, which lasts from about 20 March for about a month. By about 24 April most of the gulls will have arrived. Under normal conditions the majority will come to the breeding places in the first half of April.

In the literature and in the diaries of the trappers there are altogether 75 records of dates for the spring migration. There are 7 of these records in February, 14 in March, 43 in April and 11 in May.

There are of course several records for one and the same year, and the different observers have also sometimes noted down an arrival each time a new flock has come, during a shorter or a longer period in the spring. But in spite of this there is a marked concentration of records in the time between 19 March and 24 April, with in all 49 observations. Between 3 and 12 April there are as many as 26 records.

In table 26 can be found the first arrivals and the dates when the main body has arrived for some of the years between 1825 and 1940.

Table 26

Spring migration

Year	First seen	Common	Year	First seen	Common
1825	10 February		1928	6 April	12 April
1889	26 March		1929	8 April	27 April
1896	10 February		1930	31 March	8 April
1900	8 April	4 May	1931	23 March	
1910	18 February		1932	13 March	
1912	26 April	15 May	1934		28 April
1918	10 April		1936	19 March	9 April
1922	3 April	21 April	1937	12 February	20 March
1924		17 April	1938	26 February	6 April
1925	25 March	3 April	1939	19 March	11 April
1926	10 April		1940		7 April
1927	27 March				

In the autumn the Glaucous Gulls probably do not begin to leave the area until the middle of September. From 14 September to 13 November there are in all 41 records, with 14 in September, 19 in October and 8 in November. It seems that most of the birds leave before 15 October. For the last half of this month there are only 5 records. A few may stay a little longer in years with open water along the coasts, but none have been recorded later than 13 November. There is, however, one exception. Kristoffersen, who wintered in Hornsund 1923/24, relates that several specimens were seen all the winter on the refuse heap outside his hut. He also caught them in his traps. At the end of January 1924 he had shot 11 bears, the carcasses of which were spread about in the area. These were totally devoured by the gulls in an unbelievably short time (432 : 183). In 1929/30 he wintered at Sørkapp and found the birds wintering also here. He says: "Although a great number leave the area in the autumn, one can find big flocks in the middle of the winter. The species is certainly more common in the dark period than any other of the resident seabirds of Svalbard, which, with exception of the Fulmar, are very rarely seen in the dark time of the year. At Sørkapp quite a big number wintered, but they did not wander far, mostly keeping to the open water on the west side of the island. During the months of January and February their numbers increased and in March they were found everywhere." (472 : 252)

G e n e r a l h a b i t s. — There are no birds of prey in the Svalbard area. In Spitsbergen the Snowy Owl has been recorded about 50 times and the big falcons have been seen there a few times. However, the Glaucous Gull has taken over the role of predator and it is a dangerous enemy to most of the other birds inhabiting these islands.

This big gull will kill and eat any other bird it can overcome and during the breeding season it not only takes the eggs of other birds, but it kills hundreds of young Eiders, Kittiwakes, Guillemots and Little Auks.

Besides this it acts as a scavenger and eats carrion with great relish. Because

of this it is protected in the Norwegian collieries at Longyearbyen and Ny-Ålesund, and some years ago, when Sveagruva was still worked, it was also protected there. In these mining towns it can always be seen on the refuse heaps, where it finds some edible matter. In Longyearbyen it has been seen to catch brown rats.

Along the coast of Vestspitsbergen, there are in many places low islands, where in former times thousands of Eiders bred. As the crews of small Norwegian vessels which visit these coasts in summer-time do not respect the protection the law gives these birds the islands have for many years been plundered during the breeding season. This has reduced the Eider population of the islands to such an extent that it is now possible for the gulls almost to exterminate the few remaining birds. On many of these islands no female Eider will succeed in getting her young on to the sea, for the gulls will take them as soon as they are hatched.

These gulls also attack and kill small newborn seals (especially *Phoca hispida*), the "Snadd" of the Norwegian hunters. These seals are born in April–May and in the first days, before they can go into the water, they are left in small caves in the snow and upon the ice, close to the diving hole of the mother. If the cover of snow then becomes thin or melts away, the gulls will at once attack and kill the seal babies.

As the Glaucous Gull always nests near other birds, in Eider colonies, on bird-cliffs etc., it lives during the breeding season mainly upon their eggs and young. It can be seen raiding the ledges where Guillemots and Kittiwakes are nesting. Here the eggs are taken, and later when there are young birds, these are thrown out from the nests and eaten when dead at the foot of the cliff. Before 1925, when reindeer were not protected, it happened time and again that hunters who had shot reindeer and came back a few days later to fetch their venison, found that every scrap of meat had disappeared. It had been eaten by the gulls. When there are enough of them, they can devour the meat of a big seal in a few hours.

Some of the more interesting records of this bird as a predator shall be cited below:

Scoresby says that they kill and eat small birds (40 : 536). Sundevall says they kill the young of other birds and eat them (52 : 126). Beechy saw them stealing Eiders' eggs (56 : 101). Malmgren found that they lived on eggs and young birds (85 : 105). Chydenius shot a specimen and found that it had swallowed a whole young Eider (89 : 333). Holmgren says that the young gulls are fed on young Black Guillemots and Little Auks (100 Vol. II : 982). Cocks tells how Mr. Rabot gave a dead Purple Sandpiper to a captive Glaucous Gull, which swallowed the bird whole (151 : 441). Nathorst saw them at the carcass of a dead reindeer in July 1870 (177 : 82). Nordenskiöld shot two geese in July 1890 and left them on the ground. When he came to fetch them a little later, they had been eaten by the gulls. On 30 July he came to fetch 6 reindeer which he had shot in Colesbukta some days before, and found only skin and bones left (178 : 39, 41). Feilden shot several Eiders on 5 July 1894, but took them with him, saying that otherwise they would have been eaten by the

gulls (189 : 89). Conway records that these gulls robbed a number of nests of Pink-footed Geese near "Waterfall Camp" in Eskerdalen on 5 July 1896. Near the mountain Lusitaniafjellet they ate a reindeer which he had shot for provisions. On 9 August Trevor-Battye shot a Little Auk, which was immediately seized by a gull (196 : 126, 136, 296). Nathorst says that the species replaces the birds of prey in Spitsbergen. He says it must be compared with the vulture because it takes young birds which are ill, and also will devour carrion (212 : 96). Bruce saw them taking young Guillemots on the bird-cliffs of Fuglehuken on 20 July 1906 (272 : 249).

Mathey-Dupraz found them at the carcass of shot Reindeer in 1906. A specimen which he dissected had swallowed a whole adult Black Guillemot. ("En disséquant un sujet, nous trouvons dans son jabot un *Uria grylle* adute, parfaitement complet, il avait donc été avalé d'une seule becquée.") He also records that they took eggs and young birds (311 : 51).

Munsterhjelm was on board a whaler in 1910 and saw how they took pieces of blubber away from the Fulmars when Bottlenose Whales were flensed (313 : 31).

Kristoffersen records that they take eggs and young of other birds, and adult birds which are wounded or hurt (432 : 183).

Hartley and Fisher say that they are partly predators and partly scavengers (513 : 383).

Løvenskiold describes how they take young Little Auks when these are leaving their colonies. Twenty-four gulls were shot in Hyttevika in August 1952, and of these 16 had Little Auks in the ventricle. The gulls caught them in the air, on land and on the sea and took an immense toll of the small birds (615 : 86).

Georg Bjørnnes saw a specimen at Gipshuken on 11 April 1940, which was eating a young seal (*Phoca hispida*) which it had killed (1939/40, 636). Arthur Oxaas found a dead young seal at Kapp Wijk on 12 April 1938. The gulls had pulled it out of the cave in the snow where it was born, had killed it and eaten the brain. On 9 May he found two young seals killed by gulls (1937/38, 643). On 11 April 1939, the gulls killed numbers of young seals (1938/39, 643).

Peder Åm found many dead young seals on the ice in Kongsfjorden on 15 April 1936. They had all been killed by Glaucous Gulls (1935/36, 646).

Like Kittiwakes, Glaucous Gulls are fond of bathing in fresh water. Bruce found Richardlaguna (on the NE side of Forlandet) to be a resting place for the species, especially after the breeding season (272 : 153). This, however, is something which may be seen anywhere in the Svalbard area where these birds are present in numbers. They will seek freshwater lakes or lagoons with fresh or brackish water, even while breeding, though many of the birds found here may be non-breeders.

In such places they are often found in the company of Kittiwakes. Sometimes enormous numbers of both species are present, bathing, and preening. The shores of a much-frequented lake can then be covered with a thick layer of their feathers.

According to Summerhayes and Elton the Glaucous Gull is a very powerful bird and can even hold its own against the Arctic Fox (397 : 218). Løvenskiold found a row of nests which had recently been in use at Måseneset at the southern entrance to Van Mijenfjorden on 29 July 1948. The nests were placed just beneath the upper rim of the steep brink of a raised beach. On the beach below fresh tracks of foxes were seen every day. If the birds had not been able to defend themselves and their offspring, they would have been unlikely to choose such a nesting place (615 : 88).

Strong as they are, they are mercilessly driven away from the tern-colonies. This has been described by many authors: Montague (433 : 145), Godfrey (529 : 31), Jung (539 : 130), Tiedemann (560 : 248) and several others.

Where there are big colonies of the Arctic Tern, it usually happens that Eiders, Long-tailed Ducks, Phalaropes and other birds breed among them. Here they are protected against the big gulls as long as they have eggs or can keep their young within the colony. But as soon as the mother Eider takes her ducklings to the sea they are in great danger of being taken.

Another bird which is quite unafraid of the big gulls is the Ivory Gull. Some authors say that they will not stand up to their bigger relatives, but others have seen them driving off the Glaucous Gulls, which have not offered any resistance at all. In August 1948, Løvenskiold saw them driving off all other birds when they had found some edible matter. However, one day the Ivories approached a shot seal to take the blubber. With them arrived four young Glaucous Gulls which drove them away from their food (615 : 90). In Signehamna in Krossfjorden the Ivories drove away all the big gulls from the carcass of a seal which had been shot there (1956, 633).

Tiedemann describes how when the birds left their breeding place high up on the mountainsides, one could, if there was clear weather with no wind, hear a certain buzzing sound, quite different from the noise of the air against the wings when the birds were diving to attack. He compares the sound with that of the tail-feathers of the snipe in its nuptial display. When he reached Hornsund, the birds had, however, begun to incubate, and he could not say if this performance had anything to do with the sexual display of the species (560 : 247).

If one approaches the nest or young, the parents will attack, diving at the intruder from a height of some 5–10 metres. Usually nothing will happen, but sometimes the bird will strike with its feet in the same way as the Arctic Skua does. See also Tiedemann (560 : 249), Duffey and Sergeant (586 : 560), and Løvenskiold (615 : 92).

In many ways the species is a great nuisance. As mentioned above it will at once devour all dead animals from the size of a Snow-Bunting up to a reindeer, if they are left uncovered on the ground. If nets are set for the Arctic Char and left dry at low tide, they will take the fish and tear the nets. The trappers hate them because they set off the traps laid for Arctic Foxes by stealing the bait. But the greatest harm they do is destroying the Eider colonies.

B r e e d i n g. — When the main body of these gulls arrives in April, all the ground is snow-covered, and their usual nesting sites are not available. This

does not matter very much as they have been known to build on snow and ice. But as long as the ground is covered with snow, they cannot get at their nesting material, which mainly consists of moss, grass-roots, and other vegetable matter.

The nest can be placed in many different surroundings. Most commonly they will nest on bird-cliffs, where they almost always build above the other inhabitants of the colonies, mainly on ledges near the top of the cliff. A great number of nests can also be found on islands and islets where Eiders breed, and here they are found both along the shores and also in the interior of these islands. They also nest on isolated rocks and big stones out in the sea, and sometimes also on raised beaches along the shores of the fjords. In some instances, single nests may be found, but usually several pairs nest together, especially on eider-holms, near them or on bird-cliffs. Here as many as 40 to 50 pairs have been found breeding together. Munsterhjelm describes the nest as a fairly big construction, the cup measuring about 350 mm across and with a depth of 80 mm (313 : 31). It is mainly built of moss, intermingled with tufts of grass with roots still on them, and other plants such as *Saxifraga oppositifolia,* and sometimes sea-weed. On Eider-holms the down from the Eiders' nests is very often used as a lining for the nest-cup.

On Kong Karls Land, Kolthoff found a rather curiously constructed nest at Kapp Weissenfels on Svenskøya on 8 August 1898. Very little vegetable matter can be found there, and the birds had built their nests of stones. One nest which he examined closely was built of stones about the size of pigeons' eggs, its highest rim being 100–120 mm above the surrounding ground. The cup of the nest was constructed of small stones and its surface was perfectly smooth. Empty eggshells around it showed that chicks had been hatched (261 : 68).

In a few instances nests have been found which were built upon snow-drifts or on ice-blocks. Evans and Sturge found nests on "masses of ice" near Sørkapp in 1855 (72 : 167). Kolthoff found a nest built on snow on a small island near Forlandet on 26 June 1900 (250 : 65). On 28 May 1924 on some small islands near Hornsund, Kristoffersen found a nest built upon a snow-bridge between two large boulders, where as soon as the snow melted, the nest and eggs would be lost. A second pair had built upon a snow-drift and a third pair on a block of ice (432 : 183).

Nests have been found in many sorts of places, such as on the roof of old huts, on islands in river deltas etc.

The egg-laying period begins in May and the earliest dates known are 8 and 18 May. Most eggs are laid from the third week of this month and to the middle of June, in normal years, varying with the climatic conditions. After 15 June fresh eggs have been found in a few instances, even until the middle of July, but in most cases these late clutches will have belonged to a second brood.

The number of eggs is usually 2 or 3, sometimes only 1. In cases where there are three eggs, it happens relatively often that one of them is infertile, a fact which has been observed by many authors. A second clutch is often found when the first one has been taken away at an early date. The second clutch, as far as we know, has never exceeded two eggs.

Table 27
Egg-laying

EGGS

Date	No. of nests	No. of eggs	Condition	Eggs presumably laid	Place	Author
28 May 1924	many	2	fresh	28 May	Hornsund	Kristoffersen (432: 183)
28 » 1924	»	1	fresh	28 May	Hornsund	Kristoffersen (432: 183)
28 » 1924	»	2 and 1	some days incubated	20 May	Hornsund	Kristoffersen (432: 183)
3 June 1866	1	3	fresh	3 June	Bjørnøya	Isachsen (446: 66)
3 » 1930	many	?	fresh	3 June	Sørkapp	Kristoffersen (472: 252)
6 » 1918	»	?	fresh	6 June	Bellsund	M. Olsen (1917/18, 642b)
10 » 1930	»	?	fresh	10 June	Sørkapp	Kristoffersen (472: 252)
12 » 1931	»	?	fresh	12 June	Bjørnøya	Tomkinson (485: 81)
12 » 1931	»	?	14 days incubated	30 May	–»–	Tomkinson (485: 81)
13 » 1898	»	?	well incubated	21 May	–»–	Kolthoff (261: 68)
13 » 1908	»	?	almost fresh	10 June	Hornsund	Le Roi (316: 193)
13 » 1930	»	3 and 2	incubated		Sørkapp	Kristoffersen (472: 252)
13 » 1898	»	3 and 2	fresh	13 June	Bjørnøya	Römer und Schaudin (246: 120)
13 » 1898	»	3 and 2	all st. of incubation	20 May	–»–	Römer und Schaudin (246: 120)
13 » 1921	1	2			–»–	Paget Wilkes (391: 2)
14 » 1900	1	?	fresh	14 June	Hornsund	Bianchi (253: 318)
14 » 1921	»	3 and 2			Bjørnøya	Paget Wilkes (391: 2)
15 » 1921	6	16 in all	pt. of hatching	20 May	–»–	Paget Wilkes (391 : 2)
16 » 1921	5	2			–»–	Paget Wilkes (391: 2)
16 » 1921	1	2 juv. + 1 egg	egg pt. of hatching	18 May	–»–	Paget Wilkes (391: 2)
					–»–	Paget Wilkes (391: 2)
16 » 1900	1	?	fresh	16 June	Hornsund	Bianchi (253: 318)
17 » 1907	many	?	incubated		Bjørnøya	Le Roi (316: 193)
17 » 1907	1	3			–»–	Le Roi (316: 193)
18 » 1907	1	3			–»–	Le Roi (316: 193)
18 » 1907	1	4			–»–	Le Roi (316: 193)
18 » 1864	many	?	some days incubated	21 May	Bjørnøya	Malmgren (92: 389)
19 » 1930	»	?	pt. of hatching		Isfjorden	Dalgety (470: 252)
20 » 1855	»	3			Sørkapp	Evans and Sturge (72: 167)
22 » 1910	1	2	slightly incubated	18 June	Forlandet	Munsterhjelm (313: 31)
22 » 1921	5	?	fresh	22 June	Bjørnøya	Paget Wilkes (391: 2)
23 » 1899	many	3 and 2	pt. of hatching	26 May	–»–	Swenander (247: 21)
23 » 1900	»	2 and 1	fresh	23 June	Hornsund	Bianchi (253: 318)
23 » 1900	»	?	10 days incubated	13 June	–»–	Bianchi (253: 318)

EGGS						
Data	No. of nests	No. of eggs	Condition	Eggs presumably laid	Place	Author
25 June 1899	2	2	fresh 2nd brood	25 June	Bjørnøya	Swenander (247: 21)
26 » 1935	many	?	fresh	26 June	Hopen	B. Trøhaug (1934/35, 645)
26 » 1900	1	3			Hornsund	Bianchi (253: 318)
26 » 1900	many	?	incubated		–»–	Bianchi (253: 318)
28 » 1864	1	1			Isfjorden	Wolley (88: 336)
16 July 1930	many	2	2nd brood fresh	16 July	Sørkapp	Kristoffersen (472: 252)
16 » 1954	1	3	8 days incubated	8 July	Wijdefjorden	Løvenskiold (1954, 633)
16 » 1907	many	?	fresh	16 July	Bjørnøya	Le Roi (316: 193)
16 » 1907	1	2	fresh 2nd brood	16 July	–»–	Le Roi (316: 193)
16 » 1870	many	3 and 2			Hornsund	Heuglin (123: 111)
31 » 1923	1	3			Nordaustl.	Longstaff (407: 489)

The Great Black-backed Gull lays on alternate days and it is highly probable that the Glaucous Gull does the same. Swenander visited a nest on Bjørnøya on 25 June and found one egg. Then he came back on the 28th and found two. These eggs were presumably laid on the 25th and the 27th (although 24 and 26 June is also possible). They hatched on 25 and 26 July, and Swenander says: "Die Brütezeit beträgt also, nach diesem Falle zu urteilen, 27 bis 28 Tage, was mit den Angaben in der «Fauna Arctica» genau übereinstimmt" (247 : 22). There are 30 days from 25 June to 25 July, one of these dates included, and 29 days from 27 June to 26 July. Thus the incubation period must be 29–30 days.

Kristoffersen found the first egg on the mainland on 3 June 1930. On the 10th the laying had begun on the islands (472 : 252). Here the first young, 2 to 3 days old, were seen on 12 July, which gives 29 days incubation. These two instances are the only reliable records on the period of incubation which we have from the Svalbard area, and here we must reckon with 29 to 30 days.

Römer and Schaudin say 28 days for the incubation, which is very close to the above statement (246 : 120).

Swenander found a further nest where the young were hatched on 26 June. On 13 August, after 49 days, they could fly. This corresponds well with the facts known about the Great Black-backed Gull, where the young can fly after 7 weeks. (In tables 27 and 28 an incubation period of 29 days is assumed and a growth period of 49 days.)

Young birds on the wing have been seen as early as 20 and 24 July. But the normal time for them to fly is in the first three weeks ofAugust.

When they are able to fly, they will in most cases have to fend for themselves, but they can sometimes be fed by the parents for some days afterwards. Løvenskiold saw the first on the wing in Hornsund on 15 August 1952. On the

Table 28

Hatching and fledging

YOUNG						
Date	No. of nests	No. of young	Age	Eggs presumably laid	Place	Author
13 June 1896	many	many	in down		Bjørnøya	Römer und Schaudin (245: 76)
17 » 1871	»	»	just hatched	20 May	Spitsbergen	Heuglin (132: 185)
18 » 1898	»	»	just hatched	21 May	Bjørnøya	Kolthoff (261: 68)
22 » 1910			just hatched	25 May	Forlandet	Munsterhjelm (313: 31)
22 » 1921	many	many	small in down		Bjørnøya	Paget Wilkes (391: 2)
26 » 1949	1	3	1 egg + 2 hatched	29 May	Kongsfjord	Løvenskiold (615: 91)
12 July 1930	many	many	just hatched	14 June	Sørkapp	Kristoffersen (472: 252)
16 » 1950	many	many	just hatched	4 June	Stormbukta	Løvenskiold (615: 84)
16 » 1950	many	many	14 days old	18 June	–»–	Løvenskiold (615: 84)
17 » 1861			alm. fully fledg.		Hinlopen	Chydenius (89: 199)
19 » 1950	many	many	just hatched	7 June	Tokrossøy	Løvenskiold (615: 83)
19 » 1950	»	»	8 days old	15 June	–»–	Løvenskiold (615: 83)
19 » 1950	»	»	14 days old	21 June	–»–	Løvenskiold (615: 83)
24 » 1957	»	»	on wing	8 May	Norskøyane	Bateson (1957, 650)
25 » 1899	1	2nd brood	just hatched		Bjørnøya	Swenander (247: 21)
26 » 1899	1	2nd brood	just hatched		–»–	Swenander (247: 21)
4 Aug. 1898	many		on wing	18 May	Heleysund	Römer und Schaudin (246: 120)
8 » 1898			on wing	22 May	Kong Karls Land	Kolthoff (261: 68)
9 » 1957	many		on wing	23 May	Norskøyane	Bateson (1957, 650)
10 » 1948	»		on wing	24 May	Isfjorden	Duffey (586: 560)
13 » 1899	1	2	on wing	27 May	Bjørnøya	Swenander (247: 21)
15 » 1948	many		on wing	29 May	Hinlopen	Løvenskiold (615: 92)
15 » 1952	»		on wing	29 May	Hornsund	Løvenskiold (615: 87)
17 » 1950	»		on wing	1 June	Sassenfjd.	Løvenskiold (615: 91)
18 » 1889	many		on wing	2 June	Edgeøya	Walter (169: 246)
18 » 1896	»		on wing	2 June	Hornsund	Trevor-Battye (203: 593)
18 » 1954	»		on wing	2 June	Wijdefjorden	Løvenskiold (1954, 633)
21 » 1952	»		on wing	5 June	Hyttevika	Løvenskiold (615: 87)
22 » 1956	»		on wing	6 June	Krossfjorden	Løvenskiold (1956, 633)
24 » 1958	»		on wing	8 June	Bjørnøya	Løvenskiold (1958, 633)

21st they were fed by the parents, but on the 27th, when they still begged for food, they were driven away (615 : 87).

F o o d. — As mentioned before, the Glaucous Gull in the Svalbard Area is both a predator and a scavenger. It will kill and devour all animals it can overcome, and it will take carrion and any kind of edible refuse. In the Norwegian collieries it is protected because it eats a large amount of offal, and this is the only instance in which it acts as a harmless bird.

It would take too much space to put down everything written about the food of the species, but a few interesting and more special records will be mentioned below:

Cocks records that on a trip in 1882, Mr. Rabot had a captured Glaucous Gull. He once gave the bird a dead Purple Sandpiper, which it immediately swallowed whole, as mentioned earlier (151 : 441).

Klinckowström saw the species in 1890 in Adventfjorden feeding from the carcass of a Greenland Shark (172 : 99).

Schalow says that it takes excrement of seals and Polar Bears (232 : 378).

Bertram and Lack mention shore-crabs such as *Hyas araneus* as a common food of the species on Bjørnøya in 1932 (488 : 298). Hartley and Fisher examined three specimens in Billefjorden in 1933. Two contained the crustacean *Thysanoëssa inermis* and one of the gulls also had feathers in the stomach. The third bird only had digested offal in the ventricle. In late August and early September they also saw young birds feeding among the Kittiwakes, probably on *Thysanoëssa*. Adult birds were never seen doing this (513 : 383). Duffey and Sergeant examined some specimens on Bjørnøya in 1948 and found that among more usual food they had also taken *Cephalopoda* (586 : 560).

Løvenskiold found the middle part of a very big Herring (scales examined) in a nest in Stormbukta in 1950. On some small islands near Hornsund, visited on 2 August 1950, a great number of young birds were found. Their parents became very excited and disgorged newly swallowed, fairly big sea-slugs (holothurians). The bird-cliffs of Sofiakammen in Hornsund were visited on 4 August. No remains of birds were found on the grass-clad slopes beneath these enormous bird-cliffs, but a family of foxes lived there. On another visit two years later the foxes had disappeared and now the slopes were littered with remains of Kittiwakes and Guillemots. The skins of these birds were inverted, a sure sign that they had been taken and eaten by Glaucous Gulls.

On 26 June 1949 I visited Lovénøyane in Kongsfjorden. Here a gull came to an Eider's nest, took an egg, swallowed it and flew away. It alighted some distance off, disgorged the egg and ate it. On 20 July 1954, empty eggshells of Ptarmigans were found in Wijdefjorden. They were without doubt taken by these gulls (1954, 633).

As the bird very often swallows its prey whole, feathers, bones and other indigestible items are disgorged in the form of pellets. These pellets are often found around the nests. In the literature on Spitsbergen birds, a few instances where such pellets have been examined are mentioned: Kjellman relates that Malmgren found herring-bones in pellets taken in nests of this species (135 : 323). Schalow describes a number of pellets that were collected in Spitsbergen. One

contained the remains of a whole young *"Gavia alba"* (*Pagophila eburnea*). This pellet was 200 mm long and 25 mm wide. Another pellet was 60 mm long and 48 mm wide and contained feathers, stones and mud. A third held feathers, remains of *Crustacea* and mud. One of the feathers (from a young gull) was 105 mm long. The length of the pellet itself was 185 mm. A fourth pellet was 154 mm long and 45 mm wide. It contained the remains of a crab *"Platycarcinus* sp." (232 : 378). Duffey and Sergeant collected pellets on Bjørnøya in 1948. These pellets showed that the food of the bird near the southern auk colonies was largely eggs and young birds, but in the north and west, where there were few auks, it was almost exclusively the crab *Hyas araneus* (586 : 560). Løvenskiold collected some pellets on Dunøyane in 1950. The contents were almost exclusively membranes of Eider's eggs and down of ducklings (615 : 87).

No. 55. *LARUS MARINUS* L.[1]

The Great Black-backed Gull

Geographical distribution

The species breeds in N Europe from Iceland, the Færoe Islands, Svalbard, Scandinavia, Finland and N Russia south to Denmark and NW France. It also breeds in N America.

According to Salomonsen it goes up the west coast of Greenland as far as latitude 70° N, but only to 66° N on the eastern (588 : 293).

Occurrence in Svalbard

The species breeds on Bjørnøya, on the islands in the Hornsund district (probably in Bellsund), and on Forlandsøyane outside Prins Karls Forland.

First records

Keilhau records that he saw this gull on Edgeøya in 1827 (48 : 163), but this is probably only a misprint for the Glaucous Gull. Chapman relates that Pike thought he had seen a young *L. marinus* on Amsterdamøya in September 1888 (195 : 343), but he probably mistook a young *L. hyperboreus* for the other species.

The first record for the Svalbard area is from 1908. Le Roi reports that an adult bird was seen on Bjørnøya on 11 June (316 : 195). In 1921 a pair was found breeding there.

The first record from Spitsbergen is in 1923 and the first record of breeding in 1930.

Distribution. Sections I–V

Section I. Bjørnøya. — The bird was first found on the island in 1908. The first nest was found in Kvalrossbukta on the north coast in 1921 and the *L. marinus* is still breeding there.

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[1] Contour map showing distribution, see backflap.

Section II. Hornsund. — The first record is from 1923, when a single bird was shot in Hornsund. In 1930 it was seen on Sørkappøya, on Tokrossøya and on the mainland. The first record of breeding is from 25 June, 1930, when Kristoffersen found two nests on Stjernøya (between Sørkappøya and the mainland). In the same year, single birds seen were now and then on the mainland. In 1950 ten pairs were found breeding on Stjernøya and five on Tokrossøya. The species was also seen on Dunøyane, where it was found breeding in 1952, and it was seen again here in 1957. In the summer of 1952 two birds were seen on Isøyane.

Section III. Bellsund. — In August 1949, two birds were seen at Kapp Martin. Later a pair was found on Reiniusøyane farther into the fjord. The birds behaved as if they were breeding, and were possibly the same birds as were seen at Kapp Martin.

Section IV. Isfjorden. — A single bird was shot in this fjord in 1937.

Section V. Prins Karls Forland. — During the summer of 1956 these gulls were repeatedly seen flying over Forlandet, and on 31 July they were found breeding on the central (the biggest) island of Forlandsøyane.

Biological

In the Svalbard area the Great Black-backed Gull is a relative newcomer. In fact, as Bertram and Lack say, it has quite recently established itself on Bjørnøya (528 : 45). In the future it will also occupy more and more of Spitsbergen.

Since it began to breed there only about thirty years ago, there are but few records of it. We know next to nothing of the migration etc. of the species. The earliest date it has been observed is 28 March, 1930, when Kristoffersen saw it on Sørkapp. But we do not know where the birds come from and if they go, for example, to the Norwegian coast in winter-time.

Wynne-Edwards says that the species is seldom seen more than forty miles from land, both in British and Canadian waters (512 : 315).

It is therefore very interesting that the bird is found in the Svalbard area.

No. 56. *LARUS FUSCUS* subsp?

The Lesser Black-backed Gull

Le Roi shows quite clearly that all previous records of this species from the Svalbard area are erroneous (316 : 190).

Between 16 and 23 June, 1949, on a journey by collier from Norway to Spitsbergen, Professor Hans Johansen and Dr. Løvenskiold observed Lesser Black-backed Gulls following the ship. The last one of these disappeared when the position was 75° N, a little to the north of Bjørnøya (615 : 80).

No. 57. *LARUS ARGENTATUS ARGENTATUS* Pontopp.

The Herring-Gull

The first to record this gull from the Svalbard area was le Roi (316 : 189). One of his companions, Baron v. Geyr shot a young bird in its 3rd year on Bjørnøya, 7 July, 1908.

In 1932 Bertram and Lack found the species breeding on Bjørnøya. "We saw an adult in Walrus Bay on 18 July, and two on the east coast 5 August, but as a breeding species it is confined to the north-west, seven pairs being present among the Glaucous Gull colonies at and north of Kapp Dunér. A nest found on 4 July was later robbed by fishermen. A second nest had two young on 28 July, one well-grown chick being taken on 4 August which, with photographs of the adult, confirms the identification. The other five pairs kept to restricted areas, but were not breeding. The nests are the first for Svalbard and the farthest north yet recorded. All the birds had pink legs, and hence were not *Larus argentatus cochinans* Pall." (488 : 296)

They also found hybrids between *Larus argentatus* and *Larus hyperboreus*. "On 27 June we saw a remarkable bird among a flock of Glaucous Gulls on the east coast which agreed with the Herring-Gull in its size and black-tipped wings, but it had the pale mantle of an immature Glaucous Gull. We concluded that it must be a hybrid. Then on 28 July a Herring-Gull was found which had paired with a Glaucous Gull. The birds were observed for an hour and kept constantly together. Both were watched down to the nest, from which they combined to chase off passing Glaucous Gulls. The nest contained a chick about four days old, two cold eggs which had partially developed, and the remains of the third egg. These were taken but, owing to the precipitous nature of the cliffs, we could not obtain the adult, both of which swooped close over our heads in defence of the nest."

In 1950 the Herring-Gull had reached Spitsbergen. On 25 July Løvenskiold found two pairs on Tokrossøya, an island just south of Øyrlandet, the SW point of the mainland. A male bird was shot, and found to have large brood-patches which were already becoming covered with feathers. Both pairs behaved as if they were breeding. But among the many juvenile Glaucous Gulls that were running around it was impossible to find the young Herring-Gulls.

The next day a pair of these gulls were observed on the island Stjernøya south of Tokrossøya and on 5 August, 1950, a single bird was seen on Dunøyane north of Hornsund. This bird also behaved as if it was breeding (615 : 79).

In the above paper the race is erroneously determined as *Larus argentatus omissus* Pleske. Professor Hans Johansen in Copenhagen, to whom the bird was sent for further study, writes (in a personal communication) that it is the common Herring-Gull, *Larus argentatus argentatus* Pontopp.

LARUS GLAUCOIDES GLAUCOIDES Meyer

The Iceland Gull

The Duke of Orleans says that he saw this gull in several places on the W and NW coasts of Spitsbergen in 1905 (277 : 333, 337). He did not shoot any specimens, and so he had nothing with which to prove the records.

Le Roi says that there is no reliable record of the bird from this group of islands (316 : 190).

During the 8 summers in which I have visited Svalbard, several Glaucous Gulls have been shot, almost always including some very small specimens. In all instances however, these birds have been genuine Glaucous Gulls.

As far as can be seen, there is no reliable record of this species from the Svalbard area.

No. 58. *LARUS CANUS CANUS* L.

The Common Gull

There are several old records of this species from the Svalbard area, but probably in every case the Kittiwake has been mistaken for the Common Gull. Those who claim to have seen this gull in Spitsbergen are: Fries and Nyström (109 : 79), von Zeppelin (179 : 168), Oustalet (231 : 304), Roth (257 : 58) and Gauert (300 : 151).

I quite agree with le Roi when he says that the Common Gull has never been found so far north (316 : 189).

In 1932 the bird was found for the first time in the area when Bertram and Lack saw a pair on 21 June on Bjørnøya. The gulls behaved as if they were breeding and therefore were not shot, but they were never seen again (488 : 296).

No. 59. *XEMA SABINI* (Sabine)[1]

Sabine's Gull

Geographical distribution

In Europe it breeds in Spitsbergen, and in Asia on the Taimyr Peninsula, Lena delta, the New Siberian Islands and Anadyr. In America it breeds in the western part of Alaska from Kuskokwim river to Point Barrow, on the arctic islands of Canada to Baffin Island and the mouth of Hudson Bay, and northwards to Ellesmere Island and N Greenland.

The species is found occasionally in Jan Mayen, Iceland, the Færoe Islands and Franz Josef Land, and along the coasts of European countries. The winter habitat is unknown.

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[1] Contour map showing distribution, see backflap.

Occurrence in Svalbard

The bird has been found once in the Hornsund district. From Isfjorden there is also one record. On Forlandet it has been seen at least two, probably three times. The species has been found on several occasions in Kongsfjorden and this is where it breeds more or less regularly. From Wijdefjorden there is one certain record and one undated. For Nordaustlandet there is a record from Nordkapp, and another from Storøya where the birds may also have bred. From Storfjorden there is one record.

First records

The first time this gull was found was on the west coast of Greenland on 25 July, 1818, by Sir Edward Sabine. The first description of the bird, with an illustration, appeared in the *Transactions of the Linnean Society of London,* Vol. 12, 1818, by Mr. Joseph Sabine, who named it *Larus Sabini,* after his relative.

The first time the bird is heard of from Spitsbergen is during Parry's expedition in 1827, where Lieutenant Foster is said to have seen the bird in the Waygatz Strait, i. e. Hinlopenstretet (46 : 195).

It is of course possible that he did see the species, but it is more likely that he saw only Arctic Terns.

Much has been written on the two specimens which are said to have been shot in Spitsbergen in July, 1823, by Sir Edward Sabine. But he says nothing about this in any publication known to me. Swainson and Richardson say that he killed a pair in Spitsbergen (49 : 428), and Saunders says that Sabine shot two gulls of this species in Spitsbergen in July, 1823 (439 : 668). It seems, however, that nobody has been able to trace the original record. Malmgren and several contemporary ornithologists said that the whole thing was only a fraud (85 : 118).

The first time proof was brought that the bird was an inhabitant of Spitsbergen was in 1898, when the species was seen and shot by Römer and Schaudin. In a paper published in 1898, Oustalet says that the species has never been found in Spitsbergen (214 : 266). The first time the species was found breeding was by Professor Koenig in 1907.

Distribution. Sections II–XIV

Section II. Hornsund. — Kristoffersen shot an adult male bird on 16 June 1929, near Sørkapp. This gull had been pursued by an Arctic Skua, and it tried to hide itself among some boulders (472 : 254).

Section IV. Isfjorden. — Le Roi states that a member of the expedition, Mr. C. Essingh, saw a small black-headed gull in Sassen on 22 June 1908. This can only have been a Sabine's Gull (316 : 181).

Section V. Prins Karls Forland. — Bruce says that he saw a Sabine's Gull on Forlandet in 1906, and as he had not heard of Römer and Schaudin's specimens, he thought that this was the first record (282 : 147). Le Roi states that Koenig shot a male Sabine's Gull on the NE point of For-

landet on 19 June, 1908. Jourdain says that J. S. Huxley reported a small gull seen at close range on 7 July 1921, near Richardlaguna, Forlandet, which may have been an immature bird of this species (381 : 173).

Section VI. Kongsfjorden. — Koenig found the species breeding on an island in Kongsfjorden on 7 July, 1907. A nest with two eggs was found and both birds were shot. The female had the third egg, which was fully developed, in the oviduct (286 : 135). Mathey-Dupraz saw a bird of this species on 1 August 1911, on an island in Kongsfjorden (333 : 114). In another publication he states that he saw two birds on 1 August 1911 (346 : 17). Wollebæk says that Dr. A. Orvin shot two *Xema sabini* on one of the islands in Kongsfjorden on 6 August 1922 (392 : 380).

In 1923 George Binney presented a young Sabine's Gull, shot in Spitsbergen, to the British Museum, Nat. Hist. (401 : 825). Longstaff saw a Sabine's Gull in Kongsfjorden on 26 August, 1923. Shortly afterwards he saw a pair. His party also obtained a young bird, and this is the specimen in the British Museum, referred to above (407 : 488). Elton states that a nest with one egg of *Xema sabini* was found on one of the islands in Kongsfjorden in the summer of 1924 (415 : 113). Dalgety records that a single bird of this species was seen in Kongsfjorden on 1 and 11 July, 1930 (470 : 252). Olivier saw a Sabine's Gull on an island in Kongsfjorden on 6 August, 1931 (493 : 64).

Section VIII. Wijdefjorden. — Binney states that he saw a Sabine's Gull in this fjord, but he says nothing about when and where (413 : 62). Blurton Jones saw a specimen at the river mouth at the end of Mittag-Leffler-breen on 16 August 1957 (1959, 652).

Section X. Nordaustlandet. — Collett and Nansen relate that when *Fram* was in 83° N, north of Spitsbergen, a gull with a black head was seen (237 : 48).

Kolthoff and Jägerskiöld say that they were informed by Dr. F. Schaudin in a personal communication that eight pairs of *Xema sabini* were seen on Storøya on 7 August, 1898. The gulls lived among the Arctic Terns and seemed to breed there (209 : 319). Schalow states that Römer and Schaudin found *Xema sabini* in Spitsbergen in 1898. They brought back three specimens from Storøya, one male and two females. Schalow was of the opinion that the birds bred there, and says that this is the first reliable record for Spitsbergen (232 : 376, 379). See also Römer and Schaudin (245 : 72) and (246 : 116). Lönnberg says that eight pairs have been found breeding in Spitsbergen. This refers to the birds on Storøya in 1898, but no nest was found there and no actual proof of breeding was obtained (409 : 750).

Kristoffersen says that the bird was found breeding by Nathorst in 1898 on the island Storø, the southernmost point in Spitsbergen (472 : 254). He had this information from Schaanning (351 : 264), but he has mistaken Storø, which is another name for Sørkappøya, for Storøya east of Nordaustlandet, and Nathorst, of course, has never found Sabine's Gull breeding in Spitsbergen. It is really Römer and Schaudin's record which is referred to. Worsley says that a Sabine's Gull was seen on 21 August 1926, at Nordkapp on the island Chermsideøya on the north coast of Nordaustlandet (441 : 184, 273).

Section XI. Storfjorden. — Løvenskiold saw a Sabine's Gull at Kvalhovden in Storfjorden on 5 September, 1952 (615 : 79).

Section XIV. Hopen. — Askheim relates that a specimen visited the island in 1954 and in 1956 (1957, 649).

Biological

Migration. — The species has been found only a few times in the Svalbard area, and so far nothing is known about its migration habits.

General behaviour. — At the nest Sabine's Gull behaves much in the same way as the terns it often breeds among.

Montague says that both birds showed great anxiety and swooped at the intruders, but without striking at the head with the bill, as the terns will do. They were far less ferocious than the Arctic Terns. The non-sitting bird was extremely aggressive and was constantly harassing such terns as came near it. This hostility was not confined to the actual neighbourhood of the nesting territory (433 : 144).

Longstaff visited a breeding place in 1923 and a pair of Sabine's Gulls came and settled on the ground close by him. After an hour's search, the birds all at once began to fly over his head and uttered a cry resembling that of *Larus ridibundus,* but thinner and higher. A young bird then left the shore and settled on the sea where it was shot (407 : 488).

Breeding. — The species has occasionally been found breeding in Spitsbergen, and nearly every time the birds have been killed, and the eggs and young taken. It is almost a miracle that the species is still found in the area.

This rare and beautiful gull should be fully protected and nobody should be allowed to harm it in any way.

It seems that when *Xema sabini* breeds, it seeks the protection of big colonies of the Arctic Tern, in the same way as several other birds will do. Eiders, Long-tailed Ducks, Grey Phalaropes and Turnstones are often found breeding among the terns, which tolerate them and do not molest them in any way. If Sabine's Gull is not always welcomed in this manner by the terns, it is because the gulls sometimes eat their eggs.

All who have found the species breeding in Spitsbergen agree that the birds always breed among the terns. This seems to be a constant habit of the species. Salomonsen says that in Greenland: ". . . it is always associated with the Arctic Tern" (588 : 337). Witherby says that the terns make constant sallies at them when on the wing, without, however, in the least disturbing them (583, Vol. V : 51). On the other hand Montague saw them driving terns, as well as gulls and skuas away from their territory (433 :144).

Two different types of nests have been found in Spitsbergen. Le Roi found a nest on an island in Kongsfjorden, only a few yards from the tern nests. It was a small, shallow scrape on a piece of stony ground with no vegetation at all (316 : 182). The other type of nest was found by Montague, and was a mere dry hollow in a very wet patch of moss and with a very sparse lining of dry grass stems. The nest was in the centre of the ground occupied by the

terns and three or four yards inland from the edge of a small shingle beach (433 : 144).

In 1907 as well as 1924, the nests were found on 7 July. In the first instance there were two eggs in the nest and a third in the oviduct of the female. In the second instance the nest contained one slightly incubated egg. Binney says that a nest was found in Kongsfjorden in 1924, but gives no details. This, however, is the same nest as that found by Montague and described by him.

On 26 August, 1923, Longstaff visited an island in Kongsfjorden. He had met Dr. Adolf Hoel from Oslo, who had told him that *Xema sabini* was breeding there. The ternery, which was the biggest that Longstaff had seen in Spitsbergen, was located and a Sabine's Gull in full breeding plumage was seen. Shortly afterwards a pair with a fully fledged young bird was observed. The young bird was shot, but luckily enough the adults were spared. Longstaff adds: "I learnt that Jourdain's party originally discovered this colony in 1922." (407 : 488), but Mr. Jourdain visited Spitsbergen in 1921.

Römer and Schaudin saw eight pairs on Storøya on 7 August, 1898. They shot three birds, two of which were females. These, the authors thought, showed unmistakable signs of having bred. They say that because of the fog they could find no eggs (246 : 177), but so late in the year the eggs should have been hatched. Apart from the condition of the females, which is not described, there is really no actual proof of breeding.

F o o d. — Le Roi says that one specimen obtained had small stones and a long straw in the stomach, the other had small stones and remains of molluscs (316 : 182). Lönnberg states that in Greenland they take cuttlefish (409 :750). Witherby writes that they take: "Insects and their larvae (chiefly *Diptera*), *Crustacea* (*Isopoda* and *Amphipoda*), *Annelida* (aquatic worms and earthworms), molluscs (mussels and *Gastropoda*). Also small fishes (583, Vol. V : 52). Salomonsen says that they will sometimes eat the eggs of terns in the colonies where they are breeding (588 : 338).

No. 60. *RHODOSTETHIA ROSEA* (MacGill.)[1]

Ross's Gull

Geographical distribution

This gull breeds in NE Siberia in the deltas and valleys of the rivers Indigirka, Alazei and Kolyma, probably also sometimes in Greenland. It has been recorded from Novaya Zemlya, Bennet and Wrangel Islands, Melville Peninsula etc. In England it has been found once. According to Løvenskiold the species has been found twice in Norway, one adult female on 6 May, 1900, in Finnmark in latitude 70° 5′ N, and another on Jæren in the SW part of the country, on 1 January, 1949 (571 : 785).

[1] Contour map showing distribution, see backflap.

First records

The first known specimens of this gull were shot by Lieutenant Ross (the later Sir James Clark Ross) in June 1823, at Alagnak on the Melville Peninsula in latitude 60° N. Of the two birds shot there, one was presented to the Museum of the University of Edinburgh, the other was given to Mr. Joseph Sabine.

The first description was by Mr. Richardson, who called it *Larus Rossii,* in a paper read to the Wernerian Society in January 1824. This paper was published in the Appendix to Parry's second voyage, in 1825.

According to Swainson and Richardson, Mr. MacGillivray, who called the bird *Larus roseus,* described it from the same specimens as cited above, in a paper to the same society, but his paper was published in 1824 (49 : 427).

The next time the bird was seen, was in the ice north of Spitsbergen in 1827, in latitude 82° N, by Lieutenant Ross, who accompanied Mr. Parry on his voyage towards the North Pole.

One would think that this observation was not to be doubted, but several scientists, some of whom had been to Spitsbergen and failed to see the bird themselves, excluded the species from the avifauna of Spitsbergen and denied that Lieutenant Ross saw the bird.

Since that time, however, the bird has been found in the same latitude and at the same time of the year, first by Nansen and Johansen north of Franz Josef Land in 1895 and then two years later by Andrée north of Kvitøya. Therefore it cannot be doubted that Ross saw the bird. The first time the bird was seen in Spitsbergen was in 1950.

Occurrence in the Svalbard–Franz Josef Land Archipelago

According to Parry six specimens were seen by himself and Lieutenant Ross between 16 July and 21 August, 1827. They were then within an area between the latitudes 82° 6′ and 82° 36′ N and the longitudes 17° 45′ and 22° 4′ E. (46 : 81, 87, 89, 110). The statement that Lieutenant Foster had seen the bird in the Waygatz Strait (Hinlopenstretet), must have arisen from a misunderstanding (46 : 195).

According to Payer and Feilden a single specimen was shot by Mr. Julius Payer on board the *Tegettoff* in the summer of 1873 in the ice south of Franz Josef Land (140 : 276) and (143 : 200).

Collett and Nansen relate that when Nansen and Johansen were in the area between the latitudes 82° 10′ and 81° 30′ N and around the longitude 60° E, between 11 July and 3 August, 1895, they saw more than 20 specimens of this gull. When they came to the NE islands (called Hvidtenland by Nansen) in Franz Josef Land on 7 and 8 August, whole flocks of these gulls were flying about and were also sitting on the edge of a glacier (237 : 27).

According to Andrée and Lönnberg about 19 specimens were seen by Andrée and his companions between 25 July and 30 August, 1897. They were then within latitudes 82° 36′ to 81° 40′ N and longitudes 28° and 31° E (461 : 399-432) and (473 : 149, 150).

Jackson saw a single specimen at Kapp Flora on Franz Josef Land on 5 July, 1897, just outside his house there (224 Vol. 2 : 3216,403). This is denied by

Bruce who thinks the bird was a Kittiwake (207 : 99). I have, however, gone through Jackson's diary in the library of the Scott Polar Research Institute in Cambridge. The description of the bird which is given in the diary makes it quite obvious that the bird was a Ross's Gull.

From Spitsbergen there is only one record. On 1 July, 1950, Løvenskiold saw a single specimen flying over a colony of Arctic Terns on Hotellneset in Adventfjorden. The bird flew fast because it was pursued by the terns, but the narrow dark ring around the neck and the wedge-shaped tail were unmistakable (615 : 79).

From this it is apparent that *Rhodostethia rosea* can be found in the ice north of Spitsbergen and Franz Josef Land around the latitude 82° N, at least in the months of July and August. The greatest number was seen in longitude 60° E, where about 20 individuals and then flocks were seen. Around longitude 30° E about 19 birds were seen and in longitude 20° E only 6. This must not be taken as a general rule, however, as the birds were observed in three different years.

All these birds have been seen around the latitude 82° N. It therefore seems possible that there is much food in the form of macroplankton for the birds in the channels between the ice-floes in this latitude.

Much has been written on the occurrence of this bird in Spitsbergen and north of these islands. Malmgren did not see the bird himself and he denies that either Parry, Ross or other members of the expedition in 1827, had seen this gull (85 : 120) and (92 : 412).

Newton was of the opinion that Ross had seen this bird north of Spitsbergen, but that Foster had mistaken another species for Ross's Gull in Hinlopenstretet (96 : 524).

Dresser says that Malmgren's suspicions were justifiable (115 Vol. 8 : 343).

Le Roi thinks it probable that the bird really had been seen by Ross, but he is of the opinion that others would have to bring actual proof of its occurrence there (316 : 183).

But there are others who are in no doubt as to the validity of Ross's observations. Feilden cites a letter from Mr. Julius Payer on the bird shot south of Franz Josef Land in the summer of 1873, in which he concludes: "How interesting it is thus to obtain, after a lapse of fifty years, corroborative evidence that Sir James Clark Ross was correct in determining this species as seen by him to the north of Spitsbergen, during Parry's memorable attempt to reach the North Pole." (143 : 201)

In his paper "Results of a Voyage to East Spitsbergen", W. Eagle Clarke writes: "In conclusion, I would enter a protest against the omission, or rather exclusion of *Rhodostethia rosea* from the Ornis of Spitsbergen. It is impossible to doubt the accuracy of Commander Ross, the discoverer of the species . . ." (220 : 51).

In February 1959, Løvenskiold received a letter from Mr. Knut Samuelsen (1959, 654), who had been a radio operator at Kapp Linné at the entrance to Isfjorden in 1955. Parts of the letter are quoted below:

"One day at the end of April 1955, the steward came running and told me that a flock of birds was passing the station. They have pink breasts and a black ring around the neck, he said. . .

"At the end of May we were visited by a bird which I had never seen. It was perhaps a little larger than a tern, but had a breast like the most wonderful sunset. It kept to the station for about 10 days and then made a nest, 10 metres from the south corner of the house . . .

"One egg was laid and it had the same protective colour as the eggs of the terns. The bird itself had a rose-coloured underside and the sharply defined ring around the neck was not more than 3–4 mm broad. After some days one of the men on the station shot the bird which was thrown away . . ."

Mr. Samuelsen is a reliable man, and neither he nor the others at the station knew anything about birds, or that this gull was a very rare one.

No. 61. *PAGOPHILA EBURNEA* (Phipps)[1]

The Ivory Gull

The Ivory Gull is an arctic species which breeds in Svalbard, Franz Josef Land and on some islands north of the Asiatic coast. These islands are, Lonely Island between Novaya Zemlya and the Taimyr Peninsula, Bennet Island north of the New Siberian Islands and on Herald Island to the east of Wrangel Island. North of the coast of N America it nests on Polynia, Prince Patrick, Melville, Ellesmere and N Baffin Islands. It also breeds in Greenland.

In winter it goes as far south as the arctic coasts of Europe, Asia and America. It has occasionally been found in Scandinavia, Finland and Russia. In Norway it has been recorded 14 times between 1883 and 1932.

Occurrence in Svalbard

The Ivory Gull has been observed in all districts of the Svalbard area, but it is far more common in the east and north-east than in the south and west of the islands. It has been found breeding in several districts, for example, Hornsund, Isfjorden, NW Spitsbergen, Hinlopen, Nordaustlandet, Storfjorden, Kvitøya and Kong Karls Land.

First records

The first time this species is mentioned from Spitsbergen is in 1610, by Jonas Poole who saw the bird there in 1609. His description of *Pagophila eburnea* is unmistakable: "A white Fowle with a greene bill, the top of the bill of it and the eyes were redde, with black feet" (4 : 23). Martens names the bird "Rahtsherr" and says that it is whiter than snow, as can be seen when it sits on the ice. He also observed that the bird would never sit on the water as other gulls do, and he saw it eating excrement of walrus (12 : 56). He made a drawing of it at "Flacke Point" (probably Jermaktangen) and shot a specimen (there?) on 10 July, 1671. Martin saw the bird in Spitsbergen during the summer of 1758 (17 : 126), and Phipps, who described the bird and named it scientifically, saw it there in 1773 (23 : 187). Mandt saw the Ivory Gull when he visited Spitsbergen in 1821 (42 : 4).

[1] Contour map showing distribution, see backflap.

Distribution. Sections I–XIV

Section I. Bjørnøya. — The bird has been seen many times on the island and on the sea around it. It has never been found breeding there.

Section II. Hornsund. — Adult and young birds have been found in many places in this district. A breeding colony was found in the vicinity of Hornsundtind, and they are known to have bred in three other places.

Section III. Bellsund. — The bird has been observed in Bellsund, Recherchefjorden, Van Keulenfjorden and Van Mijenfjorden. At Sveagruva at the head of Van Mijenfjorden, there were numbers of these gulls as long as the mines were worked. One could almost always see between 50 and 100 birds there.

Near the glacier Paulabreen at the head of the southern branch of the fjord there are usually several to be seen. Here there is said to be a breeding place.

Section IV. Isfjorden. — The bird has been observed in Grønfjorden, Colesbukta, Adventfjorden, Sassendalen, near De Geerfjellet at the head of Billefjorden, and here a colony was found near the glacier Ebbabreen. It has also been seen at Kapp Thordsen between Billefjorden and Dicksonfjorden and at Kapp Wijk in the latter fjord. In addition it has been seen on Bohemanneset and in Forlandsundet.

Section V. Prins Karls Forland. — There is only one record from this island.

Section VI. Kongsfjorden. — There is one record from Engelskbukta, two from Kongsfjorden and one from Signehamna in Krossfjorden.

Section VII. NW Spitsbergen. — In this district the species has been found breeding in Magdalenefjorden and on the mountain Strengehagenfjellet on the west side of the glacier Monacobreen. It has been seen in Sørgattet, on Danskøya, Amsterdamøya, Norskøyane, Flathuken, Raudfjorden, Jermaktangen, the island Moffen, on Reinsdyrflya, in Liefdefjorden, and on Gråhuken.

Section VIII. Wijdefjorden. — In this fjord the birds have not been breeding. They have been seen in Vestfjorden, on the glacier Oxfordbreen, at Austfjordnes, Dirksodden, in Mosselbukta, at Verlegenhuken, Ragnarbreen, Framstaken, and at the end of Mittag-Lefflerbreen.

Section IX. Hinlopen. — There are two breeding places in this district, one near the head of Sorgfjorden and the other on the south side of Chydeniusbreen. Birds have been seen in Lomfjorden, on Fosterøyane and on Bastianøyane.

Section X. Nordaustlandet. — Many colonies have been found on this island. The birds have been found breeding at Torellneset, in two colonies in Palanderbukta, on the south side of Wahlenbergfjorden, almost at the head on the bay, and there is also a colony to the W-NW of the head of the fjord. The first colony in Spitsbergen was found in Murchisonfjorden. There is a breeding place on the west side of Birdvågen and two at the head of Rijpfjorden and one on Storøya. The birds have been seen in the centre of the ice-cap and in many places in the pack-ice around the islands. They have also been

observed on several of the islands, such as Lågøya, Parryøya, and Karl XII Øyane.

Section XI. Storfjorden. — Here the birds have been found in Agardhbukta, on the glacier Elfenbeinbreen to its west, in Dunérbukta, Ginevrabotn, Heleysundet, on the north and west points of Barentsøya, and in Freemansundet. On Edgeøya they have been seen at Kapp Lee Kvalpynten, Kraussbukta, on Zieglerøya in Tjuvfjorden and on Negerpynten. A breeding colony has been found some way inland east of Diskobukta. The birds have also been seen on Tusenøyane, Kong Ludvigøyane and on Ryke Yseøyane.

Section XII. Kvitøya. — On this island there are colonies both on Andréeneset on the west point, and on Kræmerpynten on the north point.

Section XIII. Kong Karls Land. — Here the birds have been found breeding on all three islands.

Section XIV. Hopen. — On this island the bird has been seen a few times.

Records from the sea around Svalbard

To the west and the north of Svalbard, Ivory Gulls have been seen in almost all the places where notes on birds have been taken.

The South-West. — In the period March–May, 1863, and between the latitudes 71° and 74° N, and the longitudes 7° 30′ W and 5° E, Quennerstedt saw these gulls resting on the ice, but never on the open sea. He saw up to 20 birds at one time (106 : 29).

The West. — Orleans crossed the Polar Sea from Spitsbergen to Greenland in 1905. Between the dates 8 July and 16 August, single birds and small flocks of this species were seen almost every day from 80° 5′ N, 8° 34′ E to 71° 19′ N, 17° 21′ W (277 : 338–46).

The North. — Parry saw the species from 26 June to 17 July, 1827, between the latitudes 81° 20′ and 82° 32′ N, and the longitudes 21° 12′ and 24° 23′ E (46 : 62, 66, 72, 81, 89).

Andrée saw several Ivory Gulls north of Kvitøya in 1897. From 15 July at 82° 55′ N, 29° 52′ E, he saw single birds and small flocks all the way until he reached Kvitøya about 17 September (461 : 272–443).

According to Collett and Nansen the species had been observed almost up to the latitude 85° N. In the summer of 1896, on board *Fram,* two Ivory Gulls were seen on 13 May in latitude 83° 50′ N. The ship was then due north of Spitsbergen. Gradually these gulls became exceedingly numerous. Many were shot, on 29 July as many as 14 birds (237 : 49).

Biological

Migration. — The Ivory Gull is a bird of the pack-ice; therefore one cannot speak of any real migration, but it comes early in the year to the coasts of Svalbard. Often it arrives so early in the year that it is still very dark in the day-time. Therefore an observer has often had to guess that the bird flitting past him like a shadow in the darkness must have been an Ivory Gull, but in most instances he would have been right.

When the bird has been seen in April–May it has almost always been in

search of food after hunters had shot a seal or a bear, or it has come to the trappers' huts to live on refuse. But in this part of the year the Ivory Gulls are also distributed all over the ocean where it is ice-covered.

Keilhau relates that the skipper who took him to Bjørnøya had wintered on this island 1824/25, and that he had seen the first Ivory Gull there on 10 February, 1825 (48 : 130). Chydenius saw the species in the ice near Amsterdamøya on 23 May, 1863 (89 : 52). Kjellman relates that Ivory Gulls visited Mosselbukta (Wijdefjorden) after 15 May, 1873 (135 : 51). Chapman relates that Pike saw the first Ivory Gull of the year on Danskøya on 15 March, 1889 (195 : 348). Walter saw three individuals in Storfjorden on 17 May, 1889 (169 : 238). Klaus N. Thue saw two birds at Kapp Thordsen on 13 March, 1896 (1895/96, 644 c).

Bianchi relates that these gulls were seen in Hornsund on 1, 17, 21, 25 and 29 April, and on 5, 17, 18 and 25 May, 1900 (253 : 315). Arthur Oxaas saw two birds in Virgohamna on Danskøya on 23 March, 1921, and some at his hut on Verlegenhuken on 3 April, 1922 (1920/21 and 1921/22, 643). Kristoffersen saw the first specimens of the year in Hornsund on 8 and 25 May, 1924 (432 : 184). When he wintered at Sørkapp 1929/30 he saw single birds from January through the rest of the winter until May. After the "spring migration" in this month, they disappeared completely until 2 September 1930 (472 : 253).

Sverre Sørensen shot three specimens on Hopen on 10 February, 1924 (1923/24, 644 b). Meyer Olsen saw the first Ivory Gull on Lågøya (Nordaustlandet) on 20 March, 1924 and then some more on 17 April and 11 May the same year (1923/24, 641). Arthur Oxaas saw them at Flathuken on 26 March, 1925 (1924/25, 643). Georg Bjørnnes saw the first in Wijdefjorden on 3 April, 1928, and the first in Storfjorden on 17 April, 1929 (1927/28 and 1928/29, 636). Alfred Svendsen saw the first on Verlegenhuken on 3 March, 1928, in Lomfjorden on 4, 19 and 21 April, 1929, and on Kvalpynten on 8 March, 1930 (1927/28, 1928/29 and 1929/30, 644 a). Hilmar Nøis saw the first in Sassendalen on 16 February, 1938 (1937/38, 642 a). Arthur Oxaas saw the bird at Kapp Wijk on 31 March and on 9 April, 1938, and others on 7 April, 1940 (1937/38 and 1939/40, 643). Børre Trøhaug saw the first on Hopen on 9 March, 1935, (1934/35, 645).

There are only a few records from the autumn migration. Kristoffersen says that the autumn migration goes on during October; the last four birds were seen in Hornsund as late as 7 November, 1923 (432 : 184). In 1930 at Sørkapp he saw them all the autumn until the last days of November. That year they must have disappeared for a shorter period, for he writes that the greatest number seen during the winter came in December–January (472 : 253). Georg Bjørnnes saw Ivory Gulls in Storfjorden as late as 1 October in 1928 (1928/29, 636).

Dege saw a single specimen on 23 October, 1924, in Rijpfjorden on Nordaustlandet (613 : 135).

G e n e r a l h a b i t s. — Though basically a bird of the pack-ice, the Ivory Gull comes to land to breed. In the breeding period it mostly keeps to the colony, and if possible finds its food in the vicinity of the colony. But it is known sometimes to go far away from land to feed.

In the south of Spitsbergen it seems to nest on steep cliff walls, mostly in the interior, but in the north and the east it has often been found breeding on level ground fairly close to the coast. Here it is found nesting on cliff-walls near the sea.

The bird has very sharp eyesight. Hunters have often related how they had not seen a single Ivory Gull anywhere, but when they shot a reindeer, a seal, or a bear, these gulls came dropping out of the blue, and all at once there could be more than 20 birds gathered round the corpse.

A curious habit of this bird is that it seems hardly ever to settle on the water as other gulls do. The reason for this may perhaps be that living for a great part of the year on the ice it is accustomed to get its food from the frozen surface of the sea. There are, however, authors who have seen the Ivory Gulls swimming and picking up its food from the sea as other gulls do.

The Ivory Gull is an aggressive bird, which knows very well how to defend itself and its nest or food against intruders. The big Glaucous Gull, which will kill and eat anything it can overcome, will immediately leave the field to the much smaller Ivory Gull without any dispute. It is a curious fact, however, that the Ivory Gull, which without hesitation drives away an adult Glaucous Gull from its food, will allow the young grey Glaucous Gulls of the year to take the food from them without any sign of defending themselves.

When a Glaucous Gull or an Arctic Skua comes near a breeding colony of the Ivory Gull, it is mercilessly driven away. They will also defend their nests against man, striking at the head of the intruder, sometimes with their feet and sometimes the bill.

In the mining towns of Spitsbergen the Glaucous Gulls assemble and act as scavengers. Here they take all the edible refuse they can find. At the colliery Sveagruva, at the head of Van Mijenfjorden, they had to compete with the Ivory Gulls which became very tame, some of them so tame, indeed, that they ate from the hand.

Usually Ivory Gulls are not afraid of man, if they have not had bad experiences with him. They will come close up to the hunters skinning an animal to get their share of the spoil.

In summer they are often to be found in places where glaciers come out into the sea, as there are often seals to be found here. In these places, says Løvenskiold, they seem to be quite unafraid of the sound of shots aimed at other animals, probably because they are accustomed to the loud cracks coming from the glaciers (615 : 100).

Martens named the bird "Rahtsherr", i. e. alderman, and was the first to give particulars of its habits. He says: "He doth not willingly swim in the water as the other birds do, nor doth he care for wetting his feet, but he stays rather where it is dry, yet he loves fish mightily; and so the proverb that we commonly say of the cat is true of him, — The cat loves to eat the fish, but does not love to wet her feet." (12 : 56)

Eaton saw the species in Wijdefjorden in 1873. He says that the bird was swimming when fishing for *Crustacea* and *Clione borealis* (130 : 3810). Trevor-Battye says: "The presence of ice has some attraction for the Ivory Gull. It

may be said indeed to go and come with the ice." (203 : 592) Römer and Schaudin say that when the ice is missing, this gull is not be seen. Further, that the bird will rarely settle on the water, but rests on the ice. The reason why Martens named the bird "Rahtsherr" was because a flock of them can often be found sitting around a hole in the ice, waiting for a seal to come up, just like aldermen sitting by a round table (246 : 117).

Isachsen relates that a Glaucous Gull came flying past his camp near the mountain Strengehagenfjellet (not far from the glacier Monacobreen), hard pursued by the Ivory Gulls which bred on the mountain (274 : 96).

Haag saw the species in the sea east of Bjørnøya between 8 and 22 July, 1908. He never saw them resting on the water (284 : 137). Le Roi saw a great number of Ivory Gulls at the edge of the solid pack-ice north of Spitsbergen. He found them to be rather shy (but then he shot at them). They were never seen resting on the water (316 : 185).

Zedlitz visited Spitsbergen in 1900 when both Forlandsundet and the inner part of Kongsfjorden were ice-covered. When a seal was shot on the ice, in clear weather, not a single gull was to be seen. But as soon as the animal was killed they came, and always from the land. When he came back here in 1910, both places were ice-free and not a single Ivory Gull was seen (319 : 309).

Longstaff speaks of their habit of fearless attendance on hunting parties. They would pick up scraps of blubber or meat out of the sea, he says, but would never settle on the water, much less attempt to dive. When pieces of blubber were dropped beside a floe where several of them were sitting, they took them from the air. When blubber was thrown in a shallow pool they refused even to wade to it. Elton, he says, suggests that their arctic winter habit forbids the risk of a wetting with the consequent disaster of becoming temporarily helpless by the freezing of their plumage. These gulls, he says, spend much time perched invisible on the ice, and were always the first birds to appear when an animal was skinned. Except on one occasion the Glaucous Gulls seemed afraid of approaching a carcass which was in the possession of even a single Ivory Gull. A Fulmar which threatened with its beak succeeded in keeping the Ivory Gull off, perhaps because the gull was afraid of the Fulmar's oily vomit.

A Skua attacking an Ivory Gull was easily eluded. When attacked in the air, the Ivory Gull turned almost on its back, striking upwards with its claws. Eventually the Skua had to leave it alone, the gull having disgorged nothing (407 : 489).

Kristoffersen says that an Ivory Gull will follow a wandering Polar Bear. On 7 November he had discovered the tracks of a bear on the ice, but as there was only a little snow here and there, the tracks were difficult to follow. He then saw four Ivory Gulls which were all looking in the same direction. Sometimes one would fly straight up in the air for some metres, to have a better view. Going up to the gulls he found three bears eating the remains of a seal, and shot all of them. He was once told by a friend that an Ivory Gull had once attacked a bear bleeding from a wound (432 : 184).

Ahlmann describes how these gulls defend their nests by attacking the in-

truders who came to take the eggs (467 : 182). Lönnberg cites Andrée who found that the Ivory Gulls have three different cries: 1) 'piyrr', 2) 'pyöt' (young birds), and 3) a sound like the croak of a crow. When the mother is anxious or is giving a warning, she utters the sound " pyim", but then shrilly and in rapid succession (473 : 149).

Dalgety reports that near a breeding colony, the birds would stoop at him, but not hit him (477 : 5). Jung denies that the Glaucous Gull is afraid of the Ivory Gull. He says that quite the opposite reaction will take place when the two species oppose each other (539 : 131).

Løvenskiold says: "In its behaviour the Ivory Gull reminds one to a certain extent of a tern. The voice of the bird is totally different from that of other gulls. . . This gull seldom rests on the water (and only on two occasions have I seen it sitting on the sea). I have tried to throw pieces of blubber to it in shallow water and the bird waded out after them, but as soon as the water came up under its belly it flew up . . . It was curious to see that these big fellows [the Glaucous Gulls] did not dare to stand up against the much smaller Ivory Gull." (615 : 98)

B r e e d i n g. — The Ivory Gull breeds especially in the eastern part of the archipelago, but sometimes it can also be found in the west, and then mainly in the interior of Vestspitsbergen. It has happened, however, that here also they have been found breeding, at least in single pairs, near the coast.

The nests are sometimes built on level ground. But in most instances such nests have been found in places where man rarely appears, such as Kvitøya, Storøya and Kong Karls Land. The most common way for them to build is probably on ledges on steep cliff-walls or in more or less inaccessible spots.

That they breed on the pack-ice, as mentioned by such authors as Haag and Knothe, is entirely out of the question (284 : 138) and (471 : 84). The species goes to dry land to breed, but Kristoffersen found in a single instance that a pair did build on a stranded ice-boulder in Hornsund (432 : 185). Among other curious statements about this bird, we have that of Miethe, who as late as 1925 believed that the breeding grounds of the species were unknown (422 : 248).

It seems that the Ivory Gull, when it breeds near the coast, prefers to have the frozen sea in the vicinity of the breeding grounds. This must be considered in connection with their mode of living and the way they get their food. Therefore, if they do not find the conditions favourable, places where they have been breeding one year may be deserted in following years. To the seafaring people of the north, this changing of breeding places is well known. But they put it down to quite a different reason. According to Ahlmann they say that when a colony is raided, the birds will never use the place for breeding again (467 : 180).

Collett says that when the nest is built on level ground, nine-tenths of it consists of green moss, the rest being small splinters of drift-wood, a few feathers and a little sea-weed (162 : 442). When they are breeding on more or less perpendicular cliff-walls, says Malmgren, the nest is often a scrape of eight to nine inches in diameter in the soil of the ledge and lined with dry plants,

grass, moss and a few feathers (85 : 103). The above descriptions are confirmed by others who have seen the nests.

There are normally two eggs in the nest, but very often only one. Three eggs seem to be exceptional.

The first record of the species as a breeding bird in Spitsbergen was mentioned by Newton, who had been told that the Swedish arctic expedition had collected eggs there in 1861 (77 : 400). This refers to Malmgren, who found the species breeding in Murchisonfjorden, Nordaustlandet on 7 July, 1861 (85 : 102). Here a great number of Ivory Gulls were nesting on a sheer wall of limestone some hundred feet high, in company with Glaucous Gulls and Kittiwakes. The two latter species inhabited the higher parts of the cliff, the Ivory Gulls were near the bottom of it, from 50 to 150 feet above the sea-level. Malmgren took two nests, but the others were inaccessible. In the summer of 1864, he saw the bird in Isfjorden. A specimen shot on 8 July had brood-patches, and was assumed to have been breeding somewhere near the fjord (92 : 385).

Chydenius says that Malmgren found the colony on Stora Sten ön (Storsteinhalvøya) in 1861, and that the eggs were obtained on 30 July (89 : 166, 256). Heuglin visited Måkeberget in the northern part of Barentsøya on 25 August, 1870. He claimed that Ivory Gulls nested among the Kittiwakes in the big colonies there, but there is no proof of this (123 : 219). Eaton found the species breeding in Wijdefjorden in 1873, but does not say exactly where. He also found a breeding colony at Kapp Oetker in the SW part of Nordaustlandet, but could not get at the nests (130 : 3810). Cocks relates that at least one pair was said to breed in Magdalenefjorden when he visited this place on 29 July, 1881, but the nest or nests were inaccessible (149 : 328). In the summer of 1882 he did not see the species at all, but he was informed by a Mr. Dreyer, that the species had been found breeding as far south as Bellsund that year (153 : 16). (This is probably a mistake.)

Chapman, who visited Spitsbergen in the summer of 1881 in company with Mr. Cocks, says that the gulls were breeding on Rotges Hill in Magdalene Bay, but he could not reach the nests (152 : 144, 155). Bendire records that the National Museum in Washington had received two of the eggs taken by Capt. Johannesen on Storøya, east of Nordaustlandet on 8 August, 1887 (160 : 202).

Collett describes the actual circumstances of Capt. Johannesen's find on Storøya on 8 August, 1887. He gives a full description of the colony with the nests, eggs and young birds (162 : 440).

Pike found a colony of breeding Ivory Gulls at Kapp Weissenfels, the SE point of Svenskøya, Kong Karls Land, and not far from Kapp Hammerfest on 20 August, 1897. The birds bred together with Kittiwakes and a few Mandt's Guillemots, on a mass of columnar basalt (215 : 368). Rüdiger believed that the colony found by the German *Helgoland* expedition on Abeløya, Kong Karls Land, on 20 July, 1898, was the first breeding colony ever found. He confused the finds of Dr. Malmgren and Capt. Johannesen and says that some eggs were taken, but not from a real breeding ground. He knew nothing of Pike's find or of any of the others who saw the birds at breeding grounds (216 : 441).

Kolthoff gives a very good description of a breeding colony on Kong Karls Land. He took part in the Swedish expedition which visited the area in 1898. A colony with young birds and a few eggs, was found on Kapp Weissenfels on Svenskøya on 4 August. Here he found young birds outside their nests and in places they could not have reached on their own. He thought that the adults had carried them there. On Kongsøya he also found nests on the mountains Retziusfjellet and Sjögrenfjellet on 8 August. On the 18th he came to Kvitøya, where there were hundreds of Ivory Gulls. All the level ground was covered with nests built of green moss, but all of them were empty. The nests were covered with a film of snow and tracks of the adult birds were to be seen everywhere, but no tracks of young birds. The chicks could not be found in the short span of time he had at his disposal there (226, Vol. I : 200), (242 : 57) and (261 : 64).

Schalow records that the Zoological Museum in Berlin received 19 eggs from Abeløya in 1898. They were obtained by men from the *Helgoland* expedition (232 : 381). Roth reports that all the Ivory Gulls shot in Forlandsundet after 19 July, 1900 (about 20 specimens), had brood patches (257 : 133). As the bird usually does not wander away from the breeding places very much until the middle of August, they may have bred in the vicinity of Forlandsundet, especially as the sound was ice-covered. Schalow remarks that in 1906, the nesting places in Wijdefjorden, Lomfjorden and on Storøya were devoid of Ivory Gulls. He says: "The ice has altered the conditions in such a way that the gulls will not breed there any more" (271 : 135).

Isachsen found a breeding colony on the mountain Strengehagenfjellet near the glacier Monacobreen on 3 August, 1906 (274 : 96). Haag relates that Mr. Giesbert found a breeding colony at Kapp Hammerfest on Kong Karls Land in the middle of August, 1908. Several rocks were covered with nests and the young birds so far grown that they could fly some hundred yards. They were still fed by the adults (292 : 163).

Hoel found a breeding colony on an inaccessible cliff-wall somewhere in the vicinity of Hornsundtind on 7 August, 1919 (378 : 9). Frazer found a breeding colony on the cliffs on the south side of the glacier Chydeniusbreen on 11 August, 1923 (405 : 200). Binney found a colony of breeding birds in Wahlenbergfjorden, Nordaustlandet on 25 July, 1924. When the place was visited again on 15 August, some young were hatched, but there were also nests which contained eggs (413 : 185, 207, 240).

Kristoffersen found the species breeding in the NE part of Hornsund in 1923, when he came to an old and empty hut. Close by on the shore was a stranded ice-boulder on which there was the nest of an Ivory Gull with two eggs. No description of the nest is given. This is the first and only reliable record of the species building on ice (432 : 185). Montague visited the colony in Wahlenbergfjorden on 29 August, 1924, and found all the young birds hatched out. A second colony was found a few miles NE of Kapp Torell, Nordaustlandet. It contained 50 pairs of Ivory Gulls. The colony in Wahlenbergfjorden was situated on a 150-foot cliff of black dolerite, at the top of a steep 1,000-foot slope up from the shore (433 : 146). Knothe says that some authors

are of the opinion that the Ivory Gull breeds on the ice. Mr. Knothe himself, however, is not absolutely sure that they are right (471 : 84).

Dr. Gunnar Horn reached Kvitøya on 5 August, 1930 (when he found Andrée). On a small plain, not far from the glacier a great number of Ivory Gulls had their nests. The young birds were just hatched out, but in some nests there were still eggs (1930, 632 b).

Ahlmann found six Ivory Gulls on the SW part of Kvitøya on 16 July, 1931. There were three gulls at each nest and the nest contained blue eggs. Two days later they came to the NE part of the island, a narrow stretch of land between the sea and the ice. Here hundreds of Ivory Gulls were nesting and attacked the intruders most furiously, hitting at their heads. About 200 eggs were collected, but about four times as many were left (467 : 180).

These gulls had seemingly never been robbed in this way before, for when a gull came back and found the nest empty, it immediately attacked its breeding neighbour. In a few instances it was seen that the bird destroyed its eggs instead of leaving them to the plunderers. Later, after all the eggs had been eaten, they discovered that the British Museum (Nat. Hist.) would have paid £2 apiece for them.

Dalgety obtained 22 clutches of eggs in Spitsbergen in 1930 and 1931. On 6 July, 1930, he found a breeding colony of more than 30 pairs of birds on a cliff 1,000 feet above Vega Bay (Palanderbukta) a branch of Wahlenbergfjorden, Nordaustlandet. Half of the occupied nests had two, the other half only one egg. On 9 July, 1931, he visited the colony again and then the clutches were larger. Of fourteen nests three contained only one egg, while one nest had three. These had the appearance of having been laid by the same bird. All the nests were built of land plants and were clean, unlike the filthy nests of the Kittiwake (476 : 88, 89).

Lings refers to the above large clutches found by Mr. Dalgety. He says that there must have been some extra food-supply available this summer for the sea-birds, just as lemmings provided a good food supply for the Buzzards in Finnmark that year (481 : 91).

Glen found a breeding colony on the mountain Rosénfjella south of Sorgfjorden on 26 July, 1933. On 20 July, 1934, a colony was found near the glacier Ebbabreen at the head of Billefjorden (Isfjorden) (508 : 67, 234).

Winsnes reports that he saw a few pairs which seemed to breed on Mefonntoppane SE of Hornsundtind, on 15 August, 1952. In 1957, he found 10–12 pairs on their nests on a precipice 10 km east of Bodleybukta at the head of Wahlenbergfjorden, on 24 July. The next day he saw several in the above bay. On 3 August the same year, he found a nest with two young, SSE of the head of Rijpfjorden. Afterwards he found two nests farther east. On 14 August he found 12–14 pairs breeding on the west side of Birdvågen, south of Chermsideøya on Nordaustlandet (1959, 655).

Bateson relates that he found 35 pairs of Ivory Gulls in the colony on the south side of Wahlenbergfjorden, near the head of the fjord. In the two colonies in Palanderbukta there were none, neither did he find them in another

colony east of Oxfordhalvøya, where he says that 12 pairs bred in 1957 (1959 : 651).

F o o d. — During winter-time Ivory Gulls live mainly on excrement of Polar Bears and seals. They will therefore follow the bear on his wanderings over the ice, and they will also sit patiently on the ice around a seal hole, waiting for an animal to come up. During the summer they also live on fish and *Crustacea,* which they usually pick up from the surface of the sea in their flight as they do not like to settle on the water. In a few instances they have been seen fishing in the same way as other gulls.

They are very fond of fat in any form, and also of meat. When a seal, a bear, or a reindeer is shot, they will drop out of the blue and gather around the dead animal. When this is skinned they may come close to the hunters to peck at the blubber. After the men have left, they will eat anything digestible on the carcass. They will also come to the trappers' huts for scraps of food, whereas the Glaucous Gull is always wary and will keep its distance.

The following is what can be found about the food of the Ivory Gull in print and also from diaries: Martens saw them eating excrement of the walrus (12 : 56). Chydenius saw them assemble around a dead walrus and around the remains of a reindeer (89 : 52, 94). Eaton saw them at the carcass of a shot walrus, and says that he saw them swimming when they fished for *Crustacea* and *Clione borealis* (130 : 3810). Heuglin saw them at the carcass of seal and reindeer. He also describes how they attacked young terns which he put on the water (132 : 179). Cocks saw them at the carcass of a reindeer and also at the remains of a white Whale (149 : 326, 409). Chapman saw them at the remains of a reindeer (152 : 155). Walter saw them eating the remains of seal, walrus and bear (169 : 241). Klinckowström saw them on the back of a dead whale (172 : 164). Nathorst saw them at a killed reindeer (177 : 4). Fries saw them approaching a killed reindeer (109 : 84). Von Zeppelin saw them at the carcass of a dead whale (179 : 77, 78). Trevor-Battye saw them eat seal excrement, carrion etc., (203 : 592). Kolthoff saw them approaching a dead walrus (250 : 74). Roth saw them picking up blood on the snow from a wounded Polar Bear (257 : 71). Dunér saw them at the carcass of a Polar Bear (254 : 17). Kolthoff saw them take seal blubber, polar cod, meat of seal and bear, seal excrement, *Crustacea, Amphipoda* (261 : 65). Römer had been dragging the skin of a Polar Bear, and saw many Ivory Gulls in his tracks, picking up the bloody snow (267 : XXXI). Munsterhjelm saw them approaching a dead reindeer (313 : 29).Orléans mentions reindeer (315 : 115). Le Roi mentions excrement of bear, seal and walrus, also blood, meat, blubber, fish, *Mollusca* and *Crustacea* (316 : 186). Zedlitz (319 : 310), Mathey-Dupraz (333 : 114), and Nansen (360 : 152) mention seal. Van Oordt mentions offal from a camp (370 : 160). Longstaff says that they drink fresh water. They take refuse at trappers' huts, eat filthy garbage, carrion, meat of seal, bear and walrus. The stomach of a specimen shot on 31 July contained only a little moss (407 : 489). Binney says that they take remains of seals killed by bears. Fifty per cent of the stomach contents of young birds in down consisted of small Arctic Char from freshwater tarns (413 : 111, 240).

Montague says that they are scavengers. In July and August he found fish and carrion in their stomachs. Once an Ivory Gull settled on the water beside a dead Little Auk and tried to eat it. He saw Ivory Gulls picking up dead fish under the nests of the Black Guillemots and Kittiwakes (433 : 146). Isachsen mentions walrus meat (446 : 58). Oxaas saw them eating the meat of a skinned fox (1937/38, 643). Bjørnnes saw them at the carcass of a seal (1927/28, 636). Løvenskiold saw them as camp scavengers, taking blubber of a seal, and lured them very close by giving them margarine (615 : 99).

No. 62. *RISSA TRIDACTYLA TRIDACTYLA* (L.)[1]

The Kittiwake

Geographical distribution

A N Palaearctic and NE Nearctic species. The nominate form breeds from Jan Mayen, Spitsbergen, Franz Josef Land, Novaya Zemlya, south in Europe to Iceland, the Færoe Islands, the Channel Islands, Norway and N Russia. In Asia from Bennet Island and the New Siberian Islands south to the arctic coast of Siberia, east to Chaun Bay. In N America on the eastern arctic islands from N Greenland, Ellesmere Island and Wellington Channel to E Baffin Island, Labrador and Gulf of St. Lawrence.

In the N Pacific, Bering Sea and the adjacent parts of the Arctic Ocean it is replaced by the race *Rissa t. policaris* Ridgeway. On the islands of the Bering Sea there is also the Red-legged Kittiwake *Rissa brevirostris* (Bruch).

Wynne-Edwards gives the following summary of our knowledge of the wanderings of the North Atlantic Kittiwake: "Kittiwakes are absent from the North Atlantic south of the 60th parallel from mid-June to mid-August, except near the coasts where they breed. A sea-ward migration begins in mid-August, but is not in full swing for another six weeks. In winter from late November till early April Kittiwakes are dispersed in all unfrozen offshore and pelagic waters, from at least 60° N on the European side and probably also on the American, south to the Tropic of Cancer, in the Sargasso Sea and off the west African coast. They are most abundant between 40° and 55° N, and in British waters, occurring also in the Mediterranean, but not in the Gulf of Mexico, becoming gradually scarcer towards the southern limit of their range. In April they return towards their breeding places and even non-breeding birds have disappeared from the high seas by early June" (512 : 324).

Occurrence in Svalbard

The Kittiwake breeds in all districts of Svalbard with the exception of Kvitøya.

First records

Poole saw "Sea-mewes" at Bjørnøya in 1604. He distinguishes between "Gulles and Sea-Mewes"; the first is the Glaucous Gull, the second the Kittiwake (2 : 267). Six years later he saw the species in Spitsbergen (4 : 23).

[1] Contour map showing distribution, see backflap.

Martens saw the species in Spitsbergen in 1671, and says that the bird is named "Kutge-Gehef" from its voice (12 : 59).

Phipps remarks that the bird is found on the Spitsbergen coasts (23 : 187).

Mandt saw Kittiwakes in Spitsbergen in 1821 (42 : 4).

Distribution. Sections I–XIV

Section I. Bjørnøya. — Small parties of Kittiwakes breed here and there along the north and east coast, and on the northern slopes of Miseryfjellet there is a colony. But on the vast bird-cliffs in the south they breed in enormous numbers.

Section II. Hornsund. — The birds have been observed all along the coast of the district. There are colonies on Keilhaufjellet in the extreme south, one in Stormbukta on Sørkapp Land, and in Hornsund there are three breeding places. These are Krykkjestupet east of Gåshamna, 4 colonies on a mountain on the side of the glacier Hornbreen at the head of the fjord, and the biggest of them all on Sofiakammen on the north side of the fjord, opposite Gåshamna.

Section III. Bellsund. — Kittiwakes can be seen everywhere along the coasts; they are indeed so common that very few ornithologists have taken the trouble to note in their diaries when and where the birds have been observed. In this district there is only one known colony, situated on the mountain Midterhuken, but there certainly must be more colonies still to be found, especially on Ingeborgfjellet on the other side of Akselsundet and on mountains to the north of this.

Section IV. Isfjorden. — On the south shore of Isfjorden there is no known colony to seaward of the head of Sassenfjorden. Here there is a breeding place at the point where Tempelfjorden branches off. On the mountain Tempelfjellet there is a big colony. They also breed on Gipshuken and Cowantoppen. There is one colony on Kapp Ekholm on the east side of Billefjorden and another on the west side in Skansbukta. Many breed on Kongressfjellet between Kapp Thordsen and Kapp Wijk in Dicksonfjorden, and at Kapp Wijk itself there is a bird-cliff with breeding Kittiwakes. There are no colonies along the north side of Isfjorden before Alkhornet, near the entrance of the fjord, where many breed.

Section V. Prins Karls Forland. — The birds have been seen all around the island, but there is only one colony. This is situated on Fuglehuken on the northernmost point of Forlandet, and here a very great number of birds breed.

Section VI. Kongsfjorden. — In Kongsfjorden the Kittiwakes breed on a cliff close to the glacier Kongsvegen at the head of the fjord; there is also a small colony on the island Observasjonsholmen, and a few pairs on a neighbouring island. Great numbers breed on the mountain Ossian Sarsfjellet between the glaciers Kongsvegen and Kongsbreen. In Krossfjorden they breed close to Fjortende Julibreen, at the south point of Kong Haakons Halvøy and on Nilsfjellet in Signehamna.

Section VII. NW Spitsbergen. — Although the birds are seen in numbers in this district, there are but few breeding places. In Magdalenafjor-

den there are big colonies. On Flathuken at the entrance to Raudfjorden there is a big colony, and there is a small one on a cliff on Siktefjellet in Liefdefjorden.

Section VIII. Wijdefjorden. — The birds have been seen crossing the area between Billefjorden and Wijdefjorden.

In this fjord there are three breeding places. On the east side of Kapp Petermann there are 5 or 6 small colonies just below the summit of the mountain. On the south side of the glacier Sørbreen there is a big colony, and the third place is due south of the inner part of the lagoon in Mosselbukta.

Section IX. Hinlopen. — In this strait there are but two colonies. One is on the great bird-cliff, Alkfjellet, south of the entrance to Lomfjorden, and the other is situated on Wahlbergøya, the biggest island of Vaigattøyane.

Section X. Nordaustlandet. — In this section the birds breed on Torellneset, in Palanderbukta, Wahlenbergfjorden, Murchisonfjorden, in Birdvågen not far from Nordkapp, on the islands Parryøya, Phippsøya and Martensøya, on Kapp Lovén at the entrance to Rijpfjorden, at the head of this fjord and on Isispynten on the SE side of the island.

Section XI. Storfjorden. — In the fjord and around the islands, Kittiwakes can be seen in numbers almost everywhere. On Barentsøya there are two breeding places, one on Måkeberget near Heleysundet on the north side and the other at Kapp Waldburg at the eastern entrance to Freemansundet. On Edgeøya there is one colony, in Diskobukta. On Kvalpynten they breed in numbers; near Keilhaubukta there are colonies in river ravines inland, and they also breed in Kraussbukta. On Negerpynten there are big colonies and the birds also breed on Ryke Yseøyane.

Section XII. Kvitøya. — The species does not breed on the island and there is only a single record from the place. During the summer of 1898 it was found to be common along the coast.

Section XIII. Kong Karls Land. — The birds have been found breeding both on Svenskøya and on Kongsøya, but there is no record of breeding from Abeløya.

Section XIV. Hopen. — The birds breed on the island. There are probably several big colonies there, but there is no record of where they are situated.

Record from the sea around Svalbard

The North. — Parry records that a few Kittiwakes were seen on 26 June 1827, at 81° 17′ N, 21° 17′ E, in the ice north of Spitsbergen. On 11 July they saw one bird at 82° 11′ N, 22° 54′ E. On 16 July at 82° 26′ N, 20° 32′ E, Parry remarks: "We now no longer saw any birds in the 'holes' of water, as we had done farther south." On 7 August, at 81° 48′ N, 17° 58′ E, they had more birds around them than usual. On 11 August in latitude 81° 34′ N numerous birds were seen feeding on *Crustacea* (46 : 62, 78, 87, 115, 118).

The West. — Kolthoff saw adult Kittiwakes up to 120 nautical miles west of Spitsbergen in 1898. Farther west he saw only young birds (261 : 63).

Orleans saw Kittiwakes west of Spitsbergen on 9 July 1905 at 80° 17′ N, 5° 33′ E. On 18 July at 76° 55′ N, 3° 30′ E, and on 20 July at 76° 29′ N, 4° 46′ E (277, 339, 341).

The South. — Cocks says that in September 1882 in latitude 73° N, a hundred Kittiwakes were following the ship, in a ratio of 3–4 young to one adult bird (151 : 444).

Biological

Migration. — Only once has a Kittiwake been recorded from Spitsbergen as early as March. This was on March 6th. Ordinarily these birds arrive in April and for this month there are the following records:

Dates in April	6	8	9	11	14	15	18	19	20	23	28	29
No. of observations	1	1	1	2	1	1	2	1	1	1	1	2

From May there are only three records; because the bird has ordinarily already arrived in April, there has been no reason for the observers (mainly trappers) to put down any records in May. These three records are for the 23rd, the 28th and the 31st. In years when the Kittiwakes arrived as late as this, the spring must have been late with ice covering the sea throughout April. For the record from the 31st, the trapper Arthur Oxaas says expressly in his diary from Flathuken 1925/26 that this was the first Kittiwake of the year.

Bianchi saw the first Kittiwakes on Hornsund on 8 April 1900. On the 16th flocks arrived. From 20 April to 4 May when the temperature was 23°–27° C below zero, and heavy snowstorms were blowing, pairs and small flocks of Kittiwakes were seen. On 17 May 1900 they were common and some days later numerous (253 : 317). Kristoffersen saw the first Kittiwake of the year on 6 March 1924 and on the following days small flocks were seen flying towards the head of Hornsund. The majority arrived in April and the last ones in May (432 : 181). In 1930 the spring migration began at Sørkapp on 15 April, and lasted far into May (472 : 253).

In the last days of August the Kittiwakes will begin to assemble in great flocks preliminary to migration. These flocks are of course easily seen, and therefore there are many records of such gatherings. From the days between 18 and 31 August there are no less than 28 records of big flocks.

The actual migration south takes place in the last half of September. For this month there are the following records:

Dates in September	2	3	7	11	12	15
No. of observations	1	2	1	1	1	1

After the 15th there are only two records for September, one on the 23rd and another on the 27th, and this must be because the majority of the birds have left by then. Stragglers occur later, of course, and single birds and small flocks have been recorded from October.

Dates in October	2	6	13	20	29
No. of observations	2	1	1	1	1

But only in one instance known to me, has a greater number of these birds been seen at this time of the year.

Kristoffersen records that during the greater part of the summer of 1923, he had a big flock of Kittiwakes on the lagoon in Gåshamna in Hornsund.

About the middle of September he noticed a remarkable decrease in their numbers. On the 16th there were only 40 left and on the 25th all had disappeared. As late as 20 October 1923 he saw a flock of seven birds flying south (432 : 181).

Montague says that the first Kittiwakes to prepare for migration were flocking in Liefdefjorden on 19 August 1924, and he goes on: "In a spell of bad weather later in August, large flocks assembled to shelter in protected bays along the shore of Wahlenbergfjorden (Nordaustlandet). These flocks never really separated when the weather improved, and were, I think, the basis of pre-migrational assemblies of this bird in the area." (433 : 145)

Kristoffersen, who wintered on the island Sørkappøya 1929/30, records autumn migration taking place in the last half of September 1929, but as late as October some small flocks were seen (472 : 253). Jung saw great numbers assemble at Gråhuken at the entrance to Wijdefjorden, at the end of August 1936. From there they went west over Reinsdyrflya. By the beginning of September they had disappeared (539 : 133).

G e n e r a l h a b i t s. — In Spitsbergen Kittiwakes breed in far greater numbers in the west than in the east. Very often, seemingly as often as possible, they prefer to nest under overhanging rocks. These protect them from dripping water and from droppings from the nests above. When all the nest-sites on a mountainside are occupied, the supernumerary birds must settle on adjoining rocks at varying distances from the main colony. These small settlements may consist of from five or six up to 25 or 30 pairs of birds.

To and from these colonies, to the fishing grounds and to their bathing places, they usually have very distinct flight-lines. I have observed that Kittiwakes going to their nests on the mountain Midterhuken in Bellsund always followed a certain route, riding on the rising currents of air along the side of the cliff. In Hornsund they came flying in from the sea over the outermost point on the north side of the fjord on their way to the enormous colony at Sofiakammen. They came in a continuous stream and all of them went exactly the same way, passing certain points in the landscape. On these points several Arctic Skuas waited for the Kittiwakes, which had to pay a tribute to the black marauders. I have also seen these distinct flight-lines in many other places, for example in Krossfjorden, where the birds went from the colony on Nilsfjellet in Signehamna and through a pass in the low hills to the west. Here they were probably going to a fishing ground in the sea outside Kapp Mitra (1956, 633). Others have also observed these distinct flight-lines. Duffey and Sergeant saw them on Bjørnøya in 1948 where the birds had a two-way traffic between the colonies and the place where they bathed. They found that the Kittiwakes had regular flight-lines along certain valleys in the hills.

The most thorough study of flight-lines in Spitsbergen was made by Bateson, who stayed in Raudfjorden during the summer of 1957. He writes:

> The fly line to the sea was along the coast of Klinckowströmfjorden to Alicehamna. Throughout our stay at Bruceneset the majority of the Kittiwakes followed the coast round and then crossed over the low-lying neck of Bruceneset and continued up the east side of Raudfjorden.

A resting place appeared to be Pt. Svensksund where I saw several hundreds sitting. The fly line there continued up the coast to Jermaktangen and then out to sea.

There were always a few Kittiwakes that rounded Bruceneset rather than crossing over the neck. I believe they did this because of the Arctic Skuas on the neck.

When first we arrived there were no Kittiwakes flying up Richardvatn valley but on July 6th I observed several parties breaking off and flying up the valley. On July 17th there were many more using the valley. In spite of this, when we went past the other end of the valley in Breibogen on July 12th, I saw very few Kittiwakes emerging from it. However, on July 21st I discovered the reason for this. The majority of the birds using the Richardvatn fly line crossed the mountains over a pass south of Mt. Blanc thus returning to the coast fly line. But although I was not able to observe if the birds used that path or not, it appeared to me that while we were at Breibogen much more birds were flying overhead out to sea.

Although it is profitless to speculate about the shifting of the fly lines, I believe the Kittiwakes began to use the Richardvatn fly line because of pestering by the Skuas on Bruceneset. This would explain why the Kittiwakes crossed over to their old fly line at the earliest opportunity after they had bypassed the nuisance. It is more difficult to understand why the Kittiwakes began to fly straight up Richardvatn valley, especially as a Skua pair appeared at the north end, but I believe that when lowlying clouds lay over the mountains as it often did, the birds preferred to use the shortest path rather than fly into the mist to regain their old line. With regard to Skuas, it was interesting to note that when the weather permitted the returning Kittiwakes always flew extremely high. While we were at Bruceneset I tried to establish if there was any rhythm in the comings and goings of the Kittiwakes. There was a tendency, perhaps, for more birds to go out to sea in the morning, but on some days this tendency could almost be reversed. To give you some idea of the number involved I give the figures of a count I made between 9 and 10 in the morning.

Flying north (out to sea).	Flying south.
6-11-5-7-1-1-1-3-3-1-7-6-1-6-15	1-4-10-1-2 (18)
1-1-2-4-4-1-1-7-2-3-1-1-1 (103)	

On some days I counted parties of up to 60 birds. There were no young birds to be seen while we were in the north. The first I saw was one in Sørgattet on August 12th. When we left the Spitsbergen coast on September 2nd about twelve Kittiwakes were following the boat only two of which were adults (1957, 650).

The Kittiwakes seemingly like to rest on ice and snow. I have many times seen ice-floes covered with them and in Hornsund up to a couple of hundred birds may by seen resting on an iceberg drifting out to sea. Birula saw a great number of adult birds sitting on an ice-floe in Hornsund on 19 July 1899 (298 : 169). I have seen them sitting on snow-fields when they were breeding near a snow-covered glacier. Here the snow can be intensely red-coloured because of the red droppings of the birds, which to a very great extent live on red-coloured *Crustacea*. The same thing can be seen near the colonies of the Little Auk.

It is quite curious that during the summer-time in Spitsbergen almost no young birds in immature plumage are to be seen until the young of the year leave the nest. The non-breeding youngsters keep to the sea during the whole breeding season (see Wynne-Edwards under Migration). Van Oordt remarks quite correctly that young immature Kittiwakes are never found in Spitsbergen during the breeding season, neither are young Glaucous Gulls, nor Phalaropes nor Eiders (370 : 159). Zedlitz claims to have obtained two young birds in intermediate plumage between the first and the second year in Magdalenefjorden on 2 August 1910. However, the possibility that he had taken young birds of the year which had left their nest on a very early date, cannot be absolutely excluded (319 : 311).

Kittiwakes are very fond of bathing in fresh water. This can be seen almost everywhere in the area where they breed or assemble. This bathing in freshwater has been recorded by almost all ornithologists who have visited these islands. Kristoffersen writes that when he came to Gåshamna in Hornsund on 15 August 1923 there were 150 Kittiwakes in the lagoon close to the hut. They did not fish there, but bathed in the fresh water. Only a few birds left the lagoon at a time and never before a similar number had arrived from the fjord. This manoeuvre was repeated day after day, but Kristoffersen could not find the reason for it (432 : 182). Bertram and Lack saw extremely large flocks, almost all the birds in adult plumage, round the coastal lakes of Bjørnøya throughout all their stay there from 20 June to 10 August 1932 (488 : 298). In the same place in 1948 Duffey and Sergeant saw flocks of several hundreds and in one instance over a thousand (586 : 560). Summerhayes and Elton point out that the Kittiwakes bathe in freshwater lakes probably to get rid of marine parasites (397 : 230).

Usually the Kittiwake is a very peaceable bird and does not disturb or molest other birds. It was therefore the more remarkable to see the Kittiwakes following our ship *Minna* between Spitsbergen and Norway in September 1949 pursue a young Turnstone with great zeal, each time it tried to leave the ship.

In two instances it is known that Kittiwakes have adopted the tactics of the Arctic Skua by pursuing terns to take their food from them. Munsterhjelm saw a Kittiwake trying to do this in Van Keulenhamna, but without any success (313 : 29), but van Oordt saw the same thing happen and here the Kittiwake successfully robbed the tern (370 : 159).

During a summer in Spitsbergen one can see time and again how Kittiwakes coming too near to a colony of Arctic Terns, are pursued vigorously and driven away. Now, I have never seen or heard of Kittiwakes taking eggs or young birds, but as Tiedemann remarks: "The terns must see in the Kittiwake an enemy to their broods and act accordingly" (560 : 252).

The Kittiwake has at least three enemies in the Svalbard area. The fox, which very often has his earth close to a bird-cliff, lives to a great extent on young Kittiwakes which fall down from their nests. It can also capture adult birds, as the remains outside the foxes' earths show. The most dangerous, however, is the Glaucous Gull. Time and again I have seen them raiding the nests on the bird-cliffs and here they do enormous damage, not only by killing the

young birds to eat them, but when they come raiding, many young which try to evade them, will tumble down the cliff and are then an easy prey for the foxes.

In 1950 there was a family of foxes living close to the mountain Sofiakammen in Hornsund and no remains of birds were found on the grassy slopes beneath the bird-cliffs. Two years later the foxes had disappeared and now the slopes were strewn with dried up skins of birds. All these skins were inverted, a sure sign that the Glaucous Gull had been the killer. Half the remains were from Kittiwakes, the other mostly of Guillemots.

The third enemy is the Arctic Skua. This bird is not dangerous to their lives, but it is a great nuisance to them and takes a heavy toll of the birds coming with food to their young. The skuas know perfectly well where the Kittiwakes have their flight-lines and place themselves in an opportune spot for the attacks. It seems to me that the Kittiwake is the chief prey of the Arctic Skua.

When Kittiwakes and Guillemots breed together, which they very often do, the manure from the bird-cliffs will have a marked effect on the plant-life beneath the colonies. The most luxuriant growth I have seen was at Midterhuken in Bellsund. Here I once found a slope where the *Cochlearia* grew knee-deep in enormous quantities. Bertram and Lack describe from Bjørnøya how on unmanured cliff-tops these plants were closely pressed to the ground and the leaves generally less than two inches long. Beneath the Kittiwake colonies the growth was luxuriant and the leaves up to a foot in length (528 : 31).

B r e e d i n g. — The Kittiwake breeds in all the Svalbard area with the exception of Kvitøya, but on the west of Vestspitsbergen in far greater numbers than in the east. However, even on the east there are great colonies.

The colonies are as a rule placed near the areas where the birds can find their food, but not always. The Kittiwakes prefer to nest under overhanging rocks as these protect them from dripping water and droppings from the nests above. Such places are of course not always to be found near the feeding grounds and therefore the birds often have to go a relatively long way to find their food.

As these gulls live mainly on *Crustacea* they are dependent on the occurrence of these animals, and assemble where they are found in abundance and breed as close to these places as possible. These *Crustacea* are found both in the sea west of Spitsbergen, in places where there are strong tidal currents and sometimes in places just off the end of glaciers where the streams from these mingle with the salt-water in the fjords.

The great colonies on Fuglehuken on Forlandet and the enormous bird-cliffs of Sofiakammen in Hornsund, are examples of places where the Kittiwakes have to go out to sea to fish. On the mountain Midterhuken in Bellsund there are several colonies of these gulls and they fish in great numbers in the tidal current running between this mountain and Mariaholmen at the southern entrance to Van Mijenfjorden. Here the current runs at 7 knots an hour. A similar place is Heleysundet between Barentsøya and the mainland where the current runs at a speed of up to 10 knots an hour. Here also there is a big colony of Kittiwakes. In Isfjorden many of these birds get their food near the

glacier Nordenskiöldbreen in Billefjorden, probably also at Von Postbreen and other glaciers. In Kongsfjorden they have the big glaciers Kongsvegen and Kongsbreen; in Liefdefjorden I have seen enormous numbers of them close to the glacier Monacobreen, and in Wijdefjorden, which is 120 km long, many of them have quite a distance to travel when they fish near Mittag Lefflerbreen.

The colonies vary very much in size, from ten pairs up to several thousands.

The Kittiwake is a pelagic gull and comes to land only in the breeding season. In Spitsbergen it arrives as soon as there is open water in April and then the time of nest-building is dependent on the state of the season. As the first eggs are laid at the earliest in the third week of May, nest-building will have to begin early in this month if conditions allow it.

The earliest record of nest-building, however, is on 30 May, 1889, when Mr. Pike saw them rooting up moss on Negerpynten on Edgeøya (Chapman 195 : 350). In the same year Walter saw them building in Krausshamna, a little farther north, on 3 June (169 : 240). Nathorst saw birds with moss in their bills at Sørhamna on Bjørnøya on 13 June 1898 (243 : 33), and Kolthoff also saw nest-building there on 14 June 1898 (261 : 63). At this time several young were already hatched and Kolthoff concluded that they laid at very different periods. Seemingly he did not know that the Kittiwakes build onto their nests and mend them during the whole breeding period, or at least as long as the young birds are not beginning to become fully fledged. Løvenskiold saw them carry nest-material in Sassenfjorden on 29 June 1954 (1954 : 633), and during his stay on Sørkapp Land in 1950 the birds were seen to come with moss and grass for the nests between 10 July and 8 August (615 : 95).

About egg-laying, the breeding period, fledging etc., we know very little from this area. There are various reasons for this. Firstly the birds build in more or less inaccessible places. And even if the lowest nests sometimes are just high enough above the ground for a fox to be able to jump up to them, the cliff is very much disintegrated and extremely dangerous to climb. Secondly the eggs have not been especially sought by egg-collectors as they can be obtained much more easily in other places.

The nests are built of earth, moss, grass and various other plants. Sometimes sea-weed is also used as material. The nests seem to be glued to the ledges and are in use for several years. Swenander records that the nests are built of earth, moss, lichens, grass and other plants, including *Salix, Cerastium* and *Saxifraga* (247 : 18). Tiedemann says that the nests are built upon from year to year, until eventually they grow so high that the bird cannot stand upright in them under the overhanging roof of stone (560 : 251). Mathey-Dupraz describes nest-building on Nilsfjellet in Krossfjorden and states that sea-weeds and *Cochlearia* are used for materials. He also saw building between 29 July and 3 August (333 : 115).

The Kittiwake is very peaceable and lives in good understanding with other birds on the breeding places. It is often found breeding together with the Guillemot. In Spitsbergen this happens at Sofiakammen, Midterhuken, Alkhornet, Fuglehuken and a number of other places.

They often occupy a certain part of the cliff by themselves, but just as

frequently some pairs can be found in the closest proximity to the Guillemots. Van Oordt found them breeding among Guillemots on Kongressfjellet in Isfjorden (370 : 159). Summerhayes and Elton relate that on Alkfjellet in Hinlopen they bred on dolorite cliffs above the Guillemots (450 : 211). Kristoffersen found a few pairs of Guillemots in the big Kittiwake colony on Keilhaufjellet on Sørkapp Land (472 : 253). Dalgety found a few pairs of Kittiwakes nesting in a colony of Ivory Gulls on Nordaustlandet in 1930 (477 : 2).

The normal clutch in the Svalbard area is one or two eggs, and only in a single instance (see table 29) are three eggs recorded. However, Eaton reports finding three young in nests in Hinlopen during the summer of 1873 (130 : 3811). Montague, who found them on Nordaustlandet in 1924, says: "No birds seem to rear more than one chick successfully." (433 : 145). In this part of Spitsbergen the conditions are perhaps not so good as on the west coast of Vestspitsbergen, where they succeed in bringing up two chicks.

Römer and Schaudin mention 3 to 4 eggs as a normal clutch in the Svalbard area, but this is either a mistake or a misprint (245 : 74). Swenander points out that the statement of Römer and Schaudin is erroneous, as no gull has four eggs, and that four fully fledged young would not have enough room in one nest. He himself had found clutches of two eggs to be normal in nests on Bjørnøya (247 : 18).

Table 29

Egg-laying

Date	No. of nests	No. of eggs	Eggs presumably laid	Condition	Place	Author
1 June 1873			1 June	fresh	Mosselbukta	Kjellman (135: 263)
6 » 1924			6 June	fresh	Hornsund	Kristoffersen (432: 181)
13 » 1898					Bjørnøya	Römer and Schaudin (245: 74)
14 » 1898	many	2	26 May	well incub.	Bjørnøya	Kolthoff (261: 62)
14 » 1898	3	1		–»–	–»–	–»– –»–
15 » 1898	many	2			–»–	–»– –»–
15 » 1898	1	3			–»–	–»– –»–
17 » 1907	many	2	29 May	well incub.	Bjørnøya	Koenig (286: 129)
17 » 1907	many	1		–»–	–»–	–»– –»–
18 » 1861	many				Bjørnøya	Malmgren (92: 387)
18 » 1908	3	1			Kongsfj.	Le Roi (316: 188)
18 » 1908	1	2			–»–	–»– –»–
25 » 1908	1	2			Hornsund	–»– –»–
26 » 1935		in all 9	26 June	fresh	Hopen	B. Trøhaug (1934/35, 645)
28 » 1924			28 June	fresh	Hopen	S. Sørensen (1923/24, 644b)
1 July 1900	many	2	12 June	well incub.	Hornsund	Bianchi (253: 316)
1 » 1908	1	2			Bjørnøya	Le Roi (316: 188)
1 » 1908	2	1			–»–	–»– –»–
4 » 1899	many	2	15 June	well incub.	Bjørnøya	Swenander (247: 18)
1 Aug. 1927	a few		13 July	well incub.	Edgeøya	Dalgety (442: 29)

Table 30

Hatching and young in the nest

Date	No. of nests	No. of young	Eggs presumably laid	Age	Place	Author
13 June 1898	many		19 May	newly hatched	Bjørnøya	Römer und Schaudin (245: 74)
14 » 1898	many	2	20 May	newly hatched	Bjørnøya	Kolthoff (261: 62)
14 » 1898	many	2		showing feathers	–»–	–»– –»–
15 » 1898	many				–»–	–»– –»–
17 » 1907	many	2	23 May	newly hatched	Bjørnøya	Le Roi (316: 187)
14 July 1910	many	2	16 June	newly hatched	Hornsund	Bianchi (253: 316)
20 » 1889				almost fully fledged	Ryke Yseøyane	Walter (169: 240)
22 » 1898				–»–	Kong Karls Land	Römer und Schaudin (245: 74)
22 » 1930			27 June	newly hatched	Kong Karls Land	Dalgety (470: 253)
22 » 1930				showing feathers	Kong Karls Land	–»– –»–
25 » 1910			30 June	newly hatched	Kongsfj.	Zedlitz (319: 311)
1 Aug. 1927			7 July	newly hatched	Edgeøya	Dalgety (442: 29)
3 » 1911				almost fully fledged	Krossfjorden	Mathey–Dupraz (333: 113)
20 » 1827				half naked	Bjørnøya	Keilhau (48: 120)

Table 31

Young on the wing

Date	Eggs presumably laid	Place	Author
9 August 1910	27 May	Kongsfjorden	Zedlitz (319: 311)
12 » 1910	30 May	Bjørnøya	–»– –»–
12 » 1948	30 May	Bellsund	Løvenskiold (615: 96)
13 » 1927	1 June	Wijdefjorden	Georg Bjørnnes (1927/28, 636)
15 » 1910	3 June	Bellsund	Munsterhjelm (313: 28)
15 » 1930	3 June	Sørkapp	Kristoffersen (472: 253)
17 » 1950	5 June	Sassenfjorden	Løvenskiold (615: 96)
18 » 1956	6 June	Krossfjorden	Løvenskiold (1956, 633)
19 » 1952	7 June	Hornsund	Løvenskiold (615: 95)
20 » 1927	8 June	Edgeøya	Dalgety (442: 29)
22 » 1861	10 June	Lomfjorden	Malmgren (85: 119)

If we take the dates for "Eggs presumably laid" from the three tables above and presume that strongly incubated eggs have been incubated for about 20 days, that newly hatched chicks are about two days old, with an incubation period of 24 days behind them, and that young birds on the wing have had about 46 days in the nest, (see Keighley and Lockley, 570 : 165), we arrive at the following numerical values for the egg-laying:

Dates in May	19	20	23	26	27	29	30
No. of observations	1	1	1	1	1	1	2

Dates in June	1	3	5	6	7	8	10	12	15	19	26	27	28	30
No. of observations	2	2	1	2	1	1	1	1	1	1	1	1	1	1

Dates in July	7	13
No. of observations	1	1

This shows that most of the egg-laying will take place in the last days of May and in the first week of June. If the spring is very early, the birds can begin to lay, let us say in the third week of May. If the summer is late in coming, they will of course start later, but the dates for late June and early July point to an accident to the first clutch and these eggs belong probably to a second brood.

In the same way we reach the following numerical values for the hatching of the young:

Dates in June	13	14	17	20	21	23	24	25	27	29	30
No. of observations	1	1	1	1	1	1	2	2	2	1	1

Dates in July	1	2	3	5	6	7	9	10	20	21	22	24
No. of observations	2	1	1	1	1	1	1	1	1	1	1	1

This shows that the hatching will normally begin about the fourth week of June and last until about the middle of July.

For the time when the young birds leave their nests we find:

Dates in July	12	15	16	22
No. of observations	1	1	1	1

Dates in August	1	2	4	5	8	9	12	13	15	16	17	18	19	20	27
No. of observations	1	1	1	2	1	1	3	1	3	1	1	2	1	1	2

This shows that the majority of the young birds will leave their nests about the middle of August.

The numerical values above must not of course be taken as exact values, but they show approximately when the Kittiwakes lay, hatch and fledge their young in the Svalbard area.

F o o d. — The Kittiwake lives to a very great extent on *Crustacea,* and mainly on species which occur near the surface. As for other kinds of food, it has been said that the Kittiwake never touches meat or blubber. This has been confirmed by a number of ornithologists, and I myself have never seen Kittiwakes take this kind of food.

In the Svalbard area, however, there are several records of these gulls taking both meat and blubber, and these are given here:

Torell relates that a few Kittiwakes came, together with *Larus hyperboreus, Pagophila eburnea* and *Fulmarus glacialis* to the carcass of a walrus, shot on the island Klovningen on 23 May 1861 (112 : 40).

Heuglin saw on 9 April 1870 on Edgeøya a carcass of a seal around which a number of Glaucous Gulls and Kittiwakes had gathered (123 : 167).

Klinckowström relates that a Greenland shark was caught in Adventfjorden on 21 June 1890. The remains of this fish were put on the shore where "Kittiwakes, Skuas and Glaucous Gulls" assembled to feast on the carcass (172 : 99). Munsterhjelm says: "They were especially keen on small pieces of blubber floating on the surface when a *Hyperoodon amputatus* (Bottlenose) was cut up" (313 : 29).

Le Roi reports having seen Kittiwakes feeding on the carcasses of whales, although there were only a few of these birds on each occasion (316 : 189).

Jung reports that during the summer of 1936 on the NW corner of Spitsbergen, he saw Kittiwakes take meat and intestines even when these were rotten (539 : 133).

There are several records from the archipelago of the normal food of this species. Parry relates that on 11 August 1827 when he was in the pack-ice at 81° 34 N. lat. and 18° 15 E. long., "The sea was crowded with shrimps and other sea-insects, principally the *Clio Borealis* and *Argonauta Arctica,* on which numerous birds were feeding." "The Kittiwake was seen feeding on *Merlangus Polaris* and *Alpheus Polaris* as far as the expedition went to the northward, 82° n. lat." (46 : 118, 195). Malmgren shot some Kittiwakes in Danskegattet between Danskøya and Amsterdamøya in the first days of September 1861. They were crammed full of *Limacina arctica,* which occurred in great numbers. near the surface. Malmgren states that the bird never touches blubber (85 : 104). Chydenius saw them take *Limacina* in Sorgfjorden in July 1861 and on the 9th of this month he saw them fishing outside the three glaciers on the east side of Wijdefjorden (89 : 139). Eaton, who saw Kittiwakes on Hinlopenstretet in 1873, records that they fished for pteropods and shrimps, but they also took *Boreogadus* among the ice (130 : 3810).

Conway saw them feeding at Vindodden in Sassenfjorden in July 1896 in a long line a few yards from the shore (196 : 199).

Swenander shot a number of Kittiwakes on Bjørnøya in 1899 and examined their stomachs. He found small fish, namely *Mallotus vilosus,* sometimes amphipods, and the jaws of a large species of annelids. In the majority of cases the stomachs were empty (247 : 20). Kolthoff reports that the Kittiwakes which he obtained on Bjørnøya in 1898 had eaten prawns and other *Crustacea.* At Kong Karls Land they caught the Polar Cod, *Gadus saida.* Once a bird lost such a fish, 200 mm long, on the beach there. He also shot some birds bathing on freshwater lakes, but they had only marine *Crustacea* in their stomachs (261 : 62).

Isachsen saw great numbers fishing for *Limacina* close to the front of the glacier Smeerenburgbreen on 22 July 1906 (274 : 95). Birula saw great numbers of Kittiwakes seeking food at low tide, outside the estuary of a river in Ginevrabotnen, in the north part of Storfjorden, on 20 August 1899 (298 : 170).

Munsterhjelm saw them catching *Gadus saida* among the ice-floes in Van Keulenfjorden in 1910. They also took pieces of bread thrown to them from the ship (313 : 28).

Mathey-Dupraz saw them fishing for *Crustacea* beneath the front of the glacier Smeerenburgbreen in 1911. The birds which he obtained were full of *Crustacea.* Later he saw them fishing in the same way at Lillihöökbreen in Krossfjorden (333 : 113).

Le Roi found remains of *Pteropoda, Crustacea* and *Annelida* in their stomachs, once also the remains of a small fish (316 : 189). Montague shot a number of Kittiwakes for stomach investigations in the Barents Sea at the end of the first week of September in 1924. The principal food was fish; some were full of *Crustacea,* and they were also seen to take the abundant black pteropod *Clio* (433 : 146).

Belopoldski counted the numbers of Kittiwakes along the 33° 30′ E meridian between 5 and 13 August 1927 and between 31 May and 5 June 1928. Along the 38° E meridian they were counted between 6 and 8 June 1928. He found that the biggest concentration of birds was in the places with most macroplankton. The increase for both species of birds, the Kittiwake and the Fulmar, which was recorded from lat. 74° 30′ was in relation to the great numbers of *Mollusca* and *Pteropoda* found here, close to the surface of the sea.

From what Belopoldski saw, the greatest number of birds occurred within the Gulf Stream currents or on their border. He thought it highly probable that on the borders where currents with cold and warm water or higher or lower salinity meet, great amounts of macroplankton will assemble. This should, on the other hand, increase the numbers of birds in these zones. Belopoldski hoped that these investigations would be continued, and felt that an attempt should be made to find out why birds assemble in great numbers in certain areas of the sea. The appearance of great quantities of macroplankton would not only cause birds to gather there, but also fish, and this is of the greatest importance for fisheries (486 : 105).

Hartley states that in 1933 the Kittiwakes had to travel 30 miles from the nearest colony to the feeding ground in Billefjorden (503 : 166).

Here they fed in an area outside the glacier in Adolfbukta. The actual feeding zone was 110 yards long and 50 yards across, and here about 3,000 Kittiwakes fed daily. The birds seemed to come from Skansbukta (502 : 128).

Hartley and Fisher report that in Billefjorden in that summer the Kittiwakes were surface feeders. With the exception of a small colony on a cliff by the glacier Hörbyebreen, the Kittiwakes did not nest anywhere near the feeding area at Nordenskiöldbreen. The chief colonies were situated on the north coast of Billefjorden about 30 miles from the glacier. The investigation at the feeding zone lasted from 16 July to the last week of August 1933. The feeding zone was of oblong shape, 60 yards long and 30–40 yards deep. Here about 2,000 Kittiwakes were constantly feeding. Inside the zone most birds were found on a stream coming from a cave in the glacier. Here the Kittiwakes took the crustaceans from the extreme surface, never upending. Investigations on a quantitative basis were carried out from 16 July to 12 September 1933. In all,

227 stomachs of Kittiwakes were examined, 68 proving empty. In the other 159 the following food was found:

Thysanoëssa inermis Kröyer, 159 records, the highest number in any stomach being 1,038, the average 331.

Mysis oculata, 8 records, one of 94, the others all less than ten.

Euthemisto libellula, 67 records, all under 20 except for one of 73 and one of 211 (513 : 371, 372).

Harmotöe imbricata. The paragnaths of this worm were found on eight occasions early in the season.

— Fish, 4 records.

To obtain numbers of *Thysanoëssa* when digestion had set in, pairs of eyes were counted. These remained united in pairs after the rest of the body had become soft.

All analyses included in their frequency chart were carried out on birds returning from the zone to their colonies, and were concluded on 18 August. The first young bird of the year was observed in the zone on 15 August, but not many were seen before 20 August. Before 18 August the young were fed in the colonies.

107 males and 104 females were found in the birds sexed. Disregarding empty stomachs it was found that 144 birds examined had each consumed an average of 331 *Thysanoëssa* per trip to the glacier. This figure must be a minimum, since it did not allow for digestion. Half-hour counts of birds leaving the feeding zone were taken every 6 hours over a period of 9 days from 15 to 23 July. The mean number per minute was 325 (max. 508, min. 98). The daily total is therefore around 15,600. Hence the number of *Thysanoëssa* taken per day by Kittiwakes alone was nearly 6 millions.

On 28 August bird numbers began to decrease and by 3 September the feeding zone was deserted. A cold spell had started on 26 August. A mild spell started again on 7 September and on the 9th 500 Kittiwakes had returned.

On 5 September Fisher went to the glacier Mittag-Lefflerbreen and immediately found a similar feeding zone. At the west end of the glacier a drainage stream came out in the bay and at the mouth of this *Euthemisto libellula* were found in great numbers. Here 250 Kittiwakes fed constantly (513 : 371, 372, 374, 376). Stott reports that the birds' feeding zone outside the glacier Nordenskiöldbreen investigated in 1933 contained the following dominant forms: *Calanus finmarchicus, Calanus hyperboreus* and *Thysanoëssa inermis.*

Tow-netting was performed on 20 August by quickly towing a 40 cm diameter medium mesh net to within 20 yards of the glacier face on three occasions. A total catch of 325 *Thysanoëssa* gave a density of this eupheusid of 26 individuals per cu.m. (516 : 360, 361). Løvenskiold visited the glacier Monacobreen in Liefdefjorden on 24 July, 1949. Just beneath the northern part of the glacier front, where the sheer ice-walls rose to about 50 metres above sea-level, there was a great circular eddy with big pieces of ice drifting around the edges of it. On the ice large numbers of Kittiwakes were sitting and in the middle of the eddy about a thousand birds were swimming, the majority being

Kittiwakes. All at once all the birds would take wing and rise in the air like a cloud, immediately afterwards alighting again like a snowdrift. At that time it was not observed whether they were eating anything, but they had probably gathered here for food just as they do at other glaciers. As big blocks of ice were constantly falling from the glacier at that time, it seemed too dangerous to go in for a closer investigation (615 : 97).

On 25 June 1954 Løvenskiold saw Kittiwakes in a long row some metres from the shore of Hotellneset in Adventfjorden, where they were feeding. At Kvadehuken at the entrance to Kongsfjorden, on 5 July, some were seen diving into the sea from the air. These birds disappeared totally under the surface. On 10 July a long row of several hundreds of Kittiwakes was seen fishing some metres from the leeward shore at Krosspynten in Wijdefjorden (1954, 633). Pennie and Andrew report that on 7 July 1955 a long row of several hundred Kittiwakes was lined along the leeward shore of the Vindodden delta in Sassenfjorden, feeding eagerly only a yard from the shore on debris washed round the point of the delta (623 : 60).

STERNA HIRUNDO HIRUNDO L.

The Common Tern

Pennant was the first author to mention the Common Tern from Spitsbergen (24; Vol. II : 524).

Leach thought that the bird was an inhabitant of these islands (37 : 61), and Gray gives the name *Sterna hirundo* for the tern living there (58 : 177). But it is doubtful if they would have known exactly which tern was living in the Svalbard area.

Schlegel and Hoeck, and von Zeppelin, on the other hand, should not have mistaken the Arctic Tern for the Common Tern (148 : 2) and (179 : 79).

In fact, *Sterna hirundo* has never been seen in the Svalbard area.

No. 63. *STERNA PARADISAEA* Pontopp.[1]

The Arctic Tern

Geographical distribution

The Arctic Tern breeds on Jan Mayen, Svalbard, Franz Josef Land, Kolguev, Novaya Zemlya, the New Siberian Islands and on the arctic coasts of Europe, Siberia, Alaska, Canada and Greenland. In Europe it breeds as far south as Holland, and in Denmark, S Sweden, Finland and N Russia.

Occurrence in Svalbard

The species has been found breeding in all districts of the Svalbard area, with the exception of Hopen. Although the bird must at least have visited Hopen, it has never been recorded there.

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[1] Contour map showing distribution, see backflap. (On the map *Sterna macrura*.)

First records

Martens saw the Arctic Tern in Spitsbergen in 1671. He described both the bird and its eggs and made a drawing of it (12 : 66).

Phipps saw the bird in 1773, but named it *Sterna hirundo* (23 : 188).

Pennant also writes of *Sterna hirundo* in Spitsbergen (24, Vol. 2 : 524).

Leach sent Dr. Thomson a list of Spitsbergen mammals and birds presented to the British Museum by the Admiralty. Among the birds there is a "Common Tern (*Sterna hirundo*)", which is of course an Arctic Tern (37 : 61).

Gray speaks of two specimens from Spitsbergen in the collections of the British Museum (58 : 177).

Distribution. Sections I–XIII

Section I. Bjørnøya. — The Arctic Terns are mainly found on the big plain to the north of the mountains. A few pairs may be found here and there on this plateau, breeding in groups, but small colonies are mostly restricted to the islets in the lakes.

Section II. Hornsund. — The birds are found all along the coast and in Hornsund, from Sørkappøya and up to Kapp Borthen and also north of Kapp Borthen. There are colonies on most of the islands along the coast and also in some places on the mainland. Of these colonies the biggest one is in Gåshamna in Hornsund.

Section III. Bellsund. — The terns breed on most of the islands in this district, both on the coast up to Kapp Lyell, in Bellsund itself, and in the fjords Recherchefjorden, Van Keulenfjorden and Van Mijenfjorden. There are also several colonies on the mainland, for example, at Calypsobyen and Kapp Martin. At Kapp Martin they breed on islands in the freshwater lakes.

Section IV. Isfjorden. — Arctic Terns have been seen in every part of this fjord and its different branches. As there are relatively few islands there, in many places the terns breed on the mainland, and some of these colonies are large. The birds breed at Kapp Linné, Russekjeila. Grønfjorden, Hotellneset and Longyearbyen in Adventfjorden, at Diabasodden, in De Geerdalen, at the head of Sassenfjorden, on Gåsøyane outside Gipshuken, near Brucebyen in Billefjorden and also at the mouth of the rivers Ebbaelva and Gerritelva at the head of this fjord. They have also been found breeding at the foot of the mountains Pyramiden and "Triplex" (the last-named is unknown); and further at Kapp Wijk in Dicksonfjorden and on Coraholmen in Ekmanfjorden, on Bohemanneset and on the islets outside this ness, and on Hermansenøya in Forlandsundet.

Section V. Prins Karls Forland. — The biggest colonies are found on Forlandsøyane, but they also breed on Forlandet itself, where nests have been found around Richardlaguna in the NE part of the island, and on Dawespynten on the east side. They also breed on isolated rocks and islets along the west coast.

Section VI. Kongsfjorden. — In this district the birds breed on the big plain east of Ny-Ålesund and on Brandalpynten to the west of the colliery, on Lovénøyane, Gerdøya and Blomstrandhalvøya in Kongsfjorden, on

Kapp Guissez at the entrance to Krossfjorden and on isolated rocks along the coast of this ness. In Krossfjorden they breed at the head of Møllerfjorden, on almost all the islets in the freshwater lakes around Signehamna, in Ebeltoft-hamna and on Kapp Mitra on the west coast.

Section VII. NW Spitsbergen. — The species breeds on Moseøya and in Bjørnehamna in Sørgattet, in Fuglefjorden, Birgerbukta, Cummingøya, Norskøyane, in Breibogen south of Biskayerhuken, on the island Moffen, on all the islands in Liefdefjorden and on Gråhuken. There are also several records but without evidence of breeding from Magdalenefjorden, Danskøya, Amsterdamøya, Fuglesangen, Arneliusneset south of Norskøyane, Raudfjorden and Velkomstpynten.

Section VIII. Wijdefjorden. — Arctic Terns have been breeding near the mouth of Andredalen, on Krosspynten and Ræstadholmen. At the head of the fjord there is a colony at the mounth of Zeipeldalen and one at Lemström-fjellet on the east side. They also breed in numbers on Gyllensköldholmane and on Bjørnnesholmen at Austfjordnes. They breed further on islets in the lake Immervatnet south of the big lake Femmilsjøen, and in Mosselbukta.

Section IX. Hinlopen. — The species is found in Sorgfjorden and in Lomfjorden. They are said to have bred on islands in the strait in 1923, but it is not stated on which islands they were nesting.

Section X. Nordaustlandet. — Arctic Terns breed on Gyldén-øyane in Wahlenbergfjorden, on islands in Murchisonfjorden, in Pentavika on the NW corner and on an islet to the east of Pentavika; also on Lågøya, on an islet in Beverlysundet south of Chermsideøya, on Karl XII Øyane, on Storøya and Isispynten on the SE side of Nordaustlandet.

Section XI. Storfjorden. — In this district the terns have been observed in Agardhbukta, Dunérbukta, Heleysundet, on Kapp Lee, Kvalpynten, Tjuvfjorden, Zieglerøya and Negerpynten on Edgeøya. They have been found breeding on Ryke Yseøyane, Abbotøyane north of Halvmåneøya, in Krauss-hamna on Edgeøya and on Kong Ludvigøyane and Tusenøyane.

Section XII. Kvitøya. — The birds have been found breeding on the island on two different occasions and have also been seen out at sea near the island.

Section XIII. Kong Karls Land. — Arctic Terns breed on all three islands.

Records north of Spitsbergen

Parry saw a tern at 81° 45′ N, 24° 23′ E, on 5 July, 1827 (46 : 72).

Collett and Nansen report a single tern in latitude 83° 1′ N, on 9 July, 1896. *Fram* was then due north of Spitsbergen (237 : 46).

Biological

Migration. — The first terns seem to arrive in Spitsbergen during the last few days of May. They have been observed for the first time in the year on 29, 30, and 31 May, with one arrival on each of these dates. There is,

however, one exception. The trapper Alfred Svendsen, wintering in 1927/28 saw the first tern on Verlegenhuken at the northern entrance to Hinlopenstretet on 12 May, 1929. But this is very unusual.

Generally the last terns have arrived by about 15 June, and the dates for June are as follows:

Dates in June	1	2	3	4	5	6	7	9	10	11
No. of observations	1	2	3	1	1	1	1	3	2	2

The species stays in Spitsbergen until late in the autumn. Normally they begin to gather for the journey south in the last week of August, but there does not seem to be any remarkable decrease in their numbers before the 25th of this month. From this time and far into the first half of September they can be found in flocks of several hundreds. Cocks saw the rock Festningen in Isfjorden completely covered with terns on 9 September, 1882 (151 : 400) and Løvenskiold, on 26 August, 1948, on Poolepynten on Forlandet, saw several hundred terns in a dense flock assembling for the migration south (615 : 77).

The last dates on which terns have been seen in Spitsbergen in August and September are as follows:

Dates in August	25	26	27	28	29	30	31
No. of observations	1	1	2	3	2	3	3

Dates in September	5	8	9	10	21	28
No. of observations	2	1	1	1	1	1

It seems therefore that the terns leave Spitsbergen in the last week of August and during the first week of September. Only a few birds have been seen as late as the 9th, 10th, 21st, and 28th of this month.

G e n e r a l h a b i t s. — Breeding terns often congregate in large colonies. These can be found on the mainland, but more often they are situated on islands or islets where they cannot be reached by foxes. With the exception of man, the fox is the only formidable enemy they have, provided they breed in fairly big colonies.

The Glaucous Gull and the Arctic Skua, which are such a menace to other birds, are mercilessly driven away from the territories of the terns.

In areas where the terns are unaccustomed to man, for example places which are rarely visited by trappers, fishermen and sailors, and also where they breed amongst the Eiders, so that their nests are not plundered, the terns are not particularly aggressive.

In other places, however, where the birds see people around them daily, and still worse, where dogs are able to molest them, they will attack anybody who comes within their territory. In their attacks they certainly mean business and without some solid head protection, one can easily receive several blows drawing blood in a very short time.

In such places, as near Longyearbyen, at Kapp Linné where there is a radio station, and in Ny-Ålesund, people who have to cross the breeding grounds of the terns, usually carry a stick perpendicularly over their head, to prevent the terns from hitting them with their bills. Sometimes the terns also use their droppings for defence, and their aim is extraordinarily good.

When a fox enters a colony it is immediately attacked, but it is doubtful whether the terns ever succeed in driving it away. It seems, however, that the fox usually tends to keep to the outskirts of a big colony and will not venture into the middle of it.

Although the terns are extremely aggressive towards their enemies, certain harmless birds are tolerated, and live amongst them in their colonies. Thus one often finds birds like the Eider, the Purple Sandpiper, the Grey Phalarope, the Long-tailed Duck and the Red-throated Diver nesting under their protection.

Arctic Skuas seldom come near a colony of terns, but it can happen that they will attack single birds coming in with food. Then the tern will have to give up its food to the pirate.

B r e e d i n g. — The tern colonies are much more common on the west coast than in the eastern part of the archipelago, but even here they have been found and no doubt more colonies will be discovered in the future.

In the colonies the nests are sometimes placed fairly close together with only a few metres between them, but they can also be widely spread over a large area. The nest is placed in almost any situation, provided the ground is reasonably level and otherwise suits the birds. The colony area may have a surface of shingle, or of hard clay, or it may be covered with low vegetation or moss. In some places all of these types of ground can be found within one and the same colony.

Usually the terns make only a very shallow nest-scrape and use no lining at all. In a very few of the recorded cases, feathers, straw and bare shafts of wing-primaries have been found in the nest, but it is much more common for the nest to be lined with small stones and pieces of shell. Sometimes the surrounding ground is covered with small stones, and these are often of different colours. Such decorations have been found on black, peaty, wet ground.

The time of egg-laying varies to an almost unbelievable extent. The earliest clutch from Spitsbergen was found on 31 May, but this is quite exceptional.

If we allow for an incubation period of 21 days, and also take into consideration the information concerning newly hatched chicks (taken from table 33), we arrive at the following dates for the egg-laying:

Dates in June	16	18	20	22	23	24	25	26	27	28	30					
No. of observations	1	3	1	1	1	2	1	2	1	2	1					
Dates in July	1	2	3	4	5	6	8	9	10	12	13	14	16	17	18	19
No. of observations	3	1	2	1	1	3	1	1	4	1	1	1	1	1	2	2
	20	21	23	26	27	29										
	1	4	1	2	1	3										
Dates in August	3	6	8	10												
No. of observations	1	1	1	1												

Normally, therefore, the terns begin to lay in the last week of June and onwards. Fresh eggs have been found throughout July and even as late as the first week of August.

Table 32
Egg-laying

Date	No. of nests	No. of eggs	Condition	Place	Authors
16 June 1924	many	1–2	fresh	Dunøyane	Kristoffersen (432: 185)
18 » 1889	many		fresh	Abbotøyane	Walter (169: 238)
18 » 1898	many			Bjørnøya	Nathorst (243: 50)
18 » 1954	1	1	fresh	Hotellneset	Løvenskiold (1954, 633)
19 » 1910	many	1–3		Forlandet	Munsterhjelm (313: 33)
20 » 1896	1	1		Adventfjorden	Trevor–Battye (203: 591)
20 » 1931	many	1–3	fresh	Grønfjorden	Tomkinson (485: 83)
22 » 1939	1	2	fresh	Kapp Wijk	Oxaas (1938/39, 643)
23 » 1837	many			Kapp Mitra	Lovén (51: 35)
23 » 1898	many		all stages of incub.	K. Ludvigøyane	Römer und Schaudin (245: 70)
24 » 1837	many			Kongsfjorden	Lovén (51: 35)
24 » 1909	50	1–2		Dunøyane	Haag (293: 104)
24 » 1922	many	2		Ny-Ålesund	Congreve (403: 16)
24 » 1922	1	3		Ny-Ålesund	Congreve (403: 16)
24 » 1922	many	2		Kongsfjorden	Congreve (403: 17)
24 » 1922	few	3		Kongsfjorden	Congreve (403: 17)
24 » 1949	many	1–2	fresh	Hotellneset	Løvenskiold (615: 76)
26 » 1930	300	1–2		Sørkappøya	Kristoffersen (472: 254)
26 » 1954	many	1–2	incub.	Hotellneset	Løvenskiold (1954, 633)
26 » 1956	many	1–2	fresh	Hotellneset	Løvenskiold (1956, 633)
26 » 1956	1	4		Hotellneset	Løvenskiold (1956, 633)
27 » 1908	3	2		Dunøyane	Le Roi (316: 180)
28 » 1898	many			Van Keulenfj.	Nathorst (243: 94)
28 » 1932	many		fresh	Bjørnøya	Lack (491: 231)
28 » 1949	many	2		Ny-Ålesund	Løvenskiold (615: 77)
28 » 1949	3	1		Kongsfjorden	Løvenskiold (615: 77)
28 » 1949	9	2		Kongsfjorden	Løvenskiold (615: 77)
28 » 1949	1	3		Kongsfjorden	Løvenskiold (615: 77)
29 » 1949	1	2		Sørgattet	Løvenskiold (615: 78)
30 » 1900	4	2		Hornsund	Bianchi (253: 319)
30 » 1900	8	1		Hornsund	Bianchi (253: 319)
30 » 1921	50	1	fresh	Bohemanneset	Van Oordt (370: 157)
30 » 1956	many	1–2		Kongsfjorden	Løvenskiold (1956, 633)
1 July 1921	50	2		Bohemanneset	Van Oordt (370: 157)
1 » 1921	1	3	fresh	Bohemanneset	Van Oordt (370: 157)
1 » 1950	many	2		Hotellneset	Løvenskiold (615: 76)
1 » 1950	6	1		Hotellneset	Løvenskiold (615: 76)
1 » 1950	3	3		Hotellneset	Løvenskiold (615: 76)
1 » 1956	many	1–2		Kongsfjorden	Løvenskiold (1956, 633)
2 » 1908	1	2		Bjørnøya	Le Roi (316: 179)
2 » 1956	many	1–2		Kongsfjorden	Løvenskiold (1956, 633)
4 » 1863	many			Isfjorden	Dunér (98: 46)
4 » 1894	2	2		Forlandsøyane	Feilden (189: 89)
5 » 1908	2	2		K. Ludvigøyane	Le Roi (316: 180)
6 » 1932	many			Bjørnøya	Lack (491: 231)
6 » 1949	many	2		Birgerbukta	Løvenskiold (615: 78)
7 » 1907	1	2		Kongsfjorden	Le Roi (316: 179)
7 » 1954	5	2		Wijdefjorden	Løvenskiold (1954, 633)
8 » 1899	1	2	fresh	Bjørnøya	Swenander (247: 16)

Date	No. of nests	No. of eggs	Condition	Place	Authors
8 July 1921	many	2		Moffen	Jourdain (381: 172)
8 » 1921	many	3		Moffen	Jourdain (381: 172)
8 » 1952	6	2		Bohemanneset	Løvenskiold (615: 76)
8 » 1954	1	1		Wijdefjorden	Løvenskiold (1954, 633)
9 » 1864	many			Wijdefjorden	Chydenius (89: 317)
9 » 1899	1	1	sl. inc.	Bjørnøya	Swenander (247: 16)
9 » 1954	many	2		Wijdefjorden	Løvenskiold (1954, 633)
10 » 1906	8	1		Isfjorden	Dietrich (269: 131)
10 » 1950	many	2		Isfjorden	Løvenskiold (615: 76)
12 » 1897	many			Billefjorden	Conway (208: 14)
12 » 1950	many	2		Sørkapp Land	Løvenskiold (615: 74)
14 » 1907	3	2		Bjørnøya	Le Roi (316: 179)
14 » 1950	6	1–2		Sørkapp Land	Løvenskiold (615: 74)
14 » 1952	many	2		Dunøyane	Løvenskiold (615: 75)
15 » 1864	1	2		Isfjorden	Newton (96: 506)
16 » 1954	20	2		Wijdefjorden	Løvenskiold (1954, 633)
16 » 1954	40	1		Wijdefjorden	Løvenskiold (1954, 633)
16 » 1956	50	1–2	well inc.	Krossfjorden	Løvenskiold (1956, 633)
17 » 1870	many	2		Dunøyane	Heuglin (116: 60)
19 » 1864	many			Gråhuken	Chydenius (89: 327)
19 » 1950	100	2		Tokrossøya	Løvenskiold (615: 74)
20 » 1954	many			Wijdefjorden	Løvenskiold (1954, 633)
21 » 1932	many		fresh	Bjørnøya	Lack (491: 231)
21 » 1948	many	1–2	all stages of inc.	Isfjorden	Løvenskiold (615: 76)
21 » 1949	many	2		Liefdefjorden	Løvenskiold (615: 78)
22 » 1948	63	2		Bjørnøya	Duffey and Sergeant (586: 559)
22 » 1949	many	2		Liefdefjorden	Løvenskiold (615: 78)
23 » 1956	5	1–2		Forlandet	Løvenskiold (1956, 633)
24 » 1948	many	2	just bef. hatching	Isfjorden	Løvenskiold (615: 76)
24 » 1956	2			Hermansenøya	Løvenskiold (1956, 633)
26 » 1906	60	2	just bef. hatching	Ytre Norskøya	Mathey–Dupraz (311: 52)
26 » 1952	many	2		Dunøyane	Løvenskiold (615: 75)
26 » 1954	2	1–2		Mosselbukta	Løvenskiold (1954, 633)
27 » 1910	many			Kongsfjorden	Miethe (312: 109)
27 » 1948	many	2		Kongsfjorden	Løvenskiold (615: 76)
27 » 1954	4	2		Isfjorden	Løvenskiold (1954, 633)
28 » 1952	many	2		Hornsund	Løvenskiold (615: 74)
29 » 1895	many			Recherchefj.	Coke (188: 550)
29 » 1950	1	2		Sørkapp Land	Løvenskiold (615: 74)
29 » 1956	many	1–2		Forlandsøyane	Løvenskiold (1956, 633)
30 » 1863	many			Dunøyane	Dunér (98: 90)
1 Aug. 1936	5	2		Gråhuken	Jung (539: 128)
2 » 1949	many	1–2	just bef. hatching	Kongsfjorden	Løvenskiold (615: 75)
5 » 1923	3	1	half inc.	Hinlopen	Longstaff (407: 487)
5 » 1949	50	2	just bef. hatching	Bellsund	Løvenskiold (615: 75)

(Table 32 cont.)

Date	No. of nests	No. of eggs	Condition	Place	Authors
7 Aug. 1898	many		fresh	Storøya	Römer und Schaudin (245: 70)
7 » 1899	1	1	just bef. hatching		Swenander (247: 16)
8 » 1954	6	1		Wijdefjorden	Løvenskiold (1954, 633)
9 » 1954	many	1		Wijdefjorden	Løvenskiold (1954, 633)
10 » 1936	2	2		Wijdefjorden	Jung (539: 128)
18 » 1921	1	2		Bohemanneset	Van Oordt (370: 157)

The Arctic Tern usually lays two eggs, but in some nests there is only one. A few nests will contain as many as three eggs, but in only one case is there a record of four eggs being laid by the same female.

During the first few days of July the first young terns are hatched, and the hatching continues far into August. Newly hatched chicks have even been found as late as the last few days of August.

If, as before, we assume an incubation period of 21 days, and consider only the information concerning fresh eggs and also just hatched chicks, we reach the following dates for hatching:

Dates in July	6	7	11	12	13	14	15	16	17	18	19	21	22	23
No. of observations	1	3	1	1	1	2	2	2	1	1	1	2	3	1

	24	25	26	28	29	30	31
	2	2	3	1	1	4	1

Dates in August	1	2	3	4	5	6	7	8	9	10	12	15	16	18	20
No. of observations	1	1	1	1	1	2	2	2	1	3	1	2	1	3	1

	21	22	24	26	27	28	30
	1	1	1	1	2	3	1

Most of the young terns must therefore be hatched between 15 July and 20 August.

The young birds are then brooded and fed until they are able to fly and even after that. When they can use their wings, according to Munsterhjelm, the parents come with food and will persuade them to fly by showing them a fish. They then deliberately drop the fish into the water to teach the young bird to take it there, and in this way they teach the youngsters to fish (313 : 34).

The Arctic Tern has been found nesting together in various numbers by the different observers. Trevor-Battye found never more than three pairs (203 : 591), and Zedlitz states that he also found three pairs of birds breeding together in different places in 1910 (319 : 314). Le Roi relates that he found a few birds breeding together on the inland of Bjørnøya in the summer of 1908 (316 : 177). Summerhayes and Elton found small numbers of terns near Richardlaguna on Forlandet in 1921, and Feilden, who visited Forlandsøyane in 1894, found only two pairs breeding there (189 : 89).

Table 33

Hatching and young birds

Date	Condition	Place	Authors
8 July 1930	just hatched	Tokrossøya	Kristoffersen (472: 254)
14 » 1930	just hatched	Liefdefjorden	Dalgety (470, 252)
15 » 1900		Hornsund	Bianchi (253: 319)
15 » 1921	just hatched	Bohemanneset	Van Oordt (370: 157)
16 » 1954	just hatched	Wijdefjorden	Løvenskiold (1954, 633)
17 » 1870	just hatched	Dunøyane	Heuglin (116: 60)
18 » 1906	just hatched	Recherchefjorden	Mathey–Dupraz (311: 52)
21 » 1948	just hatched	Isfjorden	Løvenskiold (615: 76)
22 » 1948	just hatched	Bjørnøya	Duffey and Sergeant (586: 559)
23 » 1948	just hatched	Isfjorden	Løvenskiold (615: 76)
24 » 1948	all st. of development	Kapp Linné	Løvenskiold (615: 76)
25 » 1910	14 days old	Amsterdamøya	Mathey–Dupraz (311: 52)
25 » 1932	just hatched	Bjørnøya	Bertram and Lack (488: 296)
26 » 1910	just hatched	Magdalenefjorden	Mathey–Dupraz (311: 53)
29 » 1956	just hatched	Forlandsøyane	Løvenskiold (1956, 633)
30 » 1861	just hatched	Depotholmen	Malmgren (85: 101)
30 » 1863	just hatched	Dunøyane	Dunér (98: 90)
30 » 1889	just hatched	Ryke Yseøyane	Walter (169: 238)
30 » 1949	just hatched	Birgerbukta	Løvenskiold (615: 78)
31 » 1932	fully fledged	Bjørnøya	Bertram and Lack (488: 296)
1 August 1954	just hatched	Wijdefjorden	Løvenskiold (1954, 633)
2 » 1949	all st. of development	Kongsfjorden	Løvenskiold (615: 77)
4 » 1924	in down	Isispynten	Binney (413: 106)
5 » 1949	all st. of development	Bellsund	Løvenskiold (615: 75)
6 » 1921	fully fledged	Bohemanneset	Van Oordt (370: 157)
7 » 1872	just hatched	Cummingøya	Kjellman (135: 56)
7 » 1898	just hatched and bigger	Storøya	Römer und Schaudin (245: 70)
8 » 1954	just hatched	Bjørnnesholmen	Løvenskiold (1954, 633)
9 » 1954	just hatched	Ræstadholmen	Løvenskiold (1954, 633)
10 » 1910	just hatched	Kongsfjorden	Miethe (312: 109)
10 » 1932	just hatched	Bjørnøya	Bertram and Lack (488: 296)
12 » 1936	just hatched	Wijdefjorden	Jung (539: 128)
15 » 1936	just hatched	Woodfjorden	Jung (539: 128)
15 » 1950	all st. of development	Isfjorden	Løvenskiold (615: 76)
16 » 1898	all st. of development	Ryke Yseøyane	Römer und Schaudin (245: 70)
18 » 1889	all st. of development	Edgeøya	Walter (169: 246)
18 » 1948	all st. of development	Bellsund	Løvenskiold (615: 75)
18 » 1956	just hatched	Krossfjorden	Løvenskiold (1956, 633)
20 » 1910	fully fledged	Van Mijenfjorden	Munsterhjelm (313: 34)

(Table 33 cont.)

Date	Condition	Place	Authors
21 Aug. 1927	8 days old	Edgeøya	Dalgety (442: 29)
22 » 1948	almost fledged	Isfjorden	Løvenskiold (615: 74)
24 » 1923	all st. of development	Liefdefjorden	Longstaff (407: 487)
26 » 1923	all st. of development	Kongsfjorden	Longstaff (407: 487)
27 » 1950	almost fledged	Isfjorden	Løvenskiold (615: 76)
28 » 1861	fully fledged	Moffen	Malmgren (85: 101)
28 » 1882	just hatched	Isfjorden	Nathorst (155: 70)
28 » 1952	fully fledged	Dunøyane	Løvenskiold (615: 74)
30 » 1923	all st. of development	Billefjorden	Longstaff (407: 487)

Parry relates that Phipps found very great numbers of terns breeding on an island in the centre of a lagoon on Lågøya in 1773 (46 : 194). Nathorst found terns breeding on an island in a lake on Bjørnøya in 1898 (243 : 50), and Koenig found them breeding in the same place in 1907 (286 : 129). Munsterhjelm located a large colony on an island near Salpynten on Forlandet in 1910 (313 : 33). Summerhayes and Elton found terns breeding on the islands in Immervatnet (named Salmon Lake by them) in Wijdefjorden in the summer of 1923 (450 : 237), and Løvenskiold found them breeding in the same place in 1954 (1954, 633). Kristoffersen found them breeding on Tokrossøya close to the SW point of the mainland of Spitsbergen in the summer of 1930 (472 : 254), and here two big colonies were found in the same place in 1950. Bertram and Lack found more than a hundred pairs breeding on an islet in a lake on Bjørnøya in 1932 (488 : 296). Løvenskiold found two big colonies on islands in freshwater lakes on Kapp Martin in Bellsund in 1949, and in the same year he discovered large colonies on Lovénøyane in Kongsfjorden (615 : 75, 77). In 1956 he found 2 colonies of 25 pairs each on steep islands along the shore of Kapp Guissez in Krossfjorden, and later in the summer he found that terns were breeding on islands in almost all the lakes near Signehamna in Krossfjorden. He also discovered big colonies on Forlandsøyane (1956, 633). Summerhayes and Elton found nests on islands in Wijdefjorden in 1923 spaced at intervals of 30–70 feet from each other (450 : 246). Bertram and Lack found a colony on Bjørnøya in 1932 in which the nests were only 6 feet apart. Løvenskiold visited the colony in Gåshamna in Hornsund in 1950 and 1952. It covered a vast area on the plain and the sides of the hills, and the distances between the nests were quite considerable.

It seems that the distance between the nests depends on the space available for nesting. In the two colonies at Kapp Guissez, there were about 25 nests on the level top of each of the islets. Here space was so restricted that the nests were very close together, some of them not more than a foot or two apart.

Regarding the type of ground on which the terns prefer to breed Summerhayes and Elton say they frequently chose to nest on a crust of moss or lichens, but Bertram and Lack speak of ground covered with damp moss which had

previously been submerged. Løvenskiold found several nests on Lernerøyane in Liefdefjorden in 1949 and there the birds had nested on dry clay, which was so hard that it was impossible for the birds to make even the slightest scrape.

The construction of the nest has been described by Trevor-Battye. To quote: "The Arctic Tern, when preparing its nest, works with both the shoulders, using its feet only as a pivot. After turning round and scooping thus, it rests for a little without leaving the nest, and employs the time in picking with its bill at the ground nearby. On moving the bird after one of these resting-spells, I have found little stones and bits of shell in the bottom of the nest. I had formerly supposed that these and small bits of seaweed occasionally seen in a tern's nest were there by chance, but I am not sure now that they are not put there by deliberate act" (203 : 591).

Often the terns do not begin to breed until late in the year, and the reason for this is generally that the breeding grounds have been either covered with snow or they have been waterlogged. In 1855 Evans and Sturge saw terns on Sørkappøya on 20 June, but none of them were nesting (72 : 167). Walter saw the birds making scrapes on Kong Ludvigøyane on 13 June, 1889, but no eggs were found in them (169 : 247).

Løvenskiold found a few nests on 8 July, 1949, south of Biskayerhuken, but up to the time he left on 20 July, no new nests were found because the ground was covered with snow and the only bare spaces were already occupied by the nests found on the 8th (615 : 78).

Lack visited Bjørnøya in 1932 and studied colony conditions on islets in three of the lakes there. These lakes were: Laksvatnet (A), one of Titrebekk-puttane (B) and one of Hølputtane (C). At (A) the breeding ground was well above the water-level of the lake, at (B) it had been submerged for a relatively short time, and at (C) it had been submerged for a longer period. The times of laying and hatching in these various places were recorded as follows:

Table 34

Locality	A	B	C
State of ground after snow melt	Dry	Waterlogged for short period	Waterlogged for longer period
First egg laid	20 June	1 July	13 July
More than half the birds had laid by	28 »	6	21 »

Table 34 is taken from the paper of Dr. Lack, who summarizes the results thus:

"1. The difference in time of laying at three colonies of the Arctic Tern (*Sterna macrura* Naumann), which amounted to twenty-three days between the extremes, were correlated with nesting conditions, not with the state of the gonads.

2. This and similar cases show that, though laying is primarily dependent on the state of the gonads, it is immediately controlled by the nervous system, through which nesting conditions, sudden cold, and perhaps other factors can limit breeding. These latter factors on occasion considerably modify the breeding time in nature, and may hence be important with regard to the phenomena of breeding periodicity.

3. That in the Northern Hemisphere birds breed earlier in the southern parts of their range seems explicable through the later appearance of suitable nesting conditions and later disappearance of cold weather in the north.

4. The last two facts may also explain why birds breed late in a late summer. It is further suggested that the wide-spread non-breeding in a late season in the Arctic, which is not paralleled in Temperate regions, is caused through the bird's gonads having regressed before nesting conditions become suitable, though the adverse effects of food scarcity on the gonads may explain some cases" (491 : 231).

Much has been written about clutch-size of the Arctic Tern, but it seems that clutches of two eggs are more frequent than clutches of one. Clutches of three eggs also occur, and one clutch of four eggs has been found in Spitsbergen.

Koenig found nests with one or two eggs on Bjørnøya in 1907, but no clutch of three eggs was found (286 : 129). Haag examined a colony of 40–50 breeding pairs on Dunøyane in 1909, and all the nests contained either one or two eggs (293 : 104). Mathey-Dupraz found about 60 nests on Ytre Norskøya in 1906, and all of these contained two eggs (311 : 52). Munsterhjelm found a large colony on an island near Salpynten on Forlandet in 1910, and here the nests contained one, two and three eggs. He took seven clutches of three, and could easily have taken more (313 : 33).

Le Roi says of clutch-size in the Arctic Tern: "The number of eggs in a clutch never exceeded two, in all the many nests found by us and also in those found by earlier travellers in Spitsbergen. The casual remark of Malmgren (1863, p. 373), that *Sterna macrura* in Spitsbergen lays two or three eggs, has not in the least been confirmed" (316 : 179). Van Oordt found a great number of nests on Bohemanneset in Isfjorden and also on the islands around the ness. At the end of June in 1921, there was one egg in most of the nests, but on 1 July all the nests contained two eggs. There were also a few nests with three eggs (370 : 157).

Congreve states that most of the nests he found in Ny-Ålesund in 1922 contained two eggs, but he also found one with three eggs (403 : 16). Montague examined between 40 and 50 clutches on Nordaustlandet in the summer of 1924, and he concludes: "(1) Clutches of one or two eggs were brooded in equal numbers. (2) Of clutches which contained two eggs, just under fifty per cent contained one infertile egg. (3) Of the single clutches, a small portion was infertile. (4) We saw no clutches of three eggs" (433 : 144). This may be true in regard to Nordaustlandet, but in Vestspitsbergen infertile eggs of terns are rarely found.

Lings found 13 clutches of three eggs in the first colony he visited in Grønfjorden in 1931, and a few days later there were more clutches of three eggs there (481 : 90). Tomkinson visited the same colony and he also found several clutches of three eggs (485 : 83). Duffey and Sergeant say that of 63 nests found on Bjørnøya in 1948, the majority contained two eggs (586 : 559).

Løvenskiold saw about a hundred nests on Tokrossøya in 1950, all containing two eggs. In 1952 a large number of nests were examined on Dunøyane. One nest contained only one egg and a few had three, but the majority contained two eggs. In a large colony at Kapp Linné in Isfjorden, visited in 1948, all the nests had two eggs, and this was also the case when the colony was revisited in 1950. Another big colony on Hotellneset near Longyearbyen was visited in 1949. On 24 June the birds had just begun to lay and there were many empty nest-scrapes. In 19 nests two eggs were found, and only a few contained a single egg. In 1950 still more terns were found on Hotellneset; on 1 July the majority of the nests contained two eggs, a few had only one and in three nests there were three eggs.

In a colony on Brandalpynten near Ny-Ålesund in Kongsfjorden a great number of nests had two eggs in 1948. In the following year a small section of this colony was examined, and it was found that three nests had one egg, nine had two and one had three. In 1949 a big colony was found close to the hut of the trapper Mr. Kræmer in Birgerbukta south of Norskøyane. Here the terns had their nests inside the empty cages of the fox-farm, where no fox could reach them. All of these nests contained two eggs (615 : 74–78).

In 1954 Løvenskiold visited a colony of about 250 pairs of breeding terns on Gyllensköldholmane in Wijdefjorden. Within a limited area 40 nests were found with one egg and 20 with two (1954, 633). On 26 June, 1956, he visited the colony at Hotellneset and here a few nests with one egg were found, but the majority had two. In one nest, however, there were four eggs, and they were so alike as to leave no doubt that they had originated from one female (1956, 633).

Römer and Schaudin were of the opinion that since the breeding season stretches over such a long period, the terns in Spitsbergen might have two broods (245 : 70). This, however, is certainly not the case. A pair whose nest has been robbed may of course lay a second clutch, but they certainly could not rear two sets of young in one season. Swenander, who visited Bjørnøya in 1899, says that the Arctic Tern has only one brood in a year (247 : 17).

When the chicks are too small to fly they usually swim out from the shore when danger threatens; this has been observed by many ornithologists in the Svalbard area. Løvenskiold once saw a newly hatched tern chick going out to sea in this way; one of the parents came and caught it by the wing and tried to carry it to the shore in its beak, but had to drop it (615 : 75).

Some authors, including Jung, have seen the young being fed by several different adult birds (539 : 130).

F o o d .— Walter found numerous shiny hairs (or bristles) of *Annelida* (probably *Polynoidae*), and the remains of a small fish in the stomach of one bird. In another he found sand, the remains of molluscs, and a big *Gammarus locusta*. In a third stomach there were four *Hippolyte polaris* and a *Gammarus*

locusta one inch long (169 : 241). Stomachs examined by Trevor-Battye were full of pteropods (203 : 591). Swenander found *Crustacea* and fish (247 : 16), Munsterhjelm also found *Crustacea* and fish, mainly *Gadus saida* (313 : 33). Le Roi found the remains of fish, molluscs and in a few stomachs there were small stones. Mostly, however, the stomachs contained the remains of *Crustacea* (316 : 181). Van Oordt states that the terns feed on *Gammarus* (370 : 157). Montague states that they feed on *Gammarus locusta* during the summer, though the crustacean *Lepidurus* is taken in August when half-grown, and on occasions the birds are seen to catch *Mysidae*. Bertram and Lack saw them skimming chironomid flies from the surface of freshwater lakes on Bjørnøya, where they also took planktonic animals (488 : 296); and in another paper they mention the terns skimming up chironomid larvae and probably *Lepidurus arcticus,* and occasionally taking chironomids in the air (528 : 34). Hartley and Fisher give the following list of food: *Thysanoëssa inermis, Mysis oculata, Euthemisto libellula, Pseudalibrotus littoralis, Gammarus locusta* and *Lepidurus arcticus* (513 : 388).

Løvenskiold saw terns fishing in the river where it leaves Revvatnet in Hornsund, and here they were probably taking the small Arctic Char which were fairly abundant (615 : 74).

No. 64. *ALCA TORDA PICA* L.

The Norwegian Razorbill

The Razorbill is erroneously mentioned by Pennant as an inhabitant of Spitsbergen (24, Vol. I : xc). Parry thought that he found the bird on Waldenøya and on Vesle Tavleøya, but the species he saw must have been *Uria lomvia* (46 : 198).

When Keilhau speaks of Razorbills on Bjørnøya, it is quite obvious that he means Guillemots (48 : 120). This is understandable, however, for in Norwegian both species are called "alke".

Torell also mentions the bird (73 : 63), and Walker names the Razorbill among several other species, which until then had never been found in the area (75 : 67).

Quennerstedt writes: "The Razorbill, *Alca torda,* I did not see, although it is said to occur here" (81 : 26). Heuglin thought that he saw Razorbills in Storfjorden in 1870 (116 : 61). Von Zeppelin thought he saw it on Bjørnøya in 1891 (179 : 58). Nathorst says that Kolthoff saw the bird on Bjørnøya in 1898 (211 : 328). In the same year Römer and Schaudin also thought they saw the species on the island (246 : 137), but le Roi says that they mistook *Uria lomvia* for the Razorbill (316 : 260). In 1899 Swenander saw two Razorbills flying past him at Kapp Malmgren on Bjørnøya, but although he stayed for several weeks on the island, he saw only these two specimens (247 : 42).

It is of course possible that some of the above observations are correct, and it is highly probable that Swenander did see the Razorbills on Bjørnøya in 1900. Nathorst's statement is also correct, because it was Kolthoff who eventually brought positive proof of the existence of the species on Bjørnøya. He

saw at least 4 birds, and of these he shot two, one on 14 June and the other on 17 June, 1898. The birds were a male and a female, but they had not bred, and Kolthoff concluded that they were only visitors to the island (261 : 88, 100).

The first person to find *Alca torda* in Spitsbergen was Bruce, who said that in 1906 he found Razorbills breeding on Fuglehuken on Prins Karls Forland, where there are bird-cliffs for about two miles along the west coast of the island (272 : 150). It is impossible, however, to find out whether or not he brought back eggs or young birds as a proof of his statement.

Le Roi states that Razorbills were found on Bjørnøya on 30 June 1908. One male bird was shot in Sørhamna and another was seen farther north. The shot specimen had big testes and seemed to be in breeding condition (316 : 260).

Mathey-Dupraz shot two birds in Adventfjorden in July, 1906, and he thought that he saw Razorbills in company with Guillemots at the entrance to Magdalenefjorden in 1910 (311 : 49).

Bertram and Lack saw Razorbills among the Guillemots in the colonies at Beinneset on Bjørnøya, and stated that a small number of Razorbills bred there regularly (488 : 298).

Duffey and Sergeant did not see the bird on the island in 1948, but the weather was very bad when they examined the 1932 haunts. However, on 21 August, 1948, they did see two Razorbills 200 miles due south of the island (586 : 561).

Løvenskiold, who stayed for two months on the island during the summer of 1958, saw no Razorbills there (1958, 633).

According to the above records, it is established that Razorbills breed in small numbers on Bjørnøya, and it is highly probable that they breed on Prins Karls Forland.

ALCA IMPENNIS L.

The Great Auk

The Great Auk has never been an arctic bird. It has been said that remains of the species have never been found north of the Arctic Circle, but well-preserved parts of the skeleton have been found by Christiani near Vardø in Norway in latitude 70° 22′ N (349 : 1–4).

In the Svalbard area, however, there is no reason to believe that *Alca impennis* has ever been found.

Martinière says that there are penguins on the island "Voygatt", but the bird he describes is obviously a pelican (10 : 144); and even this of course is absurd, since pelicans do not go so far north.

His statement has, however, led to misunderstandings; for example, certain authors, mentioned by Stenstrup, write that Martinière found *Alca impennis* in the Waigatstrait in Spitsbergen (64 : 35, 68, 94–95). Waigatstrait is an old name for Hinlopenstretet.

Newton has denied the occurrence of the Great Auk in Spitsbergen (78 : 376) and he is supported by le Roi (316 : 261).

No. 65. *PLAUTUS ALLE ALLE* (L.)[1]

The Little Auk

Geographical distribution

The typical race of the Little Auk breeds in N Greenland, Jan Mayen, Grimsey in Iceland, Svalbard and Novaya Zemlya. On Franz Josef Land it is replaced by the race *Plautus alle polaris* (Stenh.) which is bigger than the nominate form. It is possible that this bird also occurs in the extreme east of the Svalbard archipelago, although it has not yet been recorded there.

Occurrence in Svalbard

The species breeds in all districts of the Svalbard are except on Kvitøya and Kong Karls Land. On Kvitøya the bird has been observed only once, on the sea near the coast, but there are many records from Kong Karls Land and it is by no means certain that the bird does not breed there.

There is marked variation in the distribution of the bird in the area. The biggest colonies are found on the west coast of Vestspitsbergen, the colonies in the fjords of this island and in the east of the area being considerably smaller.

First records

On 9 July, 1904, Jonas Poole arrived at Bjørnøya where among an abundance of birds he saw "a small Fowle like a Willocke" (2 : 267). Now a Willock is either a Guillemot or a Razorbill, and the bird referred to by Poole must therefore have been a Little Auk.

Martens saw the bird, which he named Rotges, in the ice west of Spitsbergen on 29 May, 1671. Later he found it breeding in crevices on the mountain-sides. He describes its cry as: "Rottet, tet, tet, tet, tet", and from this call, he says, the bird got its name (12 : 61).

Martin, who visited Spitsbergen during the summer of 1758, saw the Little Auk there (17 : 109). Phipps found them in great abundance on the coasts of Spitsbergen in 1774 (23 : 186). Mandt saw the species in Spitsbergen in 1821 (42 : 4).

Distribution. Sections I–XIV

Section I. Bjørnøya. — The Little Auk breeds in small numbers here and there along the coast of Bjørnøya, but it has also been found breeding inland. Breeding birds are found mainly on the north and east coasts. A few birds breed in the south, but there are no breeding records from the west coast.

Section II. Hornsund. — In the extreme south of the mainland there is a Little Auk colony on Keilhaufjellet. They also breed along the slopes between Lidfjellet and Hohenlohefjellet south of the entrance to Hornsund, and there is a colony at the head of Hornsund. But up to the west side of the glacier

[1] Contour map showing distribution, see backflap. (On the map *Plotus alle*.)

Hansbreen there are no breeding places on the north side of the fjord. From this point breeding places stretch almost continuously up to Werenskioldbreen, north of Hyttevika.

Section III. Bellsund. — On the west coast south of Bellsund there is a colony of Little Auks on a mountain between Dunderbukta and Storvika. In Bellsund the birds breed on the mountain Midterhuken, and they have also bred on nunataks on the SW side of the glacier Finsterwalderbreen in Van Keulenfjorden. They have been observed in Recherchefjorden, in Akselsundet, in different places in Van Mijenfjorden and also in many places in Bellsund.

Section IV. Isfjorden. — In this section the birds have been found breeding on both sides of Grønfjorden, in Colesbukta, Longyeardalen, on Diabasodden, at the entrance to Sassenfjorden, and between this ness and Vindodden almost at the head of the fjord. They breed in De Geerdalen, on Tempelfjellet, on Ekholmfjellet in Billefjorden and on nunataks NE of Petuniabukta at the head of Billefjorden. They also breed in Skansbukta, on Kongressfjellet and at Kapp Wijk in Dicksonfjorden, at Kapp Wærn between this fjord and Ekmanfjorden, and at the head of Ekmanfjorden. There are colonies on the mountains around the bay Trygghamna and in Forlandsundet there is one on the mountain Moefjellet near Sarstangen.

Section V. Prins Karls Land. — Little Auks have been seen in many places around the island, and they breed on the west side of the mountain range Fuglehukfjellet in the north, at Dawespynten and Selvågen, on Methuenfjellet north of Forlandsletta and on Salfjellet in the south.

Section VI. Kongsfjorden. — The species can be seen in Kongsfjorden, in Krossfjorden, at Kapp Mitra and along the coast towards Magdalenefjorden. The birds breed on nunataks on the big glaciers at the head of Kongsfjorden, on Ossian Sarsfjellet, Blomstrandhalvøya and at Kapp Guissez at the entrance to Krossfjorden. Here they breed on the mountain ranges called Christian Michelsenfjella and Fallièresfjella and on Nilsfjellet in Signehamna.

Section VII. NW Spitsbergen. — In no other place in Spitsbergen can so many Little Auks be seen as along the coast from Dei Sju Isfjella to Magdalenefjorden, but the breeding places which must exist on the mountains along this coast have not yet been investigated. The birds breed in great numbers in Magdalenefjorden, and there are also big colonies in Sørgattet, on Danskøya, on Amsterdamøya, at the entrance to Smeerenburgfjorden and on the islands Fuglesangen, Klovningen and Norskøyane. They also breed in Birgerbukta, at Flathuken, in Raudfjorden, on Jermaktangen and on Biskayerhuken. There are also colonies on most of the mountains on the glaciers (nunataks) between Magdalenefjorden and Liefdefjorden. There is also a breeding site at the head of Liefdefjorden, and there are colonies on both sides of the glacier Friedrichbreen at the head of Bockfjorden. Often great flocks of Little Auks can be seen flying in and out of Liefdefjorden.

Section VIII. Wijdefjorden. — During the summer Little Auks can be seen in great numbers all along this fjord, past Mosselbukta and up to Verlegenhuken.

In the inner parts of the fjord there are no big colonies on the west side, but

the birds breed in small parties in many places on the mountains, e. g. on Kapp Petermann, on the west side of Vestfjorden and from Krosspynten to Purpurdalen. There are probably similar small colonies on the west side north of this valley.

On the east side of the fjord there are many colonies on the mountains in the vicinity of Dirksodden and north towards Mosselbukta. Very large colonies are found on both sides of the three glaciers Nord-, Midt- and Sørbreen. Breeding birds have also been found near the mountain Newtontoppen, at 5,000 feet above sea-level and 20 miles from the nearest coast. The Little Auks also breed on the side of Chydeniusbreen south of Lomfjorden, and there are colonies on the mountain range Terrierfjellet east of the head of Billefjorden.

Section IX. Hinlopen. — There do not seem to be very many Little Auks in the strait. The birds have been seen in Sorgfjorden and also in other places, but only a few localities are mentioned. They breed on both sides of Lomfjorden and are also said to breed in single pairs in other places, but these are not specified.

Section X. Nordaustlandet. — The birds breed on Fosterøyane in Hinlopenstretet, in Brennevinsfjorden, and on Chermsideøya, Parryøya and Rossøya. Most records are from the west and NW part of the district, but there is also one record from Karl XII Øyane.

Section XI. Storfjorden. — The species breeds on Ryke Yseøyane, Tusenøyane, Kong Ludvigøyane and in two places on Edgeøya, viz. Negerpynten and Kvalpynten.

There are very few records from this district, but the birds have been seen east of Edgeøya, in Freemansundet, in Tjuvfjorden and in a few other places.

Section XII. Kvitøya. — The only record of Little Auks in the area states that two or three birds were seen near the island.

Section XIII. Kong Karls Land. — The birds have been found on all three islands, and Römer and Schaudin claim that they breed there, but this has never been confirmed by other visitors to the area.

Section XIV. Hopen. — On this island the species breed in great numbers.

Records from the sea around Svalbard

The North. — In the summer of 1827 Parry went north towards the Pole from Sorgfjorden. He reached a latitude of about 82° 45′ and travelled for the greater part of the way along the 20° east meridian. On 26 June in latitude 81° 45′ N, he saw several Little Auks in the channels between the ice-floes, while on 1 July several "rotges" were seen in waterholes. A few birds were also seen on 3 July, and also on the 4th and the 5th. On 24 July in latitude 82° 45′ N, they heard one Little Auk. On 8 August, on the return journey, they saw not less than 200 birds, in latitude 81° 40′ N, "a flock of these little birds occurring in every hole of water". On 11 August in latitude 81° 34′ N they also saw large flocks feeding on great swarms of *Argonauta arctica* (46 : 62–197).

Chydenius relates that he saw big flocks of Little Auks in the pack-ice north of Amsterdamøya on 30 May, 1861 (89 : 66).

According to Collett and Nansen, Little Auks were seen in the summer of 1895 between 21 June and 7 July, all in the latitudes 84° 30′ and 84° 48′ N. During the summer of 1896, they appeared in great numbers in the ice north of Spitsbergen, and from the middle of June to the middle of July, during a period in which *Fram* remained around latitude 83° N, Little Auks were found in the channels every day, and at least 200 of them were shot for the table. On 23 June, 29 were shot.

In latitude 83° 56′ N, the first Little Auk of the year appeared on 28 May, 1896. After this they were numerous on clear days although during fog they were less plentiful. Of the birds shot at the beginning of July 1896, and subsequently examined, 25 per cent were females and 75 per cent males. As the ship approached Spitsbergen, the numbers of Little Auks increased. On 6 August, 1896, in latitude 81° 34′ N, the channel to the west of *Fram* was seething with Little Auks; some were sitting on the ice and many were asleep on the water. On 12 August also they saw Little Auks, mostly young birds, in countless numbers (237 : 53).

On 25 July, 1911, Mathey-Dupraz saw Little Auks fishing among the ice-floes in latitude 80° 10′ N, somewhere north of Amsterdamøya (333 : 107).

Lönnberg relates that on 18 July, 1897, Andrée saw Little Auks in latitude 82° 50′ N, and on the same day another bird was seen flying NNW. On 23 July they saw four birds 12′ farther south. Another bird was seen on 24 July, and on 8 August they recorded two in latitude 82° N. A few birds were seen on 17 August and a young bird of the year was sighted on the 24th. In the beginning of September, in latitude 80° 45′ N, the birds were fishing in channels between the ice-floes (473 : 141, 145). See also Andrée (461 : 270–445).

T h e W e s t. — Chydenius saw great numbers of Little Auks in the drift-ice on 26 May, 1861, at 76° 9′ N, 11° 49′ E (89 : 42).

Fries and Nyström saw great numbers of Little Auks on 23 September, 1868, at 78° 26′ N, 2° 17′ W, and noted that there were numerous Pteropods and Copepods close to the surface (109 : 161).

Kolthoff relates that Little Auks from the west coast of Spitsbergen flew 200 km west to get food for their young, and he adds that as long as there was open water between the ice-floes, the birds were found fishing there (251 : 99).

Orleans saw great numbers of Little Auks on 10 June, 1905, at 79° 41′ N, 6° 31′ E. Several birds were also seen on 8 July at 80° 5′ N, 8° 34′ E, on the 9th at 80° 17′ N, 5° 33′ E, on the 10th at 80° 5′ N, 2° 52′ E, while from 11th to 14th July, between the latitudes 79° 55′ and 78° 48′ N, and the longitudes 1° 52′ and 0° 4′ E, several birds were seen daily. More Little Auks were sighted on the 18th at 76° 55′ N, 3° 30′, on the 21st at 76° 45′ N, 7° 30′ W (one bird only) and on the 27th at 76° 37′ N, 18° 22′ W two birds (277 : 332).

T h e S o u t h. — Martin first saw the Little Auk on 6 May, 1758, in latitude 73° 30′ N, and as he came close to Spitsbergen, he saw the bird in thousands (17 : 109).

Malmgren saw the species in latitude 73° N, on 16 June, 1864, but it was only in latitude 75°–76° N that they became common (92 : 408).

Quennerstedt went in a sealer in 1863 to the ice between Jan Mayen and Spitsbergen. The ship stayed in the pack-ice between latitude 70°–74° N, and the longitudes 7°30′–5°E, from 9 March to 30 May. Here he saw single birds diving among the ice and also big flocks of birds flying towards the open water (106 : 31).

Torell saw big flocks of Little Auks on 20 May, 1861, at 76° 9′ N, 11° 49′ E (112 : 32).

Cocks saw nine specimens on 27 September, 1882, in latitude 75° 30′ N (151 : 487).

Munsterhjelm first saw the Little Auk on 4 May, 1910, in 74° 37′ N, 12° 24′ E (313 : 40).

Biological

M i g r a t i o n. — As soon as the young birds are fully fledged, they leave the colony, usually with their parents. Often several families will leave together in more or less close formation.

The young birds begin to leave the colonies as early as the first half of August, and in a colony which can be studied at close quarters it is possible to see that before the middle of the month, in a normal year, the number of birds has decreased.

In a large gathering of many thousands of birds, one may find all stages of development, both of eggs and of young birds, at the same time. This means that instead of leaving the colony simultaneously, the birds disappear only gradually, and for this reason there may still be a few birds left at the end of August, or sometimes even later.

Løvenskiold found that young birds which left the colony with their parents, apparently did not attempt to return, whereas young birds which started alone did sometimes try to go back (615 : 124).

As soon as the young birds have left for the sea, they presumably begin to migrate, or, more correctly perhaps, to disperse over the ocean. As the young Little Auks are well able to fly when they leave the nest, the migration in this species is probably undertaken partly on the wing, and in this respect, therefore, they differ from the Guillemots which cover the first stage of their migration on the water.

Not all of these birds disappear completely from the Spitsbergen seas. As long as the sea and the fjords remain unfrozen, some Little Auks may be found along the coasts as late as October and even in December. At this time of the year, however, just as in spring if they have arrived too early, they may be surprised by cold weather and freeze to death.

Nordenskiöld found great numbers of Little Auks dead on the ice at the entrance to Hinlopenstretet on 27 April, 1873 (138 : 59), and Kristoffersen found a single specimen lying dead on the snow on 27 February, 1930 (472 : 251).

The trapper Hilmar Nøis found ten dead Little Auks on the beach in Sassen-

fjorden on 20 December, 1938, and he suggested that the disappearance of plankton from the fjord had caused the birds to starve to death. On 1 January, 1939, and subsequently, he again found many dead birds, and he observed that these deaths tended to occur when an on-shore wind was blowing (1938/39, 642 a).

As the majority of the Little Auks leave Spitsbergen relatively early, there are quite a number of records on the autumn migration. But in spring the birds sometimes arrive very early, and as few scientific expeditions have wintered in the area and even fewer have been interested in birds, we have not many records of their arrival. Were it not for the trappers who noted down in their diaries the arrival of different kinds of birds, we would have known very little about the spring migration of Little Auks.

Some of the birds found as early as February and the beginning of March may, of course, have stayed in the area during the winter, and so it is difficult to say whether these birds had really been on migration, or whether they had just moved inshore from adjacent waters. The dates relating to the arrival in spring are as follows:

Dates in February	20	24	27											
No. of observations	1	1	1											
Dates in March	5	14	16	17	27	28	30							
No. of observations	1	1	1	1	1	1	1							
Dates in April	1	2	3	4	5	7	8	9	10	11	13	19	25	28
No. of observations	1	2	2	2	2	2	1	1	1	1	1	1	1	1
Dates in May	1	12	17											
No. of observations	1	1	1											

It seems therefore that the majority of the Little Auks arrive in the Svalbard area in the first week of April, if conditions are normal. If the coasts are ice-free they arrive early and sometimes even winter along the coast. On the other hand, if the sea is covered with ice which takes a long time to break up, the birds will stay away until the middle of May.

In the autumn the Little Auks will usually have their first young on the sea in the first week of August, and probably the migration will start then. The dates for the autumn migration are as follows:

Dates in August	6	9	10	11	13	14	15	17	18	19	23	27	28	30	31
No. of observations	2	2	1	2	1	1	1	2	2	5	1	1	1	1	1
Dates in September	1	3	4	8	9	10	22	23	25	27					
No. of observations	2	1	1	1	1	1	2	1	1	2					

One bird has been seen as late as 13 October. Birds which must be put down as wintering in the area have been found on December 4th, 10th, 12th, 20th, 23rd and 29th, and on January 1st, 2nd and 16th.

It seems therefore that in a normal year the autumn migration will start early and that the majority of the birds will disappear from the Spitsbergen waters during the first three weeks of August, while the birds whose young are still not ready to go, will probably not begin their migration until the end of August or in September.

The earliest date for the spring migration, 20 February in Hornsund in 1924, seems to be a record of a genuine migratory movement. Kristoffersen writes: "Flocks of several hundred birds arrived at short intervals, flying high and fast. They settled on their breeding places in thousands, but the migration lasted into May and then flocks thousands strong flew north over land" (432 : 189).

The birds seen by Wynne-Edwards along the east coast of North America in 1923 and by other authors mentioned in his paper, were probably Little Auks from Greenland and America (512 : 332). "On the east side of the Atlantic," he says on p. 334, "they seem to avoid the British Isles". He is probably right when he says "Probably the majority winter north of the 60th parallel on the European side".

This is a question which can be settled only with the help of ringing on a large scale, and it is to be hoped that such work can be done in the coming years.

G e n e r a l h a b i t s. — Little Auk colonies vary considerably in size, and they can consist of anything from 12–15 pairs and upwards to several hundred thousands. In the big colonies which are usually situated on the mountain-sides, or less frequently on screes at the foot of the mountains, the birds can be seen in fine weather, sitting on stones and boulders in enormous numbers, whereas in bad weather the places appear relatively deserted.

In colonies such as this there is usually great activity, and flocks of birds fly constantly back and forth, some on their way back from the sea, others leaving to search for food, and many simply circling around.

Above such colonies and also in amongst them there are always several pairs of the big Glaucous Gulls nesting. These gulls prey upon the Little Auks and catch them whenever they have the opportunity. Probably it is rare for a gull to take a healthy adult bird unless it is caught unawares, and personally I have never seen a Glaucous Gull take an adult Little Auk. Nevertheless when a Glaucous Gull comes gliding some twenty feet above the scree, every bird sitting in its path will fly up, circle for a while and settle again. As there are enormous numbers of them, the birds always fly up in flocks, never singly. But the grown birds have an enemy far more dangerous than the big gulls, namely the Arctic Fox. Unless one has seen the piles of dead Little Auks outside a fox earth, the casualties inflicted on the Little Auks by foxes are difficult to imagine.

Thus when a fox approaches a colony, every bird sitting outside the nest entrances will take to the wing, and enormous flocks of birds will continue to circle about for a long time, even after the fox has disappeared.

As soon as the young birds have left the nest, they are liable to be preyed upon, not only by foxes, but also by Glaucous Gulls and Arctic Skuas. Glaucous Gulls are by far the most destructive; vast numbers of them assemble round the colonies when the young birds are beginning to go out to sea. Young birds which are unsuccessful in their attempt to reach the sea are of course preyed upon by all three animals.

The young little Auks usually leave the colony with their parents and several

families often leave together, forming small dense flocks. While it takes time for the human eye to pick out the young bird in these flocks, the Glaucous Gull is never in doubt and will often single out a young bird in a flock and pursue it mercilessly. However, if the Little Auk can reach the sea it can save itself by diving.

Løvenskiold reports that the young birds which leave the colonies alone are almost always caught as soon as they leave the scree, and very few of them are able to save themselves (615 : 123).

The Little Auk seems to be active throughout the 24-hour period. Marshall could detect no general period of rest in the colonies he visited (533 : 249). In the vast population of a colony, he never saw any group of resting birds, but presumably great numbers of birds may have been resting singly without his being able to see them.

In Spitsbergen there sometimes occurs a phenomenon known as "Red snow". This is mentioned for the first time from the Svalbard area by Lamont who remarks: ". . . it seemed to me that in this case it was attributed to nothing but the droppings of the millions of Little Auks (*Alca alle*) which fed almost entirely on shrimps and consequently void a reddish substance" (74 : 432).

Chydenius saw the phenomenon on Amsterdamøya on about 10 September 1861, and he states that it was caused by the alga *Haematococcus* (*Sphaerella*) *nivalis,* but he adds that the colouring by this alga should not be confused with a similar colouring of the snow caused by dust containing iron, or by the almost blood-red droppings of the Little Auk (89 : 461).

Summerhayes and Elton collected a sample of "red snow" on Bjørnøya in 1921, but it turned out to consist of the remains of marine *Crustacea,* and the authors say that although *Sphaerella* (*Haematococcus*) *nivalis* was present in the area, there was no conclusive evidence that it was the alga which caused the red colouring (397 : 231).

I have seen "red snow" in many places myself during the eight summers I have spent in Svalbard, but in every instance it was attributed to the droppings of the Little Auk.

At least when they are breeding on mountains on the big glaciers, the Little Auks do not always occupy the same breeding places in consecutive years. In 1950, Mr. Liestøl, who is a glaciologist at Norsk Polarinstitutt, saw numbers of Little Auks breeding on the mountain Erdmannberget on the SW side of the glacier Finsterwalderbreen in Van Keulenfjorden. But in 1952 and 1954 there were no Little Auks present on this mountain, while on 27 July, 1956, three pairs were observed on the old breeding place, and in 1958 several birds were seen flying in this locality (1959, 653).

B r e e d i n g. — The Little Auk breeds along the whole of the west coast of Spitsbergen from Sørkapp Land right up to Sjuøyane. It also breeds on the north coast and in the big northern fjords, e. g. Liefdefjorden, Wijdefjorden and Hinlopenstretet. There are also breeding places on Nordaustlandet, on both sides of Storfjorden, on Hopen, and on Bjørnøya, but the Little Auk does not breed on Kvitøya and there is no reliable record of breeding from Kong

Karls Land, but it is not impossible that the bird may eventually be found to breed there.

In some instances only a few pairs breed together and this is probably because in these cases there are only a few suitable nesting sites available.

The colonies vary very much in size and the largest ones may include hundreds of thousands of individuals.

Nevertheless, earlier authors have greatly exaggerated the numbers of birds in the largest colonies (e. g. those on both sides of Hornsund, and from Kapp Mitra at the entrance to Kongsfjorden and up to Magdalenefjorden). Werenskiold says that in the Hornsund area the Little Auk breeds over an area 20 km long and 1 km wide, i. e. over an area of 20 million square metres. Approximately half of this area he calculates to be taken up by valleys etc., and so allowing 1 square metre per bird he arrives at a figure of 10 million Little Auks in this area alone (398 : 14). The fact is, however, that there are very few, if any places where the breadth of the breeding area is as much as one km, and in most places it is not as much as 2 to 3 hundred metres wide at the most. Another factor to be taken into account is that the screes where the birds live are by no means unbroken, and in many places the ground is unsuitable for breeding. To be on the safe side, one should not put the number of Little Auks in this area at more than one to two million. Jung refers to A. Th. von Middendorf's Sibirische Reisebeschreibung, where Messrs. Franklin and Buchan are quoted as having seen more than four million [sic!] Little Auks on the wing simultaneously in Magdalenefjorden (539 : 135).

The nests of the Little Auks are found in crevices in solid rock often high up near the summit of the mountain, but a more frequent breeding place is on the screes beneath the perpendicular rock-walls, and in such places the biggest colonies are found. North of Hornsund around the base of the mountains Rotjesfjellet, Torbjørnsenfjellet and Gullichsenfjellet, there are many places in which the screes go down almost to the water's edge and in these areas there are vast numbers of breeding birds. Thus colonies may be found from a few feet above the water's edge up to a height of 1,800 feet and more.

The eggs are difficult to get at because in rocky areas they are laid deep inside the crevices, and they are also very well hidden in the screes, where they can only be reached by prolonged digging, during which there is constant danger that stones may fall down and smash them.

When the Little Auks arrive in spring, they occupy their breeding places very quickly, probably as soon as the snow has melted on the mountain-sides. Most of the places are accessible in May, but egg-laying does not normally begin before the middle of June.

The Little Auk lays only one egg, but since it has two brood-patches, there is a theoretical possibility that occasionally a clutch of two eggs may occur. In fact Collingwood states that on one occasion on his visit to Spitsbergen in the summer of 1905, he did find two eggs in the nest of one Little Auk. About this find he says: "Now as most of the birds had young at the time it seems extremely improbable that these eggs should have been laid by separate females, more especially as they were perfectly fresh. Another nesting-

Table 35

Egg-laying

Date	No. of nests	Condition	Place	Authors
14 June 1898	no eggs		Bjørnøya	Römer und Schaudin (245: 79)
18 » 1858	2	fresh	Hornsund	Nordenskiöld (145: 105)
19 » 1900	1	fresh	Isfjorden	Kolthoff (250: 49)
19 » 1930	several	sl. incub.	Isfjorden	Dalgety and coll. (470: 254)
21 » 1908	several	fresh	Magdalenefjorden	Le Roi (316: 258)
24 » 1924	1	fresh	Hornsund	Kristoffersen (432: 189)
25 » 1931	12		Isfjorden	Tomkinson (485: 84)
26 » 1922	several		Isfjorden	Congreve (403: 19)
26 » 1931	several		Magdalenefjorden	Tomkinson (485: 84)
27 » 1922	10		Isfjorden	Congreve (403: 19)
30 » 1907	3	fresh	Isfjorden	Le Roi (316: 258)
3 July 1907	7	fresh	Magdalenefjorden	Le Roi (316: 258)
4 » 1900	several	well incub.	Danskøya	Kolthoff (261: 86)
5 » 1907	3	fresh	Klovningen	Le Roi (316: 258)
5 » 1908	several	fresh	?	Le Roi (316: 258)
9 » 1864	several	incub.	Isfjorden	Newton (86: 495)
11 » 1952	4	well incub.	Hornsund	Løvenskiold (615: 120)
12 » 1952	3	well incub.	Hornsund	Løvenskiold (615: 120)
14 » 1907	1	well incub.	Bjørnøya	Koenig (286: 132)
21 » 1956	several	pt. of hatch	Krossfjorden	Løvenskiold (1956, 633)
1 Aug. 1864	several	pt. of hatch	Hornsund	Malmgren (92: 408)
19 » 1898	1		Ryke Yseøyane	Römer und Schaudin (245: 79)

Table 36

Young birds

Date	No. of young	Condition	Place	Authors
13 July 1921	several		Isfjorden	Van Oordt (370: 164)
19 » 1952	3	8 days old	Hornsund	Løvenskiold (615: 121)
20 » 1952	several	just hatched	Hornsund	Løvenskiold (615: 121)
21 » 1956	several	just hatched	Krossfjorden	Løvenskiold (1956, 633)
22 » 1864	several	2 days old	Isfjorden	Newton (96: 213)
25 » 1910	several		Amsterdamøya	Mathey–Dupraz (311: 49)
27 » 1952	4	alm. f. fled.[1]	Hornsund	Løvenskiold (615: 121)
1 Aug. 1864	several	diff. stages	Hornsund	Malmgren (92: 408)
1 » 1952	1	outs. nest	Hornsund	Løvenskiold (615: 121)
2 » 1950	2	alm. f. fled.[1]	Hornsund	Løvenskiold (615: 121)
9 » 1948	1	able to fly	Isfjorden	Løvenskiold (615: 121)

[1] almost fully fledged

hole contained two young apparently of the same age." (265 : 358) Nordenskiöld states that he found two eggs together on 18 June, 1858, on Rotjesfjellet in Hornsund. These eggs were placed on a piece of ice among stones (145 : 105).

Most of the young are hatched about the middle of July and after the first week of August they begin to leave the colonies. The chicks are fed by both parents until shortly before the young birds leave for the sea, when they apparently stop feeding them. During this period one can hear all day and all over the colony the call "tick, tick, tick, tick. . .", which is possibly the hunger cry of the young birds. Løvenskiold says: "On August the 5th there was a marked difference in the behaviour of the birds. They did not keep so much to the smaller stones on the slopes, but sat in great numbers on the top of the screes. Still a lot of them were bringing food, but not so many as earlier." Hunger, therefore, is probably a factor of great importance in causing the young to leave the colony. By this time, of course, they are fledged and having exercised their wings for a long time, they are well able to fly. After they have left the colony it seems that they do not return (615 : 123).

No eggs have been found in the Svalbard area before 15 June. Fresh eggs have been found between 18 June and 5 July, and by the second week of July most of the eggs will probably be on the point of hatching. The earliest date on which young birds have been found is 13 July. By about the middle of July, most of the young are probably hatched, and in the first week of August the first young birds are beginning to leave the colonies. Birds from belated clutches may stay as late as 26 August.

F o o d. — Martin, who visited Spitsbergen in 1758, and all later authors agree that the Little Auk feeds on *Crustacea* (17 : 113). Römer and Schaudin state that they live on small planktonic animals in the littoral zone, and on *Amphipoda* (mainly *Gammarus*) (245 : 79). Kolthoff agrees that they live on *Amphipoda* and he also mentions the sack-like pouch under the tongue where the birds hold the food for their young (261 : 86). Mathey-Dupraz records that the stomachs of all the specimens killed at Adventpynten on 20 July, 1910, were full of cods' roe and young fish, some of which were protruding from their mouths (311 : 49). In another paper he lists the animals he found as follows: *Euphausidacea, Mysis, Parathemista oblivia* and *Crangon borealis* (333 : 107).

Glen states that *Thysanoëssa* was the basic food of the Little Auks in Adolfbukta in Billefjorden during the summer of 1933 (508 : 311). Duffey and Sergeant analysed the contents of two stomachs and found: copepods, hyperid amphipods, Zoëae and other larvae from plankton (586 : 562). Hartley and Fisher found in 1933 that the food of the Little Auks in Billefjorden consisted of the following crustaceans: *Thysanoëssa inermis, Mysis oculata* and *Euthemisto libellula.* Fish: *Leptoclinus maculatus* and *Boreogadus saida* (513 : 388).

Løvenskiold shot 9 specimens near Krosspynten in Wijdefjorden on 6 August, 1954. In the pouch under the throat they had *Mysis* and a copepod *(Calanus* sp.) (1954, 633).

URIA AALGE AALGE (Pontopp.)

The Northern Guillemot

This species is mentioned a few times in the ornithological literature of Spitsbergen as having been found in the Svalbard area, but there is absolutely no proof of this.

The northern race of this species, *Uria aalge hyperborea* Salom., which breeds in great numbers on Bjørnøya, is said to have occurred in Spitsbergen at least in two instances, but these records are, in my opinion, a little doubtful. Since it is by no means certain that this northern form has been found in the Spitsbergen waters, it seems quite unthinkable that the far more southern race should be found there.

No. 66. *URIA AALGE HYPERBOREA* Salom.

The Bear Island Guillemot

Geographical distribution

Under the name *Colymbus troille,* the species is mentioned by Linnaeus in his *Fauna Svecica* (19 : 52). Here he quotes Martens, who saw Brünnich's Guillemot in Spitsbergen and named it "Lumbe" (12 : 57). Linnaeus also refers to Anton Rolandson Martin, who kept a diary on his voyage to Spitsbergen in 1758. Martin describes in his diary a Brünnich's Guillemot which he obtained in Spitsbergen (17 : 133), and it is on this information that Linnaeus bases the description of *Colymbus troille* in his *Fauna Svecica.*

Now this species *Uria troille* = *Uria aalge* does not exist in Spitsbergen, where only *Uria lomvia* has been found, but the name *Uria troille* persisted until Jourdain (*British Birds* XVI : 322) saw Martin's diary and changed the name to *Uria aalge* Pontoppidan.

In a revision of the species, Salomonsen introduces the bird as a new race under the name of *Uria aalge hyperborea* subsp. nov. (484 : 130) and (562 : 50). See also Hartert (Ergänzungsband 1938, 260 : 504).

The breeding range of this Guillemot extends from Tromsø northwards through Norway and up to Bjørnøya, the Murman Coast and Novaya Zemlya. In Norway the nominate form *Uria aalge aalge* Pontopp. is found from Tromsø southwards to Bergen.

Sergeant writes about the Guillemots both in the Pacific and the Atlantic oceans, and says: "It may be noted that *aalge* in both seas breeds north roughly to the limit of permanently open water, *lomvia* to the limit of water open in summer" (598 : 278).

In all the races of *Uria aalge,* there occurs a "bridled" mutant which in earlier days was supposed to be a distinct species (*Uria ringvia* Brünn.). This variety seems to reach its highest percentage in the form *hyperborea,* with more than 50 % of bridled individuals on Bjørnøya. Southern and Reeve have found that the percentage of bridled birds increases from south to north and, to a lesser degree, from east to west (550 : 261).

Before *Uria lomvia* and *Uria aalge* were distinguished there were several records of *Uria troile,* i. e. *Uria aalge* from Spitsbergen. For these records see: Phipps (23 : 187), Pennant (24 : 516), Scoresby (40 : 532), Swainson and Richardson (49 : 477), White (63 : 154), Walker (75 : 67) and Schlegel and Hoeck (148 : 3). Orleans saw Guillemots on the ocean in the vicinity of Bjørnøya on 6 and 7 June, 1905, and from then almost every day along the west and north coasts of Spitsbergen until he came to Norskøyane on 16 June. Later, on 26 June, he saw them at the rim of the pack-ice north of Verlegenhuken (277 : 333). He consistently names the birds he observed *Uria troille,* and those seen on 6 and 7 June may have been correctly identified, but those seen afterwards along the coasts of Spitsbergen would not have been the same species.

Cocks records that a Mr. Dreyer had told him that he had shot a common "Alke" (Guillemot) in Spitsbergen in 1881 (153 : 17), but there is no proof of this.

Oustalet states that the Duke of Monaco obtained a specimen on the island Barentsøya on 4 August, 1898 (213 : 305), and this is perhaps the same specimen as that seen by Schalow at the World Exhibition in Paris, 1900 (271 : 126). Since that time, however, the Northern Guillemot has never been found by any other ornithologist north of Bjørnøya, and there is of course the possibility that the names Bjørnøya and Barentsøya (or as they were written at that time, Bjørnø and Barentsø) may have been changed.

Occurrence on Bjørnøya

Malmgren saw great numbers of the Bear Island race on 18 and 19 June, 1864 (92 : 404).

Holmgren saw the race on Bjørnøya in 1868 (100 : 1020). Anderson mentions it as breeding on the island (234 : 445). Nathorst saw the race on the southern part of the island on 17 June, 1898 (243 : 48). Swenander saw the Bear Island Guillemot in almost all the Guillemot colonies on Bjørnøya in 1899 (247 : 35).

Kolthoff reported their presence on Bjørnøya on 13 June, 1898. The eggs were then just about to hatch and a few young were also obtained. The majority of the birds were seen on the southern part of the island. Of about a hundred Guillemots shot in one day in this part of the island, about 90 % were *Uria aalge hyperborea,* the rest *Uria lomvia* (261 : 79).

Le Roi records that Koenig visited the bird-cliffs in the south part of the island on 17 and 20 June, 1907, and later on 16 July. On the first two dates the eggs he found were quite fresh or perhaps incubated for a day or two, but on 16 July the young were hatched in the whole colony (316 : 250).

Jourdain found the Bear Island Guillemot breeding in great numbers on the island in 1921 (381 : 176). Summerhayes and Elton saw great numbers of breeding Guillemots there in 1921 (397 : 218). Congreve saw the birds on the sea close to the island on 20 June, 1922. Bertram and Lack found the race breeding in 1932 (488 : 298) and (528 : 46). Salomonsen states that this race breeds on Bjørnøya (562 : 51). Duffey and Sergeant found them breeding

on the island in 1948 (586 : 561). Longstaff records in 1951 that the Bear Island Guillemot breeds on the island (597 : 241).

Løvenskiold found the race breeding on the ledges on the north coast together with *Uria lomvia*. The Bear Island Guillemot was in a majority and about 45 % of the individuals were bridled (1958, 633).

This Guillemot resembles Brünnich's Guillemot closely, and not only do they seem to have the same habits, but on Bjørnøya they also breed on the same ledges.

The breeding habits etc. of the Bear Island Guillemot are therefore dealt with below, under *Uria lomvia*.

No. 67. *URIA LOMVIA LOMVIA* (L.)[1]

Brünnich's Guillemot

Geographical distribution

In Europe the species breeds in Iceland, Jan Mayen, the Murman Coast, Bjørnøya, Spitsbergen, Novaya Zemlya and Franz Josef Land. In Siberia it is found at Cape Chelyuskin (Taimyr Peninsula) and in North America in the eastern arctic islands, Hudson Strait, Labrador and North Greenland. In the Bering Sea and in the adjacent part of the Arctic Ocean it is replaced by *U. l. arra* (Pallas).

According to Salomonsen the birds of Franz Josef Land should be separated as *U. l. arroides* Portenko. This subspecies may prove to be distinct, but it seems unlikely. The East Siberian birds have been separated as *U. l. elonorae,* but here again further investigation is needed to establish the validity of the subspecific distinction (562 : 56, 59).

Wynne-Edwards says that *Uria lomvia* is rarely met with in the central part of the Atlantic (512 : 332).

In winter-time it extends southwards as far as Norway, occasionally to the Færoe Islands, W Sweden, W Germany, Holland and France. See also under *U. aalge hyperborea*.

Apart from the question of food, one of the reasons why these birds are more numerous in the west of Spitsbergen than in the east may be that in the east the sea is covered with ice for a far longer period in the summer than in the west.

Occurrence in Svalbard

The bird has been recorded from all parts of the Svalbard area except Kvitøya, and it breeds in all districts except Kvitøya, Wijdefjorden and Kong Karls Land.

Birds in aberrant plumage

Feilden visited Bjørnøya on 30 June, 1894, and saw a pure white specimen about 20 yards from the ship (189 : 83).

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[1] Contour map showing distribution, see backflap.

First records

Poole, on 8 July, when his ship was about 60 nautical miles SE of Bjørnøya, reported that: "at eight of the cloke at Night we saw great flockes of Seafowles, which we call Willockes: some of these Fowles had each of them a small Fish in their bills, and flew toward the North-west by North. The other without Fish, some of them flew contrarie to the former, and some sate in the Sea very neere our Ship." On 9 July they visited Bjørnøya where they shot an abundance of Guillemots (2 : 265).

Hudson saw, when his ship was in Storfjorden in 1607, "many Birds with blacke backes and white bellies in form much like a Ducke". These birds must have been Guillemots (3 : 297).

Poole saw a great number of birds, including Guillemots, around his ship on 15 May, 1610, and he supposed that they could not be far from land. This must have been somewhere outside Hornsund, where they arrived later in the day (4 : 4). Also in 1611 Poole mentions the abundance of Guillemots in Spitsbergen (5 : 41).

Baffin relates that they shot a great number of these birds on 21 June, 1613, when they were staying with the ship in "Sir Thomas Smyth's Baye". According to the description this must have been the northern part of Forlandsundet, and this is all the more probable since they could then have observed the great colonies of Guillemots on Fuglehuken fairly closely (6 : 62).

Gerritszoon van Assum, in his "Histoire du pays nommé Spitsberghe", printed in 1613, says that there are two kinds of diving birds (Plongeons, Papegays ou Lommes) in this country. One of them is the Puffin and the other must be the Guillemot (7 : 19).

Fotherby mentions in 1622 that Guillemots are found in Spitsbergen (8 : 33).

Pellham relates how eight Englishmen who were accidently left in Spitsbergen in 1630, wintered in Bellsund, and caught Guillemots there when the birds returned in spring. On 24 May, 1631, they collected 30 Guillemot eggs (9 : 280).

Martens saw and described the species in Spitsbergen. He obtained a specimen in Magdalenefjorden on 25 July, 1671 (12 : 57).

Martin describes the Guillemot in Spitsbergen as a new species of *Colymbus,* but he refers to the specimen obtained by Martens. He adds, however, that the bird is described in the new edition of Linnaeus's *Fauna Svecica* under the name of *Colymbus troille* (17 : 133). Phipps records that the Guillemot (*Colymbus troille*) is found on the coasts of Spitsbergen (23 : 187). Pennant mentions the bird as breeding in Spitsbergen (24 Vol. I : xc, Vol. II : 516). Temminck states that the species is found in Spitsbergen (41 Vol. II : 925). Mandt saw the bird in Spitsbergen in 1821 (42 : 4).

Records without distinct locality

Gray states that the collections of the British Museum (Nat. Hist.) include a specimen from Spitsbergen presented by the Admiralty (58 : 156).

Gaimard gives the first illustration of the bird, based on a specimen obtained by Professor Sundevall in Bellsund in 1838 (59).

Quennerstedt records that he obtained a number of Guillemots in Spitsbergen in 1858 (81 : 26, 27).

Newton mentions that he saw the Guillemot, which he names *Uria arra,* in Spitsbergen in 1864 (86 : 495).

Heuglin found great numbers on the west and south coasts, but only a few single birds in the east (116 : 60).

Salvadori states that four specimens from Spitsbergen are included in the collections of the Museum in Torino (252 : 4).

Cott mentions that the eggs of Guillemots in the Svalbard area are taken for commercial purposes (609 : 425).

Distribution. Sections I–XIV

Section I. Bjørnøya. — On Bjørnøya the species breeds in enormous numbers, and almost always in company with the race *Uria aalge hyperborea.*

On the east side of the island there is a colony on the northern slopes of Miseryfjellet. On the NE coast there are two stacks, Engelske Staur and Måkestauren, each of them with a colony. On the north coast there are also two colonies, one of which is at the ness Taggen, where the birds also breed on a stack of the same name just outside the ness. The second colony is a little farther west, on Flisa.

On the west side there is a fairly big colony at Kapp Ruth. These colonies, however, are quite insignificant compared to those in the south of the island From Sørhamna on the SE side, past Kapp Malmgren, Kapp Kolthoff, past the island Stappen, the south point, and along Fuglefjellet and Hambergfjellet up to Glupen, the Guillemots breed in enormous numbers.

In the middle of this area, on the SE side, the mountain Fuglefjellet rises to 410 m above sea-level with Hambergfjellet somewhat higher (440 m). Here there is a section about 2 km long where the mountain-side falls almost perpendicularly down into the sea, and over its whole area this huge cliff is crowded with birds, including a high percentage of Guillemots. They breed here in unbelievable numbers, and the bird-cliff itself is possibly the biggest in the northern hemisphere.

Section II. Hornsund. — Guillemots can be seen all along the west coast of this section, but the greatest numbers have been found in Hornsund.

Three colonies with breeding birds are known: a small one on Keilhaufjellet in the extreme south, a very big one on Sofiakammen on the north side of Hornsund, and a third on Krykkjestupet on the south side of the fjord opposite Sofiakammen.

Section III. Bellsund. — On the sea outside Bellsund great numbers of Guillemots have been observed. In Bellsund itself there are regularly quite a number to be seen, but in Van Mijenfjorden they are mostly found in small numbers in the western part while towards the head of the fjord they become scarce. In this district there is only one known breeding colony on the mountain Midterhuken between Van Keulenfjorden and Van Mijenfjorden. Probably, however, the birds also breed on the mountain Ingeborgfjellet on the other side of Van Mijenfjorden, north of Akseløya.

Section IV. Isfjorden. — Guillemots have been seen in numbers on the sea outside the entrance to this fjord. In Isfjorden itself and in its various branches they can be seen in varying numbers, but unless there is a colony with breeding birds close at hand, they do not penetrate to the head of the various small fjords.

The species breeds on the mountains between Colesbukta and Adventfjorden, on Diabasodden at the entrance to Sassenfjorden, and at the head of this fjord on a mountain at the point where Tempelfjorden branches off. In 1957 immense numbers were breeding on Tempelfjellet. In Billefjorden they breed near Phantomodden and in Skansbukta. In Dicksonfjorden there is a colony on the mountain Kongressfjellet not far from Kapp Wijk. The biggest colony in this district is on Alkhornet on the north side of Isfjorden, not far from the entrance.

Section V. Prins Karls Forland. — Guillemots have been observed on the sea all around the island. The greatest numbers have been seen around the north point, where there is a very big colony. This colony on Fuglehuken is the only one on Forlandet.

Section VI. Kongsfjorden. — Guillemots can be seen on the sea both in Kongsfjorden and in Krossfjorden and also outside Kapp Mitra. They are often very numerous, especially near the breeding places.

One of the colonies is on the nunatak Nilsenfjellet on the big glacier Kongsvegen, SE of Kongsfjorden, and there is another on the mountain Ossian Sarsfjellet at the head of Kongsfjorden. They are supposed to have bred formerly on the island Observatorieholmen (one of Lovénøyane), but there are no Guillemots breeding there today.

In Krossfjorden there is one colony situated close to the glacier Fjortende Julibreen, one on Christian Michelsenfjella in Møllerfjorden, one on the south point of Kong Haakons Halvøy and one on Nilsfjellet in Signehamna.

Section VII. NW Spitsbergen. — Guillemots have been seen almost everywhere on the sea in this district, but in Liefdefjorden they are found almost exclusively at the entrance and a little farther in.

They breed in Magdalenefjorden, in Kobbefjorden on Danskøya (on the south side of this bay), on Amsterdamøya, Fugløya, Ytre Norskøya, and on Flathuken at the entrance and on the west side of Raudfjorden. East of this place there are no colonies before Hinlopenstretet.

Section VIII. Wijdefjorden. — In this fjord there do not seem by any breeding places, but Guillemots can be seen here in larger or smaller parties along the whole of the bay from Gyllensköldholmane in the South to Verlegenhuken in the North.

Section IX. Hinlopen. — In this strait enormous numbers of Guillemots can be met with during the summer and when they migrate south in the autumn.

There are two colonies. One is on Alkfjellet south of Kapp Fanshawe at the entrance to Lomfjorden, and this is perhaps the biggest colony in all Spitsbergen. The other is situated on the island Wahlbergøya.

Section X. Nordaustlandet. — Guillemots seem to be scarce in the inner part of Wahlenbergfjorden. Otherwise they have been seen on the

sea to the west and to the north of the island. There are colonies on one of the islands Gyldénøyane in Wahlenbergfjorden, in Brennevinsfjorden, on Waldenøya, Parryøya and on Karl XII Øyane.

Section XI. Storfjorden. — Guillemots have been seen in many places in this area, but there are only two breeding places known. Both of these are situated on the island Edgeøya, one on Kvalpynten, the other on Negerpynten.

Section XIII. Kong Karls Land. — Guillemots have been seen on several occasions on the sea around these islands, but they have never been found breeding there.

Section XIV. Hopen. — On this island there are several bird-cliffs with breeding Guillemots.

Records from the sea around Svalbard

The North. — Parry relates that a Guillemot (loom) was seen on the voyage northwards on 3 July, 1827. They also saw a specimen next day at 81° 45′ N, 24° 23′ E (46 : 71).

Klinckowström writes of the Guillemots and Eiders which in spring-time flew north to the enigmatical land which at that time was supposed to lie between Spitsbergen and the North Pole (172 : 150).

Collett and Nansen state that while *Cepphus g. mandtii* and *Plautus alle* occurred in great numbers in the open channels north of Spitsbergen during the summer of 1896, *Uria lomvia* and *Fratercula arctica naumanni* were comparatively rare there, only a few specimens of each of the last two species having been observed from the *Fram*. Of Brünnich's Guillemot, for instance, scarcely more than a dozen specimens were seen altogether. The first was seen flying past the ship on 19 June in latitude 82° 55′ N, and on 23 June the first specimen was shot along with some Little Auks which were seen that day in great numbers. Finally three more Guillemots were shot on 12 and 13 July in latitude 83° 11′ N (237 : 52).

Andrée writes in his diary that an "alka", i. e. Guillemot, was seen flying SSW on 15 July, 1897. This was not far from the spot where they landed on the ice at 82° 55′ N, 29° 52′ E. This was the only bird of this species that Andrée mentions in his diary (461 : 397). See also Lønnberg (473 : 141).

The North-East. — Orleans says that on the sea between Franz Josef Land and Spitsbergen on 26 and 27 August, 1909, the ship was surrounded as far as the eye could see, with couples of Guillemots swimming towards the south.

Each couple consisted of an adult bird and a young one, and each couple swam apart. No single birds were seen and no bird was seen on the wing. Orleans was of the opinion that the young were still unable to fly and therefore had to swim (315 : 172). These birds must have come from Franz Josef Land.

Worsley records that great numbers of Guillemots were seen on the sea between Franz Josef Land and Spitsbergen on 20 August, 1925, at 78° 17′ N, 39° 50′ E (441 : 107).

The West. — Fries and Nyström saw several Guillemots in the ice west of Spitsbergen on 23 September, 1868. There were also many other birds there. *Pteropoda* and *Copepoda* were swimming in great numbers near the surface of the sea. The ship was then at 78° 26′ N, 2° 17′ W (109 : 161).

Kolthoff states that the Guillemots in Spitsbergen fly about 200 km west to get food for their young (251 : 99). He saw the Guillemots in the sea west of Spitsbergen in 1898, about 200 km from the nearest land. All the birds which were obtained were either incubating or had young of that year. They were seen flying back and forth, always to and from the east (261 : 80).

Orléans saw numbers of Guillemots on his voyage along the rim of the pack-ice from Spitsbergen to Greenland in 1905. On 11, 12 and 13 July, the birds were numerous between latitudes 79° 55′ and 79° 14′ N, and longitudes 1° 52′ and 2° 1′ E (277 : 340).

The South-West. — Quennerstedt was on board a sealer in the sea SW of Bjørnøya during the months March–May in 1863. In the area within latitudes 71°–74° N, and longitudes 7° 30′–5° E, he saw single Guillemots diving among the ice, but occasionally he also saw big flocks of these birds flying towards open water (106 : 31).

Biological

Migration. — The arrival of the Guillemots seems to be dependent, firstly on open water, and secondly upon whether the shelves and ledges at the breeding places are covered with ice and snow or not.

In 1928 the first Guillemots arrived at Verlegenhuken between Wijdefjorden and Hinlopenstretet on 3 March and on the 27th big flocks were seen going towards Hinlopenstretet. But on 2 April they were still keeping to the open shore leads.

In 1938 they arrived at Kapp Wijk in Dicksonfjorden on 16 March, but did not occupy the bird-cliffs until 6 April.

At Flathuken at the entrance to Raudfjorden, they arrived on 27 March, 1925, and first came to the bird-cliffs on 10 April.

In the years when there is open water along the coasts, or at least channels in the ice, so that the birds can dive and find food, they arrive as early as the first few days of March, but if ice covers the sea and the fjords for a longer period, the birds may not come until as late as the last days of May.

It seems that the normal time for them to arrive on spring migration is between the middle of March and the end of April. The observations of their arrival in March, April and May are as follows.

Dates in March	3	4	5	16	19	24	27	30					
No. of observations	1	1	1	1	1	1	2	1					
Dates in April	2	3	5	6	7	8	9	11	12	16	19	20	28
No. of observations	2	1	1	2	1	1	1	2	1	1	1	1	1
Dates in May	9	12	14	19	23	29							
No. of observations	1	2	1	1	1	1							

As soon as the young birds have left the bird-cliffs they start for the open sea with the parents in attendance, and it is possible that the migration southwards may start then. Since the young birds are still unable to fly at this time, it seems highly probable that the birds have to swim in the first stage of the southwards movement. Only when the wings of the young birds have grown sufficiently strong will they be able to cover the remaining part of the migration on the wing.

If it is correct that the birds start on the journey south as soon as they leave the colonies, an exceptionally early migration could begin in the last days of July and in the first days of August. By about the 20th of August, at least in normal years, all the Guillemots should have left the bird-cliffs.

The dates given by the observations are as follows:

Dates in July	17	20	22	24	25	26	28	30			
No. of observations	1	1	1	1	1	1	1	1			
Dates in August	2	4	5	8	9	10	12	14	15	16	18
No. of observations	1	1	1	1	1	1	2	1	2	2	2

If on the other hand we say that the migration begins only when all birds have left the colonies we have the following dates:

Dates in August	11	12	15	16	21	27	30
No. of observations	1	2	1	1	1	1	2
Dates in September	2	3					
No. of observations	1	2					

In these instances the observers have either seen only a few birds left, or the empty bird-cliffs, in which case they cannot have known when the majority of the birds disappeared. At any rate, the difference is not so very great and we may consider the middle of August as the normal time for the beginning of the autumn migration.

Young birds in the company of adults have also been seen in the Spitsbergen seas on the 1st, 3rd, 8th, 10th (2 ×), 12th, and 30th September. They have even been found as late as the 8th, 12th, and 14th of October.

Sometimes indeed the Guillemots will actually winter in Spitsbergen, but for this there must be open water, and even then some of them will starve to death. Wintering birds have been found in December on the 9th, 12th, 15th and 23rd, in January on the 2nd, 4th, 7th, 11th, 18th and 23rd and in February on the 1st 9th and 12th.

At this time of year they have been found dead on the shores, especially when the wind was blowing towards the land. They have also been found dead on the ice. Thus two dead Guillemots were found in the ice of Wijdefjorden on 7 January, 1925, and one on the ice near Kapp Lee, Edgeøya on 15 December, 1929. Great numbers were found dead on the shore in Sassenfjorden on 19 December, 1938, and in January 1939. In Tjuvfjorden on Edgeøya a few individuals were found among the ice in the dark period 1954/55, but in contrast to the Black Guillemots they seemed to be in bad condition. Dead Guillemots were found on the shore at frequent intervals.

Concerning wintering along the Norwegian coast, Collett says: ". . . winters in varying numbers along the coast of North Norway. Very few specimens have been obtained. At Vardø they are more numerous than in any other place on the coast. They leave the Norwegian coast in March" (182 : 343).

Løvenskiold reports that they are common along the northern coasts of Norway, especially during the winter, and are sometimes also found there in the summer. At Florø, north of Bergen, 57 specimens of Guillemots were examined by Mr. Willman in 1929, and of these 22 were *Uria l. lomvia* (571 : 824).

Salomonsen mentions a specimen shot near Stockholm in the winter of 1912 (563 : 95).

General habits. — As described under "Migration", the Guillemots settle on the ledges of the bird-cliffs long before the actual breeding takes place. When the birds have occupied their colony, they are in a state of constant activity, leaving and returning to their cliffs at all hours of the day and night.

Roth observed a great activity among these birds in Forlandsundet at midnight of 17 June, 1900, and says that in general they were most active at that time of the night. Roth also found the birds sitting on ice-floes (257 : 79, 92), and Løvenskiold saw them sitting upright like penguins on ice-floes in Hornsund on 28 July, 1952.

Marshall could detect no resting period in Brünnich's Guillemots at Spitsbergen in 1932; they seemed to be on the wing and to fish throughout the 24-hour period (533 : 249). And similarly Pennycuick failed to find any diurnal fluctuation at the colony of Diabasodden in 1954 (624 : 97).

In a colony there is always a great deal of noise, because the birds produce a number of different calls. Pennycuick has described these calls and their significance.

Løvenskiold describes how he arrived at Midterhuken in Bellsund in a heavy fog on 28 July, 1948. No land could be seen, but from the ship they could hear Guillemots calling on the bird-cliffs above them (615 : 112).

The density of birds on the ledges is usually very great and, since the abundance of food must be sufficient to feed many more birds than those which are actually breeding, the size of the colony must be mainly dependent on the number of available nesting places. On this subject Bertram and Lack, who visited Bjørnøya in 1932, say the following: "The guillemots are of interest as regards the limit of their density. Almost certainly on so isolated an island their marine food supply is normally far in excess of their needs. Apart from Glaucous Gulls which take some of their eggs and young, they normally have no predators. The birds nest on flat ledges, chiefly on cliff faces, but also over the flat tops of stacks and islets and also on flat areas above the cliffs on the main island where these are separated from the tops by further cliffs. But any expansion on to the flat top of the main island would render the birds at once accessible to Arctic Foxes. Hence the Arctic Foxes, though normally inoperative as predators, yet may set an effective upper limit to density, i. e. that at which every inaccessible nesting site is fully occupied" (528 : 46). See also Duffey and Sergeant (586 : 561).

That the birds have no predators except the Arctic Foxes, however, is not completely true. Løvenskiold, who visited Bjørnøya in 1958, was told that a Norwegian smack had been there at the beginning of June that year, and according to the crew of the ship, they had collected 40,000 Guillemot eggs in the south part of the island to take to Norway to sell.

Longstaff, who visited the two huge colonies in Hinlopen in 1923, observed that the fog did not seem to have any effect on their sense of direction, even when there was no wind to guide them (407 : 493).

Swenander records that in fine weather they flew out to sea at quite a distance from the coast of Bjørnøya, but in fog they kept more to the coastline and even flew some stretches over land. He observed further that they often flew in flocks without any distinct formation, but he also saw them coming in to the land in long lines (247 : 41).

Løvenskiold, who visited the island in 1958, confirms this, but he also saw them flying in perfect V-formation, like geese on migration.

When there is food in abundance, Guillemots may keep close to land, but usually they go far out to sea to get their food, and sometimes they go very far indeed. Kolthoff relates that he found them fishing 120 nautical miles (about 220 km) out to sea west of Spitsbergen. He also saw the birds coming from Spitsbergen and returning there (261 : 80). Løvenskiold records that both when leaving their colonies and when they return to them, the Guillemots follow distinct flight lines (615 : 114). This was also observed by Bateson, who stayed in Raudfjorden in 1957 (1957, 650).

The most thorough investigation of the behaviour of the species ever made in the Svalbard area, has been carried out by Pennycuick. He visited the colony at Diabasodden in Isfjorden in July, 1955. In his paper he describes the different calls of the birds and their chicks, the fights and aggressive behaviour, the care of eggs and young, and also the greeting ceremony and the departure of the chick. His observations of cases of vestigial nest-building are particularly interesting.

At the colony of Diabasodden there was almost no predation during the time of observation, but at the top of the cliff there was an area littered with Guillemot eggshells and bones. The eggs were probably taken by Glaucous Gulls at the beginning of the egg-laying period when the birds did not seem to take much care of their eggs. The birds seemed to be active through all the 24-hour period, and no diurnal fluctuation was noticeable (624 : 80).

B r e e d i n g. — In their colonies the Guillemots often associate with Kittiwakes, but generally each species occupies its own part of the cliff, and it is only in certain small sections of the cliff that they can be found more or less intermingled. The two species appear to live together on completely friendly terms, and one never sees them molesting each other.

When the birds of a colony are resting, they sit with their backs towards the cliff-wall and their white breasts can be seen on all the ledges. But when incubating begins and if they are either sitting on the egg or sheltering the young, their backs are turned towards the sea.

The birds arrive on their breeding places sometime in early spring, but as

with the other birds in this area, the precise date depends on climatic conditions, and the date of arrival varies from the first days of March until late May. Breeding begins in the second half of May. The period of egg-laying probably stretches over a month, since fresh eggs have been found as early as 20 May, and as late as 20 June. However, most of the eggs seem to be laid between 10 and 20 June.

In Table 37 the incubating period is reckoned as 33 days, and the period from hatching until the young birds leave the colony when they are about half-grown is taken as 25 days.

Table 37

Egg-laying, hatching and young birds

Date	Condition	Hatched	Young left	Place	Author
21 May 1910	fresh	23 June	17 July	Bellsund	Munsterhjelm (313: 38)
24 » 1631	»	26 »	20 »	Bellsund	Pellham (9: 280)
24 » 1899	»	26 »	20 »	Hornsund	Birula (298: 175)
26 » 1900	»	28 »	22 »	Vesle Tavleøya	Dunér (254: 23)
28 » 1948	»	30 »	24 »	Isfjorden	Løvenskiold (615: 113)
29 » 1906	»	1 July	25 »	Forlandet	Bruce (272: 149)
29 » 1899	»	2 »	26 »	Hornsund	Bianchi (253: 313)
1 June 1910	»	4 »	28 »	Isfjorden	Olofsson (425: 90)
3 » 1899	»	6 »	30 »	Bjørnøya	Bruce (219: 122)
6 » 1881	»	9 »	2 Aug.	Bellsund	Chapman (152: 157)
7 » 1866	»	9 »	2 »	Bjørnøya	Isachsen (446: 67)
8 » 1866	»	10 »	3 »	Bjørnøya	Isachsen (446: 67)
8 » 1948	»	11 »	4 »	Bellsund	Løvenskiold (615: 112)
9 » 1896	»	12 »	5 »	Isfjorden	Trevor-Battye (203: 598)
12 » 1866	»	14 »	7 »	Bjørnøya	Isachsen (446: 68)
12 » 1952	»	15 »	8 »	Hornsund	Løvenskiold (615: 111)
13 » 1931	»	16 »	9 »	Bjørnøya	Olivier (493: 62)
13 » 1956	»	16 »	9 »	Forlandet	Løvenskiold (1956, 633)
13 » 1957	»	16 »	9 »	Raudefjord	Bateson (1957, 650)
13 » 1866	»	16 »	9 »	Bjørnøya	Isachsen (446: 68)
14 » 1866	»	17 »	10 »	Bjørnøya	Isachsen (446: 68)
15 » 1866	»	18 »	11 »	Bjørnøya	Isachsen (446: 68)
16 » 1907	point of hatching	19 »	12 »	Bjørnøya	Le Roi (316: 252)
16 » 1910	fresh	19 »	12 »	Bjørnøya	Zedlitz (319: 304)
16 » 1949	»	19 »	12 »	Bellsund	Løvenskiold (615: 113)
17 » 1956	»	20 »	13 »	Krossfjorden	Løvenskiold (1956, 633)
17 » 1948	»	20 »	13 »	Storfjorden	Løvenskiold (615: 114)
18 » 1907	»	21 »	14 »	Kongsfjorden	Le Roi (316: 251)
18 » 1899	»	21 »	14 »	Bjørnøya	Swenander (247: 40)
19 » 1861	»	22 »	15 »	Isfjorden	Chydenius (89: 283)
19 » 1921	»	22 »	15 »	Isfjorden	Van Oordt (370: 162)
20 » 1864	»	23 »	16 »	Isfjorden	Newton (96: 217)
20 » 1900	»	23 »	16 »	Storfjorden	Bianchi (253: 313)
22 » 1934	»	25 »	18 »	Hopen	B. Trøhaug (1934/35, 645)
27 » 1930	point of hatching	28 »	21 »	Isfjorden	Dalgety (470: 254)

The dates for egg-laying are as follows:

Dates in May	21	24	26	28	29
No. of observations	1	2	1	1	2

Dates in June	1	3	6	7	8	9	12	13	14	15	16	17	18	19	20	22
No. of observations	1	1	1	1	2	1	2	4	1	1	3	2	2	2	2	2

It will take from 30 to 33 days for the egg to hatch and here we reckon with 33 days and arrive at:

Dates in June	23	27	29
No. of observations	1	2	1

Dates in July	1	2	4	6	9	10	11	12	15	16	17	18	19	20	21	22	23	25
No. of observations	1	1	1	1	2	1	1	1	2	4	1	1	3	2	2	2	2	1

Accordingly it seems that most of the young are hatched in the last half of July.

After 3 to 4 weeks (or about 25 days) the young should be half-grown and should then leave the colonies on the following dates:

Dates in July	17	20	22	24	25	26	28	30
No. of observations	1	2	1	1	1	1	1	1

Dates in August	2	3	4	5	7	8	9	10	11	12	13	14	15	16	18	21
No. of observations	2	1	1	1	1	1	4	1	1	3	2	2	2	2	1	1

In therefore seems that most of the young leave during the relatively short period from 8 to 18 August. Keighley and Lockley say that it will take 15.7 days before the young of *U. a. albionis* leave the cliff (570 : 165–77).

Much has been written about the way in which the young leave the colonies, and most authors agree that it happens in the way described below.

When the wings of the young bird are big enough to enable it to flutter down from the cliff, the chick itself is about half-grown. There is no indication that its departure is preceded by a period of starvation.

Young birds fluttering down to the sea usually descend at an angle of 45°. They are always closely followed by one or both parents, and sometimes as many as seven adult birds have been seen to accompany one young one.

Immediately on striking the water the young bird usually dives, and when it surfaces it may call for a while. Then one of the parents, usually the female, will take the chick with her out to sea. According to Løvenskiold there are at least three reasons for this. One is that the birds try as soon as possible to reach places where food is abundant. The second reason is that the migration towards the south begins in the last half of August, and since a young bird on migration is unable to use its wings, it will have to swim. There is, however, a third reason which seems very important: the adult birds try to take the young bird out of the reach of the Glaucous Gull as soon as possible (615 : 110).

This departure has been described by: Mathey-Dupraz (333 : 105), Werenskiold (398 : 17), Pennycuick (624 : 88), Kay (569 : 156), and in less detail by several other authors.

When the chick descends from the cliff to the sea, the parents often follow

it very closely, and this has probably led to the legend that Guillemots carry their offspring down to the sea in their bills.

Olofsson, who visited Diabasodden 28–31 July, 1910, records one instance in which the adult bird took a secure hold on the skin on the youngster's back with its bill and in this way helped it down (425 : 90).

During the breeding period the Glaucous Gulls commonly take Guillemot eggs and they also push the young off the ledges, and then eat them when they are killed or stunned. This has been observed repeatedly by Løvenskiold during eight summers in these waters, and several other authors also describe the same thing.

Summerhayes and Elton, who visited the two big colonies in Hinlopenstretet in 1923, say that eggs and young of the Guillemot were the principal food of the Glaucous Gull (450 : 211).

Bruce, who saw the young leave the bird-cliffs of Fuglehuken on Forlandet in 1906, states that those which happened to drop on land were immediately devoured by Glaucous Gulls and foxes. The gulls also attacked the young birds on the sea, but here they were defended by their parents (272 : 149).

Curiously enough Pennycuick saw no predation by the large gulls at the colony of Diabasodden in 1955.

Kristoffersen says that as soon as a young bird has reached the water, the female "will take it out into the pack-ice where it can be seen all the summer" (432 : 189). But in fact the birds are not seen near the land from the middle of August until March of the following year.

F o o d. — Fries and Nyström saw Guillemots among other birds in the ice west of Spitsbergen on 23 September, 1868 (78° 26′ N, 20° 17′ W) and there they were feeding on the great numbers of pteropods and copepods in the channels in the ice (109 : 161).

Walter found in May, 1889, at Kvalpynten, Edgeøya that the Guillemot's diet included 3 or 4 species of amphipods, of which *Gammarus locusta* was predominant. In one stomach he found at least 228 *Gammarus*. He also found two specimens of *Hippolyte* (169 : 240).

Trevor-Battye relates that during the summer of 1896 the Guillemots were catching the little Arctic cod (*Boreogadus fabricii*) at the head of the bays in Spitsbergen (203 : 597).

Nathorst confirms that they take *Boreogadus* (243 : 105), but Römer and Schaudin did not see the bird take fish, and at that time the birds seemed to be living on amphipods and other *Crustacea* (245 : 78).

Swenander states that the Guillemots live on different species of *Crustacea, Annelida* and fishes. The young were fed almost entirely on fish (247 : 41).

Kolthoff found that they lived on different species of *Crustacea* and fishes. He found in their stomachs remains of *Boreogadus saida* and other fishes, such as *Lumpenus* (261 : 83).

Birula found only fish in their stomachs (298 : 175).

Munsterhjelm found that the Guillemots lived partly on *Crustacea* (shrimps) but mainly on *Boreogadus saida*. The young were fed on fish, but outside the breeding season the birds lived mostly on *Crustacea* (313 : 38).

Le Roi found small stones and the remains of *Crustacea* in the birds' stomachs, and he also states that the young were fed with small fishes (316 : 252).

Montague records that of the specimens collected at Alkefjellet in Hinlopen in 1924, both adult birds and young were feeding on fish and nothing else (433 : 150).

Hartley and Fisher found that in the Billefjord district in 1933, the Guillemots were feeding on *Crustacea*. All the stomachs examined contained *Thysanoëssa inermis* in numbers, and this was therefore concluded to be an important food source, but two specimens also included a species of prawn, *Spirontocaris gaimardii*. Fish were absent (513 : 386).

Sergeant relates that in the period July–August, 1948, the Guillemots at Bjørnøya fed principally on small gadoid fish. An unidentified polychaete worm was also taken in large numbers (598 : 283).

CEPPHUS GRYLLE ATLANTIS Salomonsen

The Norwegian Black Guillemot

This bird has never been found in the Svalbard area, but the race has been mentioned several times in the ornithological literature as an inhabitant of Bjørnøya and Spitsbergen.

A few of the most important references are as follows: Faber writes that *Uria grylle* is more numerous in Spitsbergen than *Uria mandtii,* but this statement must be due to a misunderstanding (45 : 16).

Conway writes of "Mandt's Guillemots and Black Guillemots", seen near Bjørnøya on 17 June, 1896, but no specimen was brought back to prove the statement (196 : 39).

Nathorst also mentions both races from Bjørnøya (243 : 50), and Naumann refers to the Norwegian Black Guillemot as occurring in Spitsbergen (266, Vol. 12 : 238). Even as late as 1930 when the facts about the two races should have been fully known, Hørring mentions *"grylle"* as a breeding bird in the Svalbard area (504, Vol. 3 : 119).

In spite of all this, the nominate form has never been found in the area, neither has a single specimen of *Cepphus grylle atlantis* been brought from Svalbard to any collection or museum I have heard of.

No. 68. *CEPPHUS GRYLLE MANDTII* (Mandt)[1]

Mandt's Guillemot

Geographical distribution

Mandt's Guillemot breeds in East Greenland, Jan Mayen, Svalbard, Franz Josef Land, Novaya Zemlya, Waigat, along the Arctic coast of Siberia, New Siberian Islands, Bennet Isl., Wrangel Isl. and Herold Isl.

There are in addition to this subspecies several other races which are found both in the Atlantic and in the Pacific distribution. According to Salomonsen

[1] Contour map showing distribution, see backflap.

the Atlantic forms include the following: First the nominate form *Cepphus g. grylle* (L.), which is restricted to the Baltic Sea, and second the form *Cepphus grylle atlantis* Salomonsen, which is found from western Sweden and eastern Denmark along the Norwegian coast to the White Sea, and also in Great Britain and the North American Atlantic coast from Maine to southern Labrador.

The third Atlantic form, *Cepphus grylle faeroensis* Brehm, is confined to the Faeroe Islands, where it is strictly sedentary. *Cepphus grylle islandus* Hørring is restricted to Iceland, where it also is sedentary. *Cepphus grylle arcticus* (Brehm) is found in West Greenland from Kap Farvel up to about Disco Bay, and from Labrador southwards at most to Hamilton inlet. *Cepphus grylle ultimus* Salomonsen breeds on coasts and islands of the Arctic Sea and adjacent waters of northern North America (562 : 59–106).

Occurrence in Svalbard

Although far less numerous than the other auks, the Mandt's Guillemot is relatively abundant in all parts of the Svalbard area. It has been observed on Kvitøya, but no nest has been found there. With this exception, the bird breeds throughout the area.

Birds in aberrant plumage

Melanism in known in other races of the Black Guillemot, but Salomonsen states that the black-winged mutant (*motzfeldi*) has never been recorded in the subspecies *Cepphus grylle mandtii* (562 : 104).

However, Løvenskiold saw a completely black specimen at Bjørnesholmen in Austfjorden (the eastern branch of Wijdefjorden) on 6 August, 1954. Except for the feet, the bird was completely black and there were no white feathers on the wings. This was easily observed when the bird was swimming and even better when it flew up, but the bird was seen only once; subsequent attempts to find it were unsuccessful (1954, 633).

First records

Master Jonas Poole, who visited Bjørnøya on 9 July, 1604, saw "Sea-pigeons", i. e. Black Guillemots there (2 : 267), and he saw the birds in Spitsbergen in 1610 (4 : 23). He also saw them on Bjørnøya again in 1611 (5 : 41).

Baffin saw Mandt's Guillemot in Spitsbergen in 1613 (6 : 71).

Fotherby records that he saw the bird in Spitsbergen in 1622 (8 : 33).

Martens secured the first specimen of this bird in the ice west of Spitsbergen on 23 May, 1671. Later in the summer he saw numbers of them along the coast of Vestspitsbergen (12 : 57).

Phipps found Mandt's Guillemot on the coasts of Spitsbergen in 1773 (23 : 186).

Scoresby saw them there in 1818 (40 : 131).

Mandt visited Spitsbergen in 1821. Suspecting that his specimens of this Guillemot were of a different species from the common European form, he sent

skins (or a skin) to Professor Lichtenstein, who described the bird and gave it the name *Uria mandtii*. This name was then published for the first time by Mandt in his thesis for the degree of Doctor of Medicine, and for this reason the scientific name of the bird is now *Cepphus grylle mandtii* (Mandt) (42 : 4, 30).

Faber was of the opinion that the Norwegian form *C. g. atlantis* Salomonsen (which he of course did not separate from the nominate form) was more common in Spitsbergen than the form *mandtii*. This is of course not so, since no other form of the Black Guillemot has even been found in the Svalbard area (45, Vol. I : 16).

Records without locality

Gaimard gives a very good illustration of Mandt's Guillemot from Spitsbergen; the illustration has no legend however (59).

Quennerstedt, who visited Spitsbergen in 1858, recorded that both *C. g. mandtii* and the common Black Guillemot occurred in numbers everywhere in Spitsbergen, including the far North, and he believed he had obtained specimens of both (81 : 28).

Salvadori records that there are six specimens of *C. g. mandtii* from Spitsbergen included in the collection of the Museum of Torino in Italy (258 : 4).

Dunér saw almost fully fledged young Mandt's Guillemots in Spitsbergen on 20 August, 1902 (254 : 22).

Olivier, who visited Spitsbergen in 1931, says that Mandt's Guillemot was the only bird he had seen resting on drifting ice-floes (493 : 62). (There are, of course, a number of other birds which do this, among them the Kittiwake, the Arctic Tern, the Arctic Skua and the Spitsbergen Guillemot.)

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — On Bjørnøya, where Mandt's Guillemot is a common breeder, the species has been known since 1604.

S e c t i o n II. H o r n s u n d. — This species breeds along the west coast from Sørkappøya in the south, in Hornsund and along the coast north of Hornsund wherever there are nesting sites. Breeding places have been found on Keilhaufjellet, Sørkappøya, in Stormbukta, Gåshamna in Hornsund, at Hyttevika and on Dunøyane.

S e c t i o n III. B e l l s u n d. — Mandt's Guillemot has been observed in Bellsund, in Recherchefjorden, Van Keulenfjorden and in Van Mijenfjorden. In this district there are numerous suitable breeding places for them on the low but steep cliff-walls along the shore and consequently there are many places in which they are numerous.

S e c t i o n IV. I s f j o r d e n. — The birds breed almost everywhere in this fjord, i. e. wherever there are suitable nest sites. They have been found in the following places: At Kapp Linné, Festningen, Grønfjorden, on the mountain Fuglefjellet between Grumantbyen and Bjørndalen, in Adventfjorden from Hotellneset to Longyearbyen and along the east side of the fjord past Reveneset to Diabasodden. They occur in many places in Sassenfjorden, in Tempel-

fjorden, on Gåsøyane, at Phantomodden and Wordiekammen in Billefjorden, in Skansbukta, at Rundodden, Kapp Thordsen, on Kongressfjellet at Kapp Wijk in Dicksonfjorden, on Bohemanneset, and in Trygghamna. They have also been seen in numbers around the island Hermansenøya in Forlandsundet.

Section V. Prins Karls Forland. — On this island the species breeds in several places along the coast, and also in many places high up on the mountain-sides.

Section VI. Kongsfjorden. — Mandt's Guillemot has been observed all along the coasts of this district and has been found breeding at Kvadehuken, on Ossian Sarsfjellet at the head of Kongsfjorden, on Lovénøyane, in "London" and in Blomstrandhamna on the north side of the fjord. In Krossfjorden the birds breed on Christian Michelsenfjella, on Kong Haakons Halvøy and in Signehamna.

Section VII. NW Spitsbergen. — In this district the species can be seen almost everywhere, except in places such as the north coast of Reinsdyrflya, where there are no nesting sites for them. They have been found breeding in Magdalenefjorden, on Danskøya and Amsterdamøya, on Fuglepyntfjellet, Klovningen, Norskøyane, Flathuken, on Buchananhalvøya and other places in Raudfjorden such as Richardvatnet and the mountain Montblanc. A breeding ground has also been found in Bockfjorden, one of the branches of Liefdefjorden.

Section VIII. Wijdefjorden. — Mandt's Guillemots have been observed in many places on both the west and the east side of the fjord. They have only been found breeding at Gråhuken, in Mosselbukta, and on the bird-cliffs facing the three glaciers to the south of this bay, but presumably they also breed in many other places along this very long fjord.

Section IX. Hinlopen. — In this strait Mandt's Guillemot is very common and in some places it is abundant. Surprisingly enough it is recorded from only a few localities, namely Verlegenhuken, Sorgfjorden, Lomfjorden, Vaigattøyane, Lovénberget, Bjørnsundet and Bastianøyane. In the last three places it has also been found breeding.

Section X. Nordaustlandet. — The species breeds in scattered pairs along the north coast of the island, but breeding has also been recorded from several other places in the area.

Mandt's Guillemots breed on Torellneset (SW corner), Fosterøyane in Hinlopen, Gyldénøyane and Palanderbukta in Wahlenbergfjorden. They have also been recorded from the head of Wahlenbergfjorden and they have been seen in Murchisonfjorden and in Birdvågen. The birds breed in Brennevinsfjorden and at Nordkapp on Chermsideøya. They have been found on and around Sjuøyane, where they breed on Parryøya, and they have also been found nesting on Karl XII Øyane and on Foynøya (NE corner).

Section XI. Storfjorden. — The species has been found breeding on Ryke Yseøyane. On Edgeøya they are said to breed wherever the cliffs are suitable, and indeed there are breeding records from several places on the island. On the east side they breed in Blåfjorden, and they have been seen in Freemansundet and at Kapp Lee. There are several records from Kvalpynten, and to the

east of this point Guillemots breed in Kraussbukta and in Keilhaubukta. There is also a record from Zieglerøya in Tjuvfjorden. The species breds on Tusenøyane and probably also on Kong Ludvigøyane. From Barentsøya there is one observation from Barkhamodden (SW corner) and another from the bay east of Engeløya, where they also breed. On the west side of the fjord the birds have been seen at Kvalhovden and in Dunérbukta. They breed near Hayesbreen in Mohnbukta, on "Teistberget" north of this bay and also in Ginevrabotnen.

Section XII. Kvitøya. — The species has not been found breeding on this island, and Mandt's Guillemot has only once been recorded there.

Section XIII. Kong Karls Land. — The species breeds both on Svenskøya and on Kongsøya.

Section XIV. Hopen. — Mandt's Guillemots breed on the island and have been seen there on several occasions.

Records from the sea around Svalbard

The North. — Parry saw Mandt's Guillemots in the ice north of Nordkapp on 26 June, 1827, in latitude 81° 15′ N, and on 3 July he saw a single specimen at 81° 36′ N, 22° 42′ E (46 : 71).

Collett and Nansen say: "North of Spitsbergen in the summer of 1896, the Spitsbergen Guillemot was unusually numerous by the open channels, from latitude 84° N, southwards as far as the northern shores of Spitsbergen, this and *Alle alle* being the most numerous of all the species of birds that appeared in these latitudes." In all, 150 of these birds were shot for the table. Dr. Blessing examined a number of specimens to ascertain which of the two sexes was predominant and it appeared that of the 40 specimens examined, 26 were males and the rest females. The ovaries of the females were not developed and the males' testes were small; presumably therefore these birds were non-breeders. The first Spitsbergen Guillemots were seen on 13 May, 1896, in latitude 83° 57′ N, when all the birds were in normal summer-plumage (237 : 51).

Andrée saw the birds in the ice north of Spitsbergen on 18 August, 1897, in latitude 81° 47′ N. On 3 September in 81° 15′ N a young bird was shot. Two days later two adult birds were seen, and young birds were seen at intervals until 15 September. On 17 September they saw 4 young birds (461 : 445).

The West. — Fries and Nyström record that in September, 1868, birds in grey plumage were seen among the ice at 78° 26′ N, 2° 17′ E (109 : 161).

Orleans saw Mandt's Guillemots in the ice west of Amsterdamøya on 8 July, 1905, at 80° 5′ N, 8° 34′ E (277 : 338). On 11 July at 79° 55′ N, 1° 52′ E he saw them on the border of the pack-ice. On 12 July at 79° 34′ N, 2° 37′ E several birds were seen. On 13 July at 79° 14′ N, 2° 1′ E only one specimen was seen (277 : 340), but on 21 July at 76° 1′ N, 7° 30′ W three birds were seen at the border of the pack-ice, and on 23 July one was seen at 75° 47′ N, 13° 1′ W (277 : 342).

Kolthoff states that north of 76° N and east of 2° W birds were frequently seen on the sea between Spitsbergen and Greenland in July 1898 (261 : 84).

The East. — Worsley saw the birds in the ice east of Spitsbergen in the summer of 1926 at 80° N, 38° 31′ E (441 : 80).

Biological

Migration. — It is not easy to determine when Mandt's Guillemot arrives in Spitsbergen, or when it leaves in the autumn, because when the sea is open many of them winter there.

On the quay at Longyearbyen in Isfjorden there is a powerful lamp which burns throughout the winter, and close to the quay the warm water from the electricity plant runs into the bay and keeps a fairly big area of water open, even when the temperature is very low. One or two Mandt's Guillemots have wintered in this place every year since 1952. But we have also records of birds wintering on the coast in other places. Georg Bjørnnes, who stayed in a hut on Edgeøya, saw varying numbers of birds throughout the winter of 1929/30 (1929/30, 636). Ingstad states that the birds wintered in Mosselbukta in 1933/34, a year in which the water was open all the winter (514 : 9). Lønø wintered on Edgeøya 1954/55 and he also saw Mandt's Guillemots there throughout the winter (1955, 647).

Records from Mosselbukta for the beginning of December, 1872, when Mr. Kjellman thought he saw one bird, and from Danskegattet on 11 January, 1889, when Mr. Pike also saw a Mandt's Guillemot, also indicate that Mandt's Guillemot sometimes winters in Spitsbergen.

The following records for February —

Dates in February	12	15	20	23	24	27
No. of observations	1	1	1	1	1	1

— show that the birds can arrive very early. It is impossible, however, to say whether these are migratory birds, or whether they have wintered at the shortest possible distance from Spitsbergen, say at the border of the pack-ice.

For March and April we have these records:

Dates in March	1	2	4	5	9	10	11	13	14	15	17	19	24	26	27	30
No. of observations	1	1	1	1	1	1	2	1	3	1	1	2	1	1	2	1

Dates in April	2	7	11	17	19	20
No. of observations	2	1	1	1	1	1

Since the actual spring migration depends on the presence of open water, it can begin as early as the end of February, if conditions are favourable. The normal time for the birds to arrive is probably about the middle of March, and when the sea is frozen for a very long time they may not arrive until April, or even the beginning of May. Godfrey saw thousands of Mandt's Guillemots and Little Auks migrating past the base hut in Zeipelbukta in Brennevinsfjorden on Nordaustlandet, towards Franz Josef Land near the end of March 1936. There was a storm from the west and the temperature was about 28° C below zero (529 : 116).

These hardy birds also stay in Spitsbergen waters very late in the autumn.

The records for September and October are as follows:

Dates in September	2	3	5	9	10	11	14	27	30
No. of observations	1	2	1	1	1	1	1	1	1

Dates in October	2	6	8	27	29	30
No. of observations	1	1	1	1	1	1

There is also one record for 3 November and two others for 3 and 29 December.

It seems therefore that the birds probably begin to leave in September, but their leaving is dependent upon how early or late the ice begins to cover the fjords and the sea. In years when they can find open water somewhere, there will usually be a few of them left even in October. The dates in November and December, however, point to wintering.

It also seems that the adult birds move out of the breeding area to the open sea at an early date, leaving the young behind.

Cocks saw an adult bird at Edgeøya on 5 September, 1882, and one adult and four young the next day between Edgeøya and Sørkapp. Subsequently he saw young birds on the coasts of Spitsbergen on September the 9th, 10th, 11th, 14th, 22nd and 24th. He observed that all adult birds seemed to have left the coasts before 5 September (151 : 397–486).

Munsterhjelm saw several young birds at Blåhuken in Van Mijenfjorden on 30 August, 1910, but by then the adult birds had all left the fjord. By 15 September all of the young birds had disappeared. On 30 September several adults and young were seen some miles off the coast of Bellsund (313 : 39).

Kristoffersen states that the birds were in winter-plumage in Hornsund at the end of August, 1923. These, however, must have been young birds of the year, because adult birds would not have moulted at such an early date, so they must presumably have left the fjord (432 : 189).

G e n e r a l h a b i t s. — The Black Guillemot breeds in suitable places all along the west and north coast of Vestspitsbergen, both on the sea-shore and also far into the fjords. It also breeds on the east coast.

In Spitsbergen this bird never occurs in such numbers as the other auks, e. g. the Little Auk and the Guillemot. It is, however, found almost everywhere without being numerous in any place. As a rule it is regularly distributed along the sea-coasts in pairs, but in some localities up to 20–30 individuals may congregate together, and on a few occasions I have seen as many as 50 together.

This bird prefers coasts with steep slopes and rock-walls especially where these are riddled with holes and crevices which can be used as nest-sites. It is not necessary for the birds to place their nests high up, because as a rule the site of the nest is well protected; so the rock-walls where they nest are rarely very high. Nor is it essential that the breeding grounds should be situated on the sea-shore; they may be several hundred metres from the beach.

In some places in Spitsbergen extensive strata of diabase or basalt cover the mountain-tops and in other places these eruptive formations occur at sea-level. In these strata there are holes, cracks and crevices and here Mandt's Guillemot is often found breeding. I have found it nesting, for example, in walls of diabase several hundred metres above the sea, and I have been told that it also breeds in holes in the strata of sandstone on the mountain-tops.

The Norwegian race of the Black Guillemot (*Cepphus grylle atlantis* Salomonsen) normally breeds near the sea, but my friend the late Mr. Landmark told me that in some places, e. g. Oksfjorden and Aurlandsfjorden it may nest several hundred feet above sea-level.

Like the Puffin, Mandt's Guillemot is full of curiosity and will often circle a boat repeatedly. In the summer of 1954, at Krosspynten in Wijdefjorden, Løvenskiold was out in a strong wind when a Mandt's Guillemot came flying up to him and, beating its wings against the wind rapidly, hovered perfectly still in the air about a metre from his face. This performance was repeated four times (1954, 633).

Guillemots are sometimes pursued by the Arctic Skua, but I have never seen them give up anything to it. Kristoffersen watched the skuas pursuing Guillemots on several occasions, but in only two instances did they succeed in robbing the Guillemots of their food (472 : 251). Keith has given a very good description of how Mandt's Guillemots settle on the bird-cliffs in the spring. At Zeipelbukta in Brennevinsfjorden on Nordaustlandet the birds arrived on 10 March 1936, and visited some towering basaltic cliffs close to the hut. This was the beginning of a long series of visits in which the birds arrived every night and left again early in the morning. As the months progressed the time spent on the cliffs increased, although they were always deserted in the afternoons. By 19 March the numbers of birds had increased and they were staying until about 11 a. m. By 31 March they were arriving at 1 or 2 a. m., but leaving again at about 7 a. m.; but gradually they began to arrive earlier and stay later, and by the end of April they were beginning to stay on the cliffs throughout the day (522 : 56).

B r e e d i n g. — Mandt's Guillemot is found breeding throughout the Svalbard area, but unlike the other auks, these birds do not assemble in colonies. Pairs of breeding birds are isolated from one another and only in a few instances have several birds been seen together on a bird-cliff under circumstances which indicated that several pairs were breeding there together.

The nests are placed in crevices or holes in more or less solid rock, and the eggs can be extremely well hidden. Swenander reports that only one instance is known of where eggs have been laid in the open on a ledge in the manner of Brünnich's Guillemots (247 : 33). For the choice of the nesting sites see under "General habits".

Mandt's Guillemot often breeds in company with other birds such as Kittiwakes and Little Auks. They have been found breeding up to 600 metres above sea-level and even higher.

Very often they make no nest at all. The eggs are laid on the naked rock, but in some instances the eggs have been found on a bed of small stones.

Longstaff describes the nesting site as a vertical crack in hard, sound rock with a ledge in front from which the bird utters a thin bat-like squeak often difficult to locate (407 : 494).

As the eggs are difficult to reach, relatively little is known about eggs and egg-laying in the Svalbard area.

The following tables summarize available records for egg-laying, hatching and the dates when the young are fully fledged.

Table 38
Egg-laying

Date	No. of eggs	Condition	Eggs presumably laid	Place	Author
16 June 1921	2	fresh	16 June	Bjørnøya	Jourdain (381: 177)
24 » 1907	2	fresh	24 June	Forlandet	Le Roi (316: 255)
29 » 1930		fresh	29 June	Isfjorden	Dalgety (470: 254)
29 » 1930		incubated		–»–	–»– (470: 254)
1 July 1908	2			Bjørnøya	Le Roi (316: 253)
2 » 1956	2			Kongsfjorden	Løvenskiold (1956, 633)
4 » 1899	2	hatched	10 June	Bjørnøya	Swenander (247: 33)
4 » 1899	2	hatched	10 June	–»–	–»– (247: 33)
4 » 1931	2			Isfjorden	Tomkinson (485: 85)
4 » 1931	2			–»–	–»– (485: 85)
4 » 1931	2			–»–	–»– (485: 85)
4 » 1931	2			–»–	–»– (485: 85)
5 » 1907	1 + juv.	addled		Klovningen	Le Roi (316: 255)
5 » 1908	2			K. Ludvigøyane	–»– (316: 255)
5 » 1908	2			–»–	–»– (316: 255)
5 » 1908	2			–»–	–»– (316: 255)
8 » 1908	1	fresh	8 July	Isfjorden	–»– (316: 255)
9 » 1907	1			Forlandet	–»– (316: 255)
17 » 1921	2	well incubated	27 June	Isfjorden	Van Oordt (370: 163)
29 » 1921	2			Nordaustlandet	Longstaff (407: 493)
31 » 1911				Krossfjorden	Mathey–Dupraz (346: 16)
10 Aug. 1948	2	hatched	17 July	Isfjorden	Løvenskiold (615: 116)

Table 39
Hatching and young birds

Date	No. of young	Age	Eggs presumably laid	Place	Author
5 July 1907	1	some days		Klovningen	Le Roi (316: 253)
8 » 1908		some days		Isfjorden	–»– (316: 253)
17 » 1921		just hatched	23 June	Isfjorden	Van Oordt (370: 163)
28 » 1957	2	large		Raudfjorden	Bateson (1957: 650)
29 » 1921				Nordaustld.	Longstaff (407: 493)
31 » 1911				Krossfjorden	Mathey–Dupraz (346: 16)
31 » 1927	1	just hatched	7 July	Edgeøya	Dalgety (442: 30)
5 Aug. 1957	2	large		Raudfjorden	Bateson (1957: 650)
10 » 1948	2	fully fledged	11 June	Bjørnøya	Duffey and Sergeant (586: 562)

Table 40

Young birds seen on the sea for the first time

Date	Eggs presumably laid	Age	Place	Author	
28 July 1957	29 May	Fully fledged	Raudfjorden	Bateson	(1957, 650)
6 Aug. 1921	7 June	Fully fledged	Isfjorden	Van Oordt	(370: 163)
7 » 1910	8 June	–»–	Magdalenefjorden	Zedlitz	(319: 304)
9 » 1956	10 June	–»–	Krossfjorden	Løvenskiold	(1956, 633)
11 » 1921	12 June	–»–	Isfjorden	Van Oordt	(370: 163)
12 » 1898	13 June	–»–	Kong Karls Land	Kolthoff	(261: 84)
13 » 1950	14 June	–»–	Van Keulenfjorden	Løvenskiold	(615: 116)
14 » 1861	15 June	–»–	Lomfjorden	Chydenius	(89: 281)
15 » 1899	16 June	–»–	Bjørnøya	Swenander	(247: 33)
15 » 1910	16 June	–»–	Bellsund	Munsterhjelm	(313: 39)
15 » 1952	16 June	–»–	Hornsund	Løvenskiold	(615: 116)
16 » 1921		Not fully fledged	Wijdefjorden	Longstaff	(407: 493)
16 » 1930	17 June	Fully fledged	Sørkapp	Kristoffersen	(472: 251)
19 » 1891	20 June	–»–	Kongsfjorden	Zeppelin	(179: 58)
19 » 1898		Not fully fledged	Ryke Yseøyane	Römer und Schaudin	(245: 79)
20 » 1902		–»–	Spitsbergen	Dunér	(254: 22)
22 » 1899	23 June	Fully fledged	Edgeøya	Birula	(298: 177)
31 » 1899	1 July	–»–	Hornsund	Birula	(298: 177)

If we estimate the length of the incubating period as 24 days and the fledging period as 36 days, and take the numerical values of "eggs presumably laid" in the above tables, we arrive at a series of approximate values for the dates of egg-laying:

In May there is only one record, on the 29th.

Dates in June	7	8	9	10	11	12	13	14	15	16	17	20	23	24	27	29
No. of observations	1	1	1	1	2	1	1	1	1	4	1	1	2	1	1	1

Dates in July	1	7	8	17
No. of observations	1	1	1	1

In other words, most of the eggs are probably laid in the last two-thirds of June.

In the same way we arrive at the following values for the time of hatching.

The only June record is one for June 21st.

Dates in July	1	2	3	4	5	6	7	8	9	10	11	14	17	18	21	23	25	31
No. of observations	1	1	1	1	2	1	1	1	1	4	1	1	2	1	1	1	1	1

In August there are only two records, for the 1st and the 11th. Thus most of the hatching must take place about the middle of July.

The following figures show the time when the young birds would be expected to be fully fledged:

The only July record is for the 27th.

Dates in August	6	7	8	9	10	11	12	13	14	15	16	19	22	23	26	28	30
No. of observations	1	1	1	1	2	1	1	1	1	4	1	1	2	1	1	1	1

There are only two records in September, for the 5th and the 15th.

Thus it seems that the majority of the young birds must be fully fledged by the last two-thirds of August.

These figures are, of course, only approximations, and more exact investigations in the future will prove whether or not they are correct.

F o o d. — Heuglin mentions that Mandt's Guillemots take small fishes, molluscs and jellyfish and he also found small pieces of quartz in their stomachs (132 : 163).

Römer and Schaudin found *Clio, Beroë (Ctenophora), Annelida* and the bones of fish (245 : 79).

Swenander says that all the stomachs he examined contained *Gammaridae,* and only one contained the remains of fish (247 : 35).

Koltoff relates that on 12 June, 1900, birds diving in Colesbukta close to the shore came up with the large prawn, *Sclerocrangon boreas,* which seemed to be the common food of the bird in Spitsbergen (250 : 39). The stomachs of birds from Bjørnøya contained *Amphipoda,* but on the high sea the Guillemots took small prawns and on Kong Karls Land he saw them carrying polar cod to their young (261 : 84).

Walter mentions *Clio borealis,* one amphipod and great numbers of annelids (169 : 240).

Le Roi investigated 22 stomachs. In five there were small stones. Twelve contained crustaceans (*Amphipoda* and *Gammaridae*), and ten included the shells of molluscs (*Margarita helicina* and *Natica affinis*). The remains of fish were found in five stomachs and annelid worms in two (316 : 256).

Munsterhjelm records that the birds in the fjords mainly took polar cod. Three birds shot on Forlandet had remains of crustaceans and bones of fish in their stomachs (313 : 40).

Van Oordt says that the bird lives on *Crustacea* and molluscs (370 : 163).

Montague states that the bird is a fish-eater but that it also takes pteropods (*Clio*) (433 : 40).

Summerhayes and Elton found the birds feeding on Arctic Char in the freshwater lakes on the east side of Wijdefjorden, south of Mosselbukta (450 : 128).

Hartley reports that *Thysanoëssa* was taken by Mandt's Guillemots which fed in the inshore zones on the general bottom fauna in Billefjorden in 1933 (502 : 128).

Hartley and Fisher report that an investigation in Adolfbukta in Billefjorden from 21 July to 5 August, 1933, showed a mean density of 15 Mandt's Guillemots per square mile. The birds were fishing in the bay. An examination of the stomach contents of 21 specimens gave the following results: Fish were found in seven stomachs and *Leptoclinus maculatus,* the butter fish, occurred three times (possibly). Crustaceans: *Thysanoëssa inermis* was found in six. *Euthemisto libellula* in four, *Mysis oculata* in five, *Gammarus locusta* in one; *Spiron-*

tocaris gaimardii in three; *Sclerocrangon boreas* in one; *Hyas araneus* in one; *Eupagurus pubescens* in one. Of the molluscs: gastropods occurred in five specimens, *Lamellibranchia* in one. The annelid *Harmathoë imbricata* and the remains of vegetable matter were each found in one stomach only (513 : 384, 386).

An investigation by Duffey and Sergeant of the content of four stomachs revealed the remains of three fish, *Liparis montagini,* a gadoid and cottid. There were also amphipods (*Gammarellus homari*) and about one hundred mysids (*Mysis oculata*) (586 : 562).

No. 69. *FRATERCULA ARCTICA ARCTICA* (L.)

The Northern Puffin

Geographical distribution

The Northern Puffin breeds in Iceland, in Norway from Bergen and northwards, in W Greenland and in N America. Intermediate populations (*Fratercula a. arctica* $\lesseqgtr$ *naumanni*) breed on Jan Mayen and on the Murman coast of the Kola Peninsula.

There are several old records of the race from Spitsbergen but Salomonsen says that these birds were probably only a dwarf mutant of the race *F. a. naumanni* (562 : 128).

Occurrence in Svalbard

In the Svalbard area the Northern Puffin is found only on Bjørnøya.

Anderson, who saw the bird on Bjørnøya in 1899, states that Kolthoff told him that he had found the race in Spitsbergen in 1898, but in Kolthoff's own publication on Spitsbergen birds, this observation is not mentioned (234 : 445). Presumably, therefore, the bird referred to by Anderson must have been a dwarf mutant of the race *Fratercula arctica naumanni.*

Swenander found *Fratercula arctica arctica* breeding all round Bjørnøya in the summer of 1899, but nowhere was it numerous (247 : 43).

Schalow merely refers to Swenander's paper (271 : 121).

Le Roi found the Northern Puffin on Bjørnøya in 1907 and 1908. It was living in small numbers in places along the shore where there were steep cliffs. No eggs or young birds were found (316 : 261).

Zedlitz shot 20 specimens on the SE coast of Bjørnøya on 12 August 1910. He saw no young birds on the sea (319 : 302).

Summerhayes and Elton say that the Northern Puffin occurs in small numbers in the crevices in the island's bird-cliffs (397 : 218).

Bertram and Lack say that the bird is not uncommon along the cliff-tops round all the coasts of Bjørnøya and that there is quite a large colony on Miseryfjellet. The specimens they obtained belonged to the "southern race" and not to the Spitsbergen one (488 : 300). In another paper they relate how a fox took a Puffin on a cliff-edge on Bjørnøya in 1932 and say that there were then many Northern Puffins on the island (528 : 35, 50).

Duffey and Sergeant found the race to be frequent all round the island, except in the big guillemot colonies. Most of the birds were associating with the

Black Guillemots and they were not found in the accessible nest-holes at the top of the cliffs (586 : 562). Unlike Bertram and Lack, they did not find the bird nesting on inland cliffs. When leaving the island, the birds frequently flew up to 3–5 miles from the coast.

No. 70. *FRATERCULA ARCTICA NAUMANNI* Norton[1]

The Spitsbergen Puffin

Geographical distribution

This form breeds in Spitsbergen and in NW Greenland, and it is highly probable that the Puffin on Novaya Zemlya also belongs to this race. No winter records have been published.

However, Collett mentions a young bird from Vesterålen in N Norway which was probably a winter visitor from Spitsbergen. Its proportions were in every respect greater than those of the other Norwegian specimens (182 : 347).

Salomonsen states that all small Puffins from Spitsbergen whose wing-length falls short of the minimum for the ordinary birds by 10 mm or more belong to a dwarf mutant (562 : 128).

This makes it difficult to prove that the southern race *F. a. arctica* ever visits the Spitsbergen coast, but there is no reason to believe that *F. a. arctica* may not occasionally reach Spitsbergen, just as *F. a. naumanni* occasionally visits Bjørnøya.

According to Salomonsen, Johnsen states that both forms of *F. arctica* breed in Spitsbergen, but this must be based on a misunderstanding or a misreading, for what Johnsen actually writes is that *F. a. actica* is a rare visitor to Spitsbergen (505 : 42).

Occurrence in Svalbard

In a few instances *F. a. naumanni* has been reported from Bjørnøya. In Spitsbergen it breeds in the fjords and along the west coast of Vestspitsbergen in the districts Hornsund, Bellsund, Isfjorden, Prins Karls Forland, Kongsfjorden and NW Spitsbergen. The greatest concentration is in the NW corner of the island.

In Wijdefjorden the bird has been observed in several places, but there is no record of it breeding there. It has bred, however, in Hinlopenstretet and on the islands north of Nordaustlandet.

It has also been found in Storfjorden, and there are a few observations from Hopen, but in neither place has it been found breeding. There are no records either for Kvitøya or for Kong Karls Land.

First records

Baffin visited Spitsbergen in 1613 and saw "Sea parrots" there (6 : 71).

Gerritszon mentions that Puffins are found in Spitsbergen: ". . . deux sortes

[1] Contour map showing distribution, see backflap.

de Plongeons, Papegays ou Lommes, que sont Oiseaux de Mer à rouge beqs . . ." (7 : 19).

Fotherby records that Puffins ("Sea-parrets") occurred in Spitsbergen in 1622 (8 : 33).

La Peyère [Henrich Sivers] relates that several Puffins were taken to Copenhagen from Spitsbergen, but the birds had to be killed, because it was impossible to catch them alive. This is his description: "Am Schnabel und Fädern gleichten sie den Papagayen, mit den Fühssen aber die Enten" (11 : 57).

Martens saw the species in Spitsbergen in 1671 and made a drawing of it (12 : 64).

Martin gives an exact description of the bird, which he saw in Spitsbergen in 1758 (17 : 109, 132).

Phipps found the species on the coasts of Spitsbergen in 1773 (23 : 186).

Bacstrom came to Spitsbergen in the summer of 1780 and found Puffins there then (28 : 617).

Pennant records the occurrence of Puffins in Spitsbergen (24 : Vol. I : XC and Vol. II : 511).

Leach, in a letter written to Dr. Thomson (probably in 1819), gives a list of mammals and birds "that have been received from the Northern Expeditions". Here he mentions *Fratercula Glacialis* (Northern Puffin) a new species which was killed off the coast of Spitsbergen (37 : 61). The bird was later the subject of a paper which he sent to the Linnean Society.

Mandt saw the bird in Spitsbergen in 1821 (42 : 3).

Records without locality

Gray states that the collection of the British Museum (Nat. Hist.) includes a specimen of a Puffin from Spitsbergen, presented by the Admiralty (58 : 153).

Quennerstedt who visited Spitsbergen in 1858, saw Puffins all along the west coast, but nowhere were they numerous (81 : 30).

Torell states that the bird is a yearly breeder in Spitsbergen (112 : 513).

Hartert found a specimen from Spitsbergen in the Museum of the Senckenbergischen Naturforschenden Gesellschaft in Frankfurt a. M. (171 : 248).

Salvadori records that two specimens of this bird are included in the collections in the Museum of Torino. These birds were obtained in Spitsbergen in 1898 (252 : 4).

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — There are a few records of this race from Bjørnøya, but it has not been found breeding there.

S e c t i o n II. H o r n s u n d. — In this district Puffins breed on Keilhaufjellet, NE of Sørkappøya, on Krykkjestupet, east of Gåshamna in Hornsund, on Sofiakammen on the north side of the fjord, opposite Gåshamna, and a few pairs breed on Torbjørnsenfjellet on the coast north of Hornsund.

The birds are also recorded from several places along the coast from Sørkappøya and up to Kapp Borthen.

Section III. Bellsund. — The only known breeding place in Bellsund is on the mountain Midterhuken, and apart from the birds seen in that area, there are very few records from this district.

Section IV. Isfjorden. — With one exception all the known breeding places are in Sassenfjorden and in Billfjorden. The birds breed on Diabasodden, on cliffs at De Geerdalen, on "Teistberget" where Tempelfjorden branches off from Sassenfjorden, on Tempelfjellet, on Gåsøyane, on Phantomodden in Billefjorden and in Skansbukta. They also breed in Trygghamna and on Alkhornet above the bay. Single birds and small flocks have been seen in many places in the fjord.

Section V. Prins Karls Forland. — Puffins breed on the mountains of Fuglehuken in the extreme north of the district, and they have been seen on the sea almost everywhere around the southern half of the island.

Section VI. Kongsfjorden. — In this district there are three breeding places, one on Kvadehuken, another close to the glacier Fjortende Julibreen and the third in Møllerfjorden, a branch of Krossfjorden. The birds have been seen in several places in Kongsfjorden and in Krossfjorden, and also along the coast from Kapp Mitra to the glaciers north of this cape.

Section VII. NW Spitsbergen. — Puffins have been found breeding on at least two of the mountains between Dei Sju Isfjella south of Magdalenefjorden, on a mountain a little south of the head of Fuglefjorden, on Klovningen and on Ytre Norskøya. This is the district in Spitsbergen in which the greatest numbers of Puffins are seen, and here they have been recorded all along the coast from Dei Sju Isfjella and to Breibogen south of Biskayerhuken. East of Biskayerhuken there are no records until Wijdefjorden.

Section VIII. Wijdefjorden. — Although the birds most certainly do breed in this fjord, no breeding places have as yet been found. Birds have been observed in a few places on both sides of the fjord and, as recently as 1957, at its head.

Section IX. Hinlopen. — There is one breeding place in Sorgfjorden. During the summer of 1923, Summerhayes and Elton found Puffins breeding in various parts of Hinlopenstretet, but they do not say where these breeding places were situated.

Section X. Nordaustlandet. — The bird is scarce on Nordaustlandet. They have been seen in Murchisonfjorden and in Brennevinsfjorden, and they have been found breeding at Nordkapp on Chermsideøya, on Waldenøya and on Vesle Tavleøya.

Section XI. Storfjorden. — No breeding places have been found in this district, but the birds have been observed at Kapp Agardh on the west side; on the east side they have been seen at Bølscheøya SW of Negerpynten on Edgeøya, at Zieglerøya in Tjuvfjorden, at Kvalpynten in Freemansundet and near Kapp Heuglin.

Section XIV. Hopen. — The Puffin does not breed on Hopen and there are only three records from the district.

Records from the sea around Svalbard

The North. — According to Collett and Nansen a single Puffin was seen flying northwards along a channel in the ice on 12 July, 1896, in latitude 83° 11′ N, due north of Spitsbergen. No other specimens were seen in the ice (237 : 52).

The West. — Kolthoff says that a single individual was found in 1898 at 73° 40′ N, and 0° 20′ W, which is at approximately an equal distance from Norway, Spitsbergen and Greenland (261 : 87).

The South. — Orleans reports having seen a single bird at 73° 25′ N, 18° E, south of Bjørnøya on 6 June 1905 (277 : 333).

Biological

Migration. — There are very few records from Spitsbergen of the migratorial movements of the Puffin, but from the available dates it seems that the Puffins normally arrive in Spitsbergen waters in the period between 15 May and 10 June.

It is probable that the autumn migration does not begin until a few days before the young birds have left their nests, because after the adult birds have left, the young birds have to fend for themselves. Young birds have very rarely been seen on the sea in the Spitsbergen area. It seems probable that the movement out to sea may start as early as the last days of August, but quite often adult birds have been recorded from Spitsbergen as late as the middle of September.

The records for migration are as follows:

Chydenius saw Puffins in Kobbefjorden on Danskøya on 25 May, 1861 (89 : 63).

Walter says that Puffins were seen in Hornsund between 17 and 18 May, 1889, at Forlandet on the 18th, in Magdalenefjorden on the 20th, and in Danskegattet on 23 May, 1889 (169 : 237).

Kristoffersen saw the first Puffins of the year in Hornsund on 17 May, 1924. A few days later he saw a small flock, and by the end of May the rest of them had arrived (432 : 190). In 1930 the first Puffin arrived at Sørkapp on 3 June (472 : 251).

Arthur Oxaas saw the first Puffin of the year at Flathuken (Raudfjorden) on 31 May, 1926, and another bird on 7 June (1925/26, 643).

Peder Åm saw the first arrival of that year in Kongsfjorden on 3 June, 1937 (1936/37, 646).

Løvenskiold saw great numbers of Puffins between the islands Fugløya, Fuglesangen and Norskøyane on 28 August, 1948, but no young birds were seen on the sea (615 : 130).

Munsterhjelm observed great numbers of Puffins at the mountain Midterhuken in Bellsund on 16 August, 1910, but when he returned there on the 30th, there were only a few individuals left (313 : 42).

Malmgren saw several single specimens at Norskøyane between 1 and 3 September, 1861 (85 : 113).

Løvenskiold saw numbers of adult Puffins in Skansbukta on 4 September, 1948, but here also there were no young birds to be seen (615 : 129).

Feilden saw a number of Puffins at Forlandet on 5 September, 1894 (189 : 84).

Dege saw Puffins near Hopen on 12 September, 1944 (613 : 23).

Cocks shot two male birds in Sassenfjorden on 16 September, 1882 (151 : 433).

General habits. — The Spitsbergen Puffin is nowhere very numerous, and unlike the Norwegian form, which occurs in enormous numbers in some places (for example at Lovunden and at Værø and Røst in Lofoten), the Spitsbergen Puffin occurs only in single pairs or in small colonies numbering not more than a few hundred birds.

The Spitsbergen Puffin is much more common in the west and north of the area than in the east, where it is rarely seen. Small colonies can be found here and there on the west coast and in the fjords, but the species is not at all numerous except in the NW corner of Spitsbergen from Fuglehuken on Forlandet up to Raudfjorden.

In any given area the number of individuals may vary very much from one year to another. Thus according to Mathey-Dupraz the bird was extremely common in Isfjorden in 1906, but very scarce in 1910 (311 : 50). Van Oordt says that the Puffin seems to prefer to rest near deep water (370 : 165). Hartley and Fisher say that in 1933 the birds fished in the inshore region and also in the deep water of Billefjorden (513 : 387).

Unlike the Norwegian form, which finds its food primarily on the high seas, this bird seems to prefer never to go far from the coast, at least in the breeding season. This fact has been recorded time and again by a number of observers, among them Kolthoff, who found that on the open sea the species was very scarce (261 : 87). Løvenskiold found Puffins on both the north and the south shores of Hornsund on 4 August, 1950, but none were seen in the middle of the fjord. The situation was the same in Raudfjorden when the mouth of the fjord was crossed on 6 July, 1949 (615 : 128). In the first half of August, 1956, several Puffins were seen along the west coast of Prins Karls Forland, but they were all within one nautical mile of the shore (1956, 633). This is in contrast to an observation made by Bateson, who records that Puffins were occasionally seen at Bruceneset in Raudfjorden during the summer of 1957, but always at a considerable distance from the land (1957, 650). Other records of birds found at a distance from the coast are mainly for the period outside the breeding season. Marshall, who studied the bird-cliffs near Sørgattet in 1933, could find no evidence that the Puffin had any regular resting period (533 : 249).

Breeding. — In Norway the Puffin often conceals its nest under the stones of a scree, but a large number of them also dig burrows on grassy slopes.

On Bjørnøya, where the Norwegian race also breeds, a small proportion have been found to dig out nesting holes in the turf.

In Spitsbergen the Puffins breed in crevices and holes in solid rock and sometimes also under broken stones under cliff-walls. But there is only one record of a Spitsbergen Puffin having dug a hole for its nest. Mathey-Dupraz found a burrow dug out on a grassy slope in Krossfjorden in 1911 (333 : 108).

The reason for this difference in the nesting habits of the Spitsbergen and the Norwegian Puffin may be that in Spitsbergen when the ground is frozen, it is too cold in a hole up to a metre in depth for a bird to survive, and of course, when the ground is frozen it is in any case impossible for the bird to dig. In summer, when the ground is thawed to a depth of 50 to 100 cm, it should be possible for them to excavate a hole, but in holes on a grassy slope they would easily fall prey to the Arctic Fox. (In Norway there are no foxes on the Puffin's breeding grounds.)

As the birds have to lay their eggs in holes, the Puffin's nests may be found both at sea-level and very high up on the mountain-sides. Thus on Gåsøyane in Isfjorden they nest low down, while at Diabasodden across the fjord the nests are about 50 metres above the sea, and in Skansbukta the Puffins nest on the bird-cliff several hundred metres up.

Scattered pairs are sometimes found nesting among colonies of Kittiwakes and Guillemots, but where there are more than a few pairs breeding together they are usually found in the company of Mandt's Guillemots and Little Auks.

Because of the relative scarcity of the Puffin, and also because it is a hole-nesting species, very little is known about the breeding of the Spitsbergen birds; so little indeed that there are only three records of eggs having been found. Furthermore, the chicks stay in the nest for such a long time that before they appear on the sea most of the scientific expeditions have left Spitsbergen, and for this reason there is only one record for the area of a young bird of the year. Lockley says about this: "In Spitsbergen snow and ice prevent a landfall before May, which means that, with ninety days between egg-laying and the departure of the chick, late August is the normal ending of the breeding season in the high north." (610 : 118)

Van Oordt found a male bird sitting on a slightly incubated egg on Gåsøyane on 17 July, 1921 (370 : 165).

Jourdain states that one slightly incubated egg was found on the island Klovningen (Cloven Cliff) on 9 July, 1921 (381 : 178).

Tomkinson obtained four eggs on Gåsøyane on 4 July, 1931 (485 : 85).
Kolthoff records that a young bird was seen at sea on 29 August 1898, at Amsterdamøya (261 : 88).

If the eggs are laid in the first week of July, the young birds will not appear at sea before the first week of October, or perhaps occasionally even later. Since the eggs are laid so late, it is quite clear that there are few young birds to be seen in the autumn.

A rather curious statement is made by le Roi, who says that adult birds with fish in their bills were seen going into nest-holes in the colony on Klovningen on 5 July, 1907 (316 : 265). If there had been young birds in the nests at that date, they would have been quite small, and very young birds are fed with half-digested food, disgorged in the nest by the parents. Although I have never heard of a male bird feeding the female on the nest, this may perhaps be the explanation of le Roi's observation.

F o o d. — Scoresby mentions that the Puffins lived mainly on shrimps and small species of *Helix* (40 : 130).

Oustalet records that a Puffin was shot on Amsterdamøya on 15 August, 1898. This bird had a *Gadus polaris* it its bill (231 : 305).

Munsterhjelm shot several birds at Kaldneset on Forlandet in 1910, and he found *Crustacea* in their stomachs. In Bellsund he was able to watch the birds feeding, but he never saw them catch fish. In the stomachs of Puffins obtained in Bellsund he found *Clio borealis* and pieces of the shell of *Limacina helicina* (313 : 42).

Le Roi examined the stomachs of 21 specimens from Spitsbergen. None of them contained stones. Eleven were empty, and the remainder contained gammarids and other *Crustacea*. One stomach contained the remains of annelids. He also saw Puffins with fish in their bills on the island Klovningen (316 : 267).

Kolthoff says that the Bear Island and Spitsbergen birds lived mainly on amphipods. One bird from Danskøya had taken small molluscs (261 : 88).

Hartley says that in the part of Billefjorden where he worked during the summer of 1933, the euphausid *Thysanoëssa inermis* figured largely in the food of the Puffins, although to a certain extent they seemed to be fish-eaters (205:123).

Hartley and Fisher examined ten specimens of Puffins in Billefjorden in 1933. In ten they found *Thysanoëssa,* in three *Euthemisto* and in two *Mysis*. In seven stomachs they found the remains of fish including *Boreogadus* and probably *Leptoclinus* (513 : 387).

P a r a s i t e s. — Eaton states that he found *Anoplura* (i. e. *Mallophaga*) on the Puffin (130 : 3819).

No. 71. *COLUMBA PALUMBUS PALUMBUS* L.

The Wood Pigeon

On 4 May, 1911, according to Schaanning, a female of this species was shot at sea between Bjørnøya and Spitsbergen (about latitude 75° 10′ N), and sent to Tromsø Museum (395 : 221).

No. 72. *NYCTEA SCANDIACA* (L.)[1]

The Snowy Owl

Geographical distribution

The species breeds in Norway, N Sweden, N Finland, N Russia, Novaya Zemlya, N Siberia, Arctic N America and Greenland. It is accidentally met with south of its breeding range and it has been seen in most of the European countries.

Occurrence in Svalbard

The bird is a more or less regular visitor to the area and it has been found in most parts of Spitsbergen with the exception on Bjørnøya, Hinlopenstretet and Kvitøya. More than 50 observations are known from the area. It has never been proved as a breeding species in any part of Spitsbergen. First record 1861.

[1] Contour map showing distribution, see backflap.

Distribution. Sections II–XIV

Section II. Hornsund. — The species was seen from December 1923 to March 1924, and again in March 1930.

Section III. Bellsund. — The bird has been seen in Berzeliusdalen, near the entrance to Van Mijenfjorden, on the north side and also in the fjord itself. There are also records from Van Keulenfjorden, Kapp Lyell and north of Dunderbukta.

Section IV. Isfjorden. — The species has been found in Grønfjorden, in Hollendardalen (between Grønfjorden and Colesbukta), Blomsterdalen in Adventfjorden, Adventdalen, Sassendalen, Billefjorden and at Kapp Wijk.

Section V. Prins Karls Forland. — The bird has been seen several times on the island itself, on Forlandsøyane and also sitting on an ice-floe outside the islands.

Section VI. Kongsfjorden. — Found in Ny-Ålesund and near Møllerfjorden, a branch of Krossfjorden.

Section VII. NW Spitsbergen. — The bird has been seen in Sørgattet, on Amsterdamøya and at Velkomstpynten.

Section VIII. Wijdefjorden. — One bird was shot at Verlegenhuken on 10 July 1861, and this is the first record for Svalbard. The species has also been seen in Mosselbukta and at Austfjordnes.

Section X. Nordaustlandet. — There is one record from Rijpfjorden in April 1936.

Section XI. Storfjorden. — The Snowy Owl has been seen on Zieglerøya in Tjuvfjorden on Edgeøya in 1869 and again from 15 March to 3 June in 1955. There is also one record from Ekrollhamna on the west side of the island Edgeøya.

Section XIII. Kong Karls Land. — Two records, one only from the islands without exact locality and the other from Kapp Hammerfest, Svenskøya.

Section XIV. Hopen. — The Snowy Owl visited Hopen in March 1953 and April–May 1955.

Biological

Migration. — The species has no regular migration habits in Norway or in any other European countries. In Norway its numbers vary in relation to the abundance of lemmings, voles and other small mammalia in the mountains. When the density of these animals is high the owl will breed, but in "black years", when there are not enough rodents for the bird to be able feed its young, only occasional wandering Snowy Owls will be met with.

In Spitsbergen its occurrence seems to be dependent on the decrease or increase of the population of the Ptarmigan. Trappers and ornithologists seem to agree that in years when there is an abundance of Ptarmigan, the Snowy Owl occurs in numbers, whereas when Ptarmigan are few, the big white owl will not be seen.

Breeding. — It has been said, and it is sometimes even now maintained, that the Snowy Owl does occasionally breed in Spitsbergen, but there is still no

real proof of this. There are a few observations which indicate breeding, but that is all.

In 1894 Mr. Feilden was presented with a Snowy Owl that was shot on Amsterdamøya on 8 July. The bird was extremely fat. The breast was bare and, it is said, "showed signs of incubation". However, nothing is said about a nest or young birds (189 : 90).

In 1899 Birula found a nest on 30 June which he thought could have belonged to the Snowy Owl. It was a large nest on a piece of rock jutting out from a glacier on the south side of Hornsund. In the nest there were fragments of the shells of large white eggs (298 : 201).

It should be remarked, however, that the Snowy Owl does not build large nests, and also that, as far as I know, it will not place the nest on a piece of rock jutting out from a glacier. I have always found the bird breeding in open country, where it has a clear view in all directions. In my opinion this was an old Pink-footed Goose nest.

There is also a clutch of eggs, said to have been found in Spitsbergen. Nilsson gives the measurements for seven eggs of the Snowy Owl, which are labelled Spitsbergen 3.VI, but neither the locality nor the year is given. It is in fact most unlikely that the eggs did originate from the Svalbard area (304 : 5).

Finally we have a report from Dalgety and coll. On 21 and 22 July 1930 they visited Kapp Hammerfest on Kong Karls Land and among several large rocky mounds visited by this bird, they found one with two old nest-scrapes on it. These scrapes were in a typical Snowy Owl situation, and contained fragments of egg-shells which had every appearance of being those of the Snowy Owl (470 : 245).

It is a pity that the fragments of egg-shells were not preserved in either of these cases. It would then have been a simple matter to determine whether they belonged to an owl or to a goose.

This is all that is known of the breeding of the Snowy Owl in the Svalbard area. In my opinion the evidence is not sufficient to justify the statement that the Snowy Owl actually or even probably breeds there.

Neither the big falcons nor the Snowy Owl have been found definitely breeding in this area. I have tried to show that the reason why a falcon has never been found with eggs or young in Svalbard is that there are no rodents there. The Snowy Owl is far more dependent on a diet of micromammalia than any falcon, and it will certainly need small rodents to feed its young in the first stage of growth. This must be the reason why it has never been found breeding in the Svalbard area.

Lemmings have in fact never been collected here, although they have been said to occur. Parry says that the skeleton of a Hudson Bay Lemming was found on a floe north of Spitsbergen, at "81° 3/4 N", and more than 60 miles distant from the nearest known land (46 : 190).

Heuglin refers to this skeleton and says that the lemming will occasionally come to Spitsbergen over the ice. He also says that he had often found nests of lemmings in Adventdalen in "summery places", and that a harpooner told him that he had dug out lemmings in the same part of the country (132 : 8).

Hinton says about the Greenland Lemming, *Dicrostonyx torquatus* Pallas; "No material has ever been seen from Spitsbergen" (429 : 138).

During my visits to Svalbard in eight summers, I have looked very hard for any signs of lemmings, but although I have travelled almost all the way around the island of Vestspitsbergen and have also been in several other parts of Svalbard, I have never seen a lemming there, dead or alive.

It seems to me that Mr. Johnsen is right when he says: "On the other hand it is possible that the birds observed in Spitsbergen must be looked upon as immigrants from the continent or Novaya Zemlya, birds which have left the country after a lemming year and in their search for food . . ." (505 : 32). What he says about the birds leaving their home after a lemming year seems to me to be significant, for in my opinion, though I can only judge from what I have seen in Norway, the Snowy Owl will not breed when there is not an abundance of small rodents.

There are lemmings in Novaya Zemlya and in Greenland, and the Snowy Owl breeds in both places, and it is interesting to observe what happens in a lemming year in Novaya Zemlya.

Schaanning, who visited Novaya Zemlya in 1902/3, says that only a single Snowy Owl was seen in 1902 (on 18 December), but in 1903 the species was breeding there in great numbers. On the southern shore of Matotschin Schar, near the hut where he lived, at least 30 pairs were breeding. In the winter of 1903 the owl lived almost exclusively on Black Guillemots. But on 25 May 1903 the first Lemmings, *Lemmus torquatus* and *L. obensis,* were seen, and from that time the owl lived on them. Between 18 and 21 June there was a great emigration of *L. obensis* from the district (348 : 155).

Johnsen also quotes Løppenthin who thinks that the Snowy Owl in Greenland breeds in districts in which the Greenland Lemming does not occur (482 : 126). But in a more recent publication Salomonsen expresses another opinion. He says: "In Greenland the breeding-range of the Snowy Owl is restricted to the high-arctic region, or rather to the area inhabited by the Collared Lemming (*Dicrostonyx groenlandicus*) . . . Outside the region mentioned above the Snowy Owl does not breed, but is a regular visitor in small numbers, most commonly in winter. It is not worth while mentioning the various rumours of breeding in W Greenland, which have never been proved, in spite of reputed records of 'downy young' sometimes described by older authorities" (588 : 462).

From Spitsbergen there is not even a rumour of young in down, and it is quite clear to me that the bird does not breed there. I must say that I disagree completely with Mr. Pleske when he says "I must forever revoke the supposition that it only breeds in those regions that are abundantly peopled by Lemmings (*Lemus* and *Dicrostonyx*)". He thinks that the bird is likely to breed in the northern and eastern parts of Spitsbergen, which he says, "have hitherto been only imperfectly explored" (448 : 162). Since that was written (1928), there have been several expeditions to this "corner" of Spitsbergen, but neither the Snowy Owl itself, nor even its nest, has been found there.

F o o d. — In Spitsbergen the Snowy Owl lives on Little Auks, Ptarmigan and carrion. Without doubt it will also take other birds such as Black Guillemots, which it is known to take in Novaya Zemlya. It has also been seen attacking a fox and in one instance a Snowy Owl probably killed a fox.

Plautus alle: On 2 July 1894 Mr. Feilden found pellets of the Snowy Owl in Adventfjorden which consisted exclusively of the remains of Little Auks. On 8 July 1894 he received an owl shot on Amsterdamøya, and the stomach of this bird contained only Little Auks (189 : 90).

Lagopus mutus hyperboreus: A specimen shot in Mosselbukta 13 October 1872 contained nothing but lead shot. Nordenskiold thinks, quite rightly in my opinion, that the lead shot originated from wounded Ptarmigan (138 : 42). On 23 March 1889, Mr. Pike saw a Snowy Owl on Danskøya which had killed a Ptarmigan and was eating it (Chapman 195 : 348). Kristoffersen relates that in December 1923 two owls were following a wandering flock of Ptarmigan on the north side of Hornsund. He says also that the trappers had told him that the big owls lived on Ptarmigan during the winter and frequently followed the wandering flocks (432 : 193).

Dalgety and coll. say that in the winter of 1929/30, large numbers of Snowy Owls were said to have occurred in Spitsbergen, and they continue: "Their number were doubtless due to the exceptional abundance of Ptarmigan" (740 : 245). On 22 March 1932 the trapper Georg Bjørnnes saw a Snowy Owl which had caught a Ptarmigan at the glacier Sørbreen in Wijdefjorden (1931/32, 636). On 28 August 1933 he saw another owl, which tried to take a flying Ptarmigan, but missed. On 2 October in the same year, he found a badly mauled Ptarmigan, which had undoubtedly been in the claws of a Snowy Owl (1932/33, 636). The trapper Hilmar Nøis writes on 31 January 1937: "The Snowy Owl takes Ptarmigan, but we take the owl in traps" (1936/37, 642 a).

Cepplus grylle mandtii: In Spitsbergen the owl has not been seen catching Black Guillemots, but in Novaya Zemlya Schaanning says that Black Guillemots were the main source of food for the owl in the winter 1902/03, although only the head was eaten (348 : 155).

Carrion: Malmgren relates that a Snowy Owl was shot on 10 July 1861 near Verlegenhuken. The bird was sitting on an ice-floe out at sea, and it is said that this was because some corpses of dead walrus were lying about on the ice (85 : 114). When skinned, the bird was seen to be in an excellent condition, but nothing is said about whether or not it had eaten any carrion. It seems very probable that it had done so, for Kristoffersen saw a Snowy Owl in Hornsund on 8 December 1923, flying up from a place where it had been feeding on the remains of a seal (432 : 193).

Fox: The trapper Hilmar Nøis saw two owls attacking a fox in Sassen on 6 November 1938. The fox ran away and was pursued by the birds (1938/39, 642 a). On 3 October 1933 the trapper Georg Bjørnnes found a dead fox in Wijdefjorden, lying in almost exactly the same spot as he had found a wounded Ptarmigan the day before. The fox had a large hole behind one ear, and Bjørnnes thought that the animal must have been killed by a Snowy Owl (1933/34, 636). At first sight this may seem improbable, but in fact it is no more remark-

able than the killing of a fully grown red fox by an Eagle Owl. Of this occurrence we recently had proof, for on 2 August 1955 at Ringerike in Norway, Fossheim saw an Eagle Owl with a freshly killed fox that it lifted from the ground and carried away for 100 yards. On the spot from which the owl flew up, there were signs of a fight (619 a : 102).

No. 73. *APUS APUS APUS* (L.)

The Swift

A Swift was caught on the coast of Spitsbergen in the summer of 1891 (Collett 174 : 174).

No. 74. *UPUPA EPOPS EPOPS* L.

The Hoopoe

Collett states that the Hoopoe has been found once in Spitsbergen (113 : 539).

In a letter to H. E. Dresser Collett says: "I give the following note, for the correctness of which I can vouch. In August 1869, Mr. H. Friele of Bergen (a zealous ornithologist . . .), visited Hammerfest, and found there, in the possession of a ship's captain, a specimen of *Upupa epops,* which he had caught in the summer of 1868 on Spitsbergen in good condition" (115 Vol. V : 185).

No. 75. *EREMOPHILA ALPESTRIS FLAVA* (Gm.)

The Shore Lark

The first record is from Hornsund, where Kristoffersen shot a specimen on 11 October, 1923 (432 : 194).

The second bird was seen by Professor Hennicke in Grønfjorden on 10 August, 1925 (462 : 80).

These are the only records for this species from the Svalbard area, but according to Bruce, the bird was obtained on Franz Josef Land as early as 1897 (207 : 91).

No. 76. *HIRUNDO RUSTICA RUSTICA* L.

The Swallow

According to Newton, a Swallow was seen by the men of Mr. Arthur Campbell's party in Colesbukta in Isfjorden during the summer of 1874 (137 : 272).

Bianchi relates that a Swallow (*Hirundo sp.*) was seen on board the steamer *Bakan* in Hornsund on 11 June 1900 (253 : 311).

According to Johnsen, an exhausted Swallow came aboard the ship *Michael Sars* on 29 June 1928, at 73° 30′ N, 13° E i. e. to the SW of Bjørnøya (505 : 46).

In 1954 Løvenskiold was told that for a long time during that summer there had been a pair of Swallows in Longyearbyen in Adventfjorden. After

a period of bad weather one of them was found dead by Mr. Kåre Pedersen, who sent it to the museum in Tromsø (1954, 633).

Rapp relates that a Swallow was seen by Swedish geologists in Sassendalen in July 1954 (621 : 137).

Askheim writes that Swallows had been observed on Hopen during the summers of 1954, 1955 and 1956 (1957, 649).

Løvenskiold was told that the Meteorological Station on Bjørnøya was visited by a Swallow in the summer of 1957 (1958, 633).

No. 77. *DELICHON URBICA URBICA* (L.)

The House-Martin

The Spitsbergen Gazette writes:

"In the first days of July 1897 a ship came to Adventfjorden in Spitsbergen, with a House-Martin that had come aboard near Bjørnøya a couple of days previously. The species was recognized by the painter Mr. Eckner" (202 : 98).

In 1950 Løvenskiold was told by the steward, Henry Rudi, on the radio-station at Kapp Linné at the entrance to Isfjorden that a pair of Martins had had their nest over the entrance to the mess-room at Barentsburg colliery (then Dutch) in 1924. Barentsburg (now Russian) is situated in Grønfjorden, the first southern branch of Isfjorden. There is of course now very little to support these observations, but there is no reason why they should not be believed, especially as the Martin has been collected in the area.

On 4 August 1950, a House-Martin was found dead on the floor in a trapper's hut in Hyttevika north of Hornsund on Vestspitsbergen. No doubt the bird had found its way into the hut earlier in the year (615 : 13).

A live House-Martin was caught in one of the rooms at the Meteorological Station on Bjørnøya on 26 June 1958 (1958, 633).

No. 78. *CORVUS CORAX CORAX* L.

The Raven

The Raven is resident in most European countries, and it has occurred in Novaya Zemlya. In Asia it is found in Siberia and Armenia east to Afghanistan. A great many forms are known.

There are a few reports of the Raven having been seen in the Svalbard area.

Johnsen says that Mr. Sven Sømme, a Norwegian zoologist, met Mr. Ullring, radio-operator on Bjørnøya in 1928. Mr. Ullring told him that he had observed a pair of Ravens for some time on Bjørnøya in 1927 or 1928 (505 : 46).

Martens reports that he had been told that a black crow had been seen in Spitsbergen (12 : 71). In the ornithological literature on Spitsbergen many authors have referred to this bird as a Raven.

Newton says that Mr. Arthur Campbell visited Spitsbergen during the summer of 1874. The sailors of his ship reported having seen a Raven there (137 : 272).

In an obituary on the Norwegian farmer, Mr. Hans Nordby, Professor Nathorst mentions that Mr. Nordby once had seen a Raven in Sassendalen (356 : 272). Professor Nathorst had known Mr. Nordby for a long time, and vouched for his reliability.

CORVUS CORONE CORONE L.

The Carrion-Crow

Bianchi says that Dr. A. A. Bunge saw a bird which he identified as a Carrion-Crow in Hornsund on 29 May 1900 (253 : 309).

Mr. Bianchi and several other ornithologists suggest that the bird was a Rook, which is more probable.

In the ornithological literature on Spitsbergen the bird seen by Dr. Bunge has been referred to both as *C. c. corone* and *C. f. frugilegus,* but of course it can only be one of them. Therefore the Carrion Crow must be excluded from the avifauna of the Svalbard area. See also what is said about the distribution of the Rook.

No. 79. *CORVUS CORONE CORNIX* L.

The Hooded Crow

Even if no specimen has been collected in the Svalbard area, it is highly probable that the Hooded Crow has been observed, both on Bjørnøya and in Spitsbergen. But several authors are of the opinion that the dark phase of the Arctic Skua has been mistaken for the Hooded Crow.

Observers from the Norwegian coast who have seen crows in Svalbard know both phases of the Arctic Skua, and they will also know the Hooded Crow, which is a very common bird where they live.

Fries and Nyström and Isachsen say that the Norwegian skipper Mr. Tobiesen saw a Hooded Crow on Bjørnøya on 30 March, 1866, and perhaps the identical bird again on 30 May (109 : 40) and (440 : 60, 65).

Johnsen has published the diary notes of Mr. Ullring, radio operator on Bjørnøya, which he gave to the Norwegian zoologist Sven Sømme, who visited the island in 1928. Here Mr. Ullring says that he saw a Hooded Crow on Bjørnøya in 1928 (505 : 47).

Nathorst reports that Mr. J. G. Andersson had seen a Hooded Crow in Ingebrigtsenbukta in Van Keulenfjorden on 1 July, 1898. This was confirmed by the crew of a small whaler, but Nathorst himself thought they had seen the dark phase of the Arctic Skua (243 : 157).

Bianchi reports that Dr. A. A. Bunge saw a Hooded Crow in Gåshamna in Hornsund on 29 May, 1900 (253 : 308).

Dalgety, McNeile and Ingram say that a Hooded Crow was found dead in Adventfjorden in the spring of 1930 (470 : 245), and according to Johnsen a Hooded Crow was seen near the houses in Barentsburg in Grønfjorden in the first few days of April, 1930. The bird was shy and it was constantly pursued by sea-birds. On 26 April it had disappeared (505 : 26). Perhaps this is the same specimen which is referred above.

Mr. Askheim heard from the staff at the meteorological station on Hopen that a Hooded Crow had been observed there about 1 July, 1954 and another one in 1956 (1957, 649).

No. 80. *CORVUS FRUGILEGUS FRUGILEGUS* L.

The Rook

Of the two crows which, according to Bianchi, were seen by Dr. Bunge in Gåshamna in Hornsund on 29 May, 1900, one was a Hooded Crow and the other was a black one (253 : 309), but several authors, for example Bianchi, le Roi and Jourdain, suppose that the black crow was a Rook. As the species has been found occasionally in Greenland, Iceland, Lappland and Novaya Zemlya, it is by no means improbable that it should also occur in the Svalbard area.

Schaanning has a record of the Carrion Crow from Sør-Varanger in Finnmark, Norway (351 : 82), but this bird has never been found in Greenland, Iceland, Lappland and Novaya Zemlya and it is not likely that it has ever occurred in the Svalbard area.

No. 81. *TURDUS PILARIS* L.

The Fieldfare

The Fieldfare has been found five times in Spitsbergen, three times in October and once in November. These birds had probably been blown north by a heavy wind or storm. That they should go so far north of their own free will on the autumn migration does not seem possible.

The first record is from the summer of 1908, when Högbom found a dead Fieldfare in Hornsund, in the ruins of a house in Gåshamna (295 : 47).

Nordberg found a dead Fieldfare in Spitsbergen in 1914, and sent it to Professor Nathorst in Stockholm. The bird had come to Camp Millar on the north side of Bellsund in November 1913, where for some days it stayed near the houses. The following year it was found dead between two packing-cases (340 : 231).

Kristoffersen saw a Fieldfare in Hornsund on 8 October 1923, and shot the bird on the 11th. He also saw one at Sørkapp on 19 October 1929 (432 : 194) and (472 : 249).

Peder Åm, caretaker in Ny-Ålesund in Kongsfjorden saw two Fieldfares in the mining town on 26 and 27 October 1935 (646, 1935/36).

Lønø, who wintered on Edgeøya 1954/55, found a dead Fieldfare at Negerpynten in the autumn of 1954. He presented the bird to Dr. Løvenskiold (647, 1954/55).

No. 82. *TURDUS ILIACUS ILIACUS* L.

The Redwing

According to Johnsen the Redwing has been found in the Svalbard area both in autumn and in spring. It is possible that the bird found there on spring migration belongs to the Icelandic race *Turdus iliacus coburni* Sharpe, and that the bird which appears there in autumn is the nominate form from Scandinavia (505 : 24).

Bianchi says that Dr. Bunge caught a male Redwing in Gåshamna in Hornsund on 20 October 1899. The bird was completely exhausted and had possibly come to Spitsbergen from the south with a heavy snowstorm, which started on 18 October (253 : 311).

Collett says that several Redwings were seen in Bellsund in October 1908 (299 : 5).

According to Nathorst a dead and dried-up Redwing was found in Grønfjorden in the summer of 1913. The bird was presented to the Riksmuseum in Stockholm (330 : 289).

Van Oordt says that a dead Redwing was picked up by Mr. Brown near Kapp Wijk in Dicksonfjorden on 13 July 1921 (370 : 138).

Kristoffersen shot a female Redwing in Gåshamna in Hornsund on 8 October 1923. With a wing-length of 115 mm it seems that this bird must have belonged to the Scandinavian race (432 : 194). In 1929 Kristoffersen found a dead Redwing at his headquarters on Sørkappøya on 27 September (472 : 249).

Peder Åm, caretaker at Ny-Ålesund in Kongsfjorden, saw small flocks of Redwings near the mining town on 25 and 27 October 1935. He shot one of the birds and gave it later to Dr. A. Hoel, who presented it to the Zoological Museum in Oslo (1935/36, 646).

Løvenskiold obtained two skins of Redwings from Lønø, who wintered on Edgeøya in 1950/1951. He had found them dead at Negerpynten on 12 October 1950. Both the birds had a wing-length of 117 mm. and their colouring also showed that they belonged to the race *Turdus i. iliacus*. Lønø also spent the winter 1954/55 on Edgeøya and again saw Redwings there. He shot one on 11 October 1954. This was a female belonging to the Scandinavian race, with a wing-length of 120 mm. He saw the other bird for the last time on 12 November 1954. Both birds used to sit outside the hut and pick up pieces of meat from around the chopping-block (1954/55, 647).

No. 83. *TURDUS ILIACUS COBURNI* Sharpe

The Iceland Redwing

Le Roi says that he found the remains of two specimens of Redwings at Mr. Tobiesen's house on Bjørnøya on 13 ond 14 July 1907. He found the birds to be of a darker colour than birds collected by himself in Tromsø in Norway. The feathers on the flanks especially were far more intensively coloured and

also more brown than in the Norwegian birds. But, he says, with the warm brown of the whole upper side, the birds can be nothing but *Turdus iliacus* 316 : 145). Le Roi, of course, knew nothing of a dark-coloured Icelandic race.

Johnsen thinks that the birds on spring migration belong to the Icelandic race, and those found in the autumn to the Scandinavian birds. He got a Redwing from Mr. Koefod, who brought it home from Bjørnøya where it had been found dead in Austervåg. It was a female with a wing-length of 120 mm, and compared with Norwegian birds, it was darker than these. Mr. Johnsen concluded that it belonged to the Icelandic race (505 : 24).

No. 84. *TURDUS MERULA MERULA* L.

The Blackbird

Le Roi states that the remains (left wing, the rectrices and some small feathers) of a Blackbird were found at the house of Mr. Tobiesen on Bjørnøya on 13 July 1907. The bird was a female (316 : 145).

Johnsen heard from Dr. A. Hoel in a letter dated 3 June 1930 that a Blackbird was caught by a dog in Grønfjorden on 26 April 1930. The dog belonged to the director of the radio station, Mr. Bowitz-Ihlen, who sent the bird to the Zoological Museum in Oslo, where it was identified as a female Blackbird (505 : 25). See also Dalgety (470 : 245).

In the Oslo newspaper *Aftenposten* for 4 December 1953, there is a note on Blackbirds in Spitsbergen. Here it is stated that in the last week of November 1953, a flock of ten Blackbirds came to Longyearbyen in Adventdalen, and simultaneously three birds arrived at Ny-Ålesund in Kongsfjorden. The birds sought shelter in the houses because of a snowstorm, but although the people of the mining towns tried to save them, they all died after some days (607).

Bateson reports that an adult cock was seen at the weather station at Kapp Linné on 15 August 1958 (1959, 651).

No. 85. *OENANTHE OENANTHE* subsp ?[1]

The Wheatear

Geographical distribution

The Wheatear is a holarctic species. The nominate form breeds in Norway, Sweden, Finland, Russia and Novaya Zemlya. From this northern range it goes south to Portugal, N Spain, S France, Italy, Sicily, Greece and S Russia, and to Asia Minor, Syria, N Persia and from the Aralo-Caspian Region to Altai and Siberia. It occurs in Waigat, Kolguev, Yamal and also in the Canaries. It is replaced by allied races in the Færoe Islands, *Oe. oe. schioleri* (Salom.), in Iceland, Greenland and Arctic Canada, *Oe. oe. leucorrhoa* (Gm.). In S Spain and Pityusae Isl. it is replaced by *Oe. oe. nivea* (Weigold) and in the Atlas range by *Oe. oe. seebohmi* Dixon. There are also other races.

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[1] Contour map showing distribution, see backflap.

Occurrence in Svalbard

Only a few specimens are recorded from the Svalbard area. The bird has occurred on Bjørnøya, in Hornsund, Bellsund and in Isfjorden (where it was breeding), and also in Kongsfjorden and on NW Spitsbergen.

The first record is from 1891 and there are records of breeding from 1954 and 1957.

Measurements

Only four Svalbard birds have been measured. One, a male found on 20 October 1908, according to Collett, had a wing-length of 105 mm (299 : 5). Le Roi gives the wing-lengths of 3 females, also from 1908, as 97, 99 and 103 mm (316 : 144).

Salomonsen gives the following average wing-lengths (588 : 472):

Greenland	36 ♂♂	105.00 mm	37 ♀♀	103.37 mm
Iceland	49 ♂♂	102.55 mm	23 ♀♀	98.81 mm
Færoes	22 ♂♂	99.61 mm	13 ♀♀	97.54 mm
Scandinavia	36 ♂♂	96.38 mm	36 ♀♀	93.22 mm

As the average wing-length for the three females from Spitsbergen is 99.67 mm and the only male measures 105 mm, it seems possible that these birds may belong to the race *Oe. oe. leucorrhoa* (Gm.), which is found in Iceland and Greenland.

In the Zoological Museum in Oslo there are three females, obtained in Norway, which also seem to belong to this race. They probably arrived in Norway on migration from Spitsbergen and this seems more credible than that they should have been of Icelandic origin. See also Salomonsen (438 : 204).

Now Hortling and Baker say that the birds on the Fisher Peninsula seemed to them to be exceptionally large and dull-coloured (*Oe. oe. leucorrhoa?*), but no measurements are given (479 : 110).

This is perhaps the form referred to by Professor Hans Johansen when he writes of *Oe. oe. oenanthoides* ". . . over- and underside in all plumages relatively dark. Distributed in the Tundra and the Wood-Tundra from the Kola Peninsula to Alaska" (614 : 334).

Johnsen, however, says that Pleske (448 : 158) found that the birds farther eastwards at the mouth of Yenisei and Lena belonged to the typical form. Reasoning from this, Johnsen thinks that the Spitsbergen birds must belong to a new race found on the continent (Fisher Peninsula) and on Spitsbergen (505 : 31). But perhaps Pleske has made a mistake in identifying the specimens from Yenisei and Lena. There is too little material from Spitsbergen for the race of the birds to be determined.

Distribution. Sections I–VII

S e c t i o n I. B j ø r n ø y a. — According to Munsterhjelm a Wheatear came aboard his ship on 12 May 1910 at 74° 50′ N, 11° 43′ E, i. e. to the west and a little to the north of Bjørnøya. It rested for a while and then disappeared to the NE (313 : 2).

Bertram and Lack saw two specimens on the island, one on 27 June and the other on 4 July 1932 (488 : 290).

S e c t i o n II. H o r n s u n d. — In this fjord two specimens have been observed, one according to le Roi on 25 June 1908 (316 : 144), and the other according to Dalgety and coll. on 18 June 1930 (470 : 245).

S e c t i o n III. B e l l s u n d. — Collett relates that a flock of six Wheatears was seen near some houses in Bellsund on 20 October 1908, and some others were seen at the same time near the mountain Kolfjellet in Van Mijenfjorden (299 : 5). According to le Roi two specimens were seen in Van Keulenfjorden on 14 June 1908 (316 : 144), and Liestøl found two dead specimens at his hut near Finsterwalderbreen on 25 June 1956 (1959, 653).

S e c t i o n IV. I s f j o r d e n. — Dalgety and coll. relate that one bird was seen in the fjord on 26 June 1930 (470 : 245), and Rapp found a female with young in Longyearbyen on 4 August 1954 (621 : 137).

Bateson relates that five birds were observed on Hotellneset near Longyearbyen on 22 August 1957. Of these at least two were immature birds. Birds in juvenile plumage were seen here again on 27 and 29 August (1957, 650).

S e c t i o n VI. K o n g s f j o r d e n. — Mathey-Dupraz saw one pair on 29 July 1910 (333 : 94).

S e c t i o n VII. NW S p i t s b e r g e n. — Le Roi relates that a Wheatear was seen in Magdalenefjorden on 21 June 1908 (316 : 144). Mathey-Dupraz saw a pair in the same locality on 25 July 1910 (333 : 94). Bateson saw an adult bird at Biskayerhuken on 11 August 1957 (1957, 650).

Collett relates that one bird came aboard an icebound ship near the island Moffen in latitude 80° N in the summer of 1891. The bird was caught and sent to Tromsø Museum (174 : 174).

Biological

B r e e d i n g. — An electrician from the mining company, Hjalmar Johansen, told Løvenskiold at the end of August 1954 that he had seen a family of Wheatears near the cow-shed in Longyearbyen about 1 August that year. These must have been the same birds as those referred to by Rapp (see above, section IV).

F o o d. — Owing to the scantiness of the material, very little is known about the food of the Wheatear in Spitsbergen. But le Roi says that the stomachs of the specimens shot by him were filled with *Diptera* and their larvae, *Acarida,* numerous spiders, a few particles of moss and phanerogamic plants and a few very small stones.

Brown records from Greenland that he saw Wheatears alighting on the back of Walruses and picking parasites such as *Haematopinus* off them. In the Davis Strait he saw the birds feeding on these parasites in places on the ice where the Walrus had succeeded in getting them off (102 : 430).

No. 86. *ANTHUS SPINOLETTA* subsp?

The Rock-Pipit

According to Fries and Nyström, a small pipit, probably a Rock-Pipit, came aboard the sailing schooner *Severine,* when it had passed Bjørnøya on 20 September 1868. The bird rested on the ship and disappeared the following day (109 : 205).

This observation seems to be quite different from the record provided by Holmgren, who was on board the same schooner. He says: "When, on the homeward journey we had passed Sydkapp, the southernmost point of Spitsbergen, several Snow-Buntings came close to the ship, and among them an *Anthus* (very probably an *A. obscurus)*" (110 : 5).

In the first instance, therefore, a bird is described as coming on board the ship and staying overnight, and in the other, the bird was seen merely in the vicinity of the schooner.

As Professor Holmgren and Dr. Fries were sailing on the same ship, it is difficult to decide whether they are referring to the same bird, but on the other hand it cannot be denied that we may be concerned with two different birds.

Since there were several scientists on the schooner, including not only Professor Holmgren but also Dr. Malmgren, it is highly probable that the bird (or birds) was a Rock-Pipit.

It might have been either *Anthus spinoletta petrosus* (Montague) or *Anthus spinoletta littoralis* Brehm. Both of these have been found on the northern coasts of Norway.

No. 87. *MOTACILLA ALBA ALBA* L.

The White Wagtail

This species has been recorded only once from the Svalbard area.

Dr. Løvenskiold, who visited Bjørnøya during the summer of 1958, was told that the people who had wintered there had seen a Wagtail at the meteorological station the year before (1958, 633).

No. 88. *STURNUS VULGARIS VULGARIS* L.

The Starling

Le Roi reports that the remains of a Starling were found near Mr. Tobiesen's house on Bjørnøya on 14 July, 1907. There was so much left of the wings and the feathers that it could easily be seen that the bird had been a Starling (316 : 142). This is the first record for Bjørnøya.

Johnsen reports that Mr. Sven Sømme, who acted as a zoologist to the Norwegian *Michael Sars* expedition, was told by Mr. Ullring, radio operator on Bjørnøya, that several Starlings had arrived early in the year on the island in 1927 (505 : 47).

Bertram and Lack report that a pair of Starlings were present in Tunheim on Bjørnøya from 20 June to 10 August, 1932. They were constantly seen feeding on the rubbish heaps. A nest was made in a hole high up on one of the houses, but no eggs were laid. The nest was brought to England where Kinnear confirmed that it was a genuine Starling's nest. The birds were not molested (488 : 289).

Duffey and Sergeant report that the meteorologists on Bjørnøya had seen a pair of Starlings in April 1948, and later in the month a single specimen. They remained a few days in each case, but were eventually found dead. The weather was severe at the time and food probably difficult to find (586 : 556).

Duffey and Sergeant report that the meteorologists on Bjørnøya had seen a Starling at the station in Herwighamna in the summer of 1957. In 1958 no Starling was seen (1958, 633).

Until 1925 no Starlings had been seen in Spitsbergen, but that year Mr. Devold visited the trapper Quarnström at Kvadehuken W of Ny-Ålesund in Kongsfjorden. Quarnström told him that a Starling had arrived at his hut in April 1925, together with the Purple Sandpiper. The trapper had fed it, but the bird had died after some days with a temperature of 20° to 30° C below zero. Devold reports that the trapper gave him the bird, which he brought back to Norway (545 : 40).

This is the only record for Spitsbergen.

No. 89. *CARDUELIS FLAMMEA* subsp?

The Mealy Redpoll

Contrary to the statement made by Trautsch, the Mealy Redpoll does not occur in Spitsbergen. Hornemann's Redpoll is the only species known there (217 : 363).

The only record from the Svalbard area comes from Bertram and Lack, who saw the bird on Bjørnøya: "On 20 June [1932] a dark-breasted female Redpoll, clearly a *A. flammea,* and not the much whiter *A. hornemanni,* was seen at close quarters on the north face of Miseryfjell, but not obtained. One 24 June a solitary juvenile was shot at Tunheim. This was also a *A. flammea,* and as its wing measured only 69 mm it was clearly not the Greenland Redpoll (*A. f. rostrata* (Coues)) and, therefore, must have been the Mealy Redpoll (*A. f. flammea* (L.)) or the doubtfully distinct *A. f. holboelli* (Brehm). (The head was, unfortunately, shot away, so it may have been either of the latter.) It would be remarkable for a juvenile to fly some 240 miles northwards as soon as it had fledged, and therefore, the species probably bred on the island or in Spitsbergen" (488 : 289). This is the first record for Bjørnøya and for the Svalbard area as a whole.

Mr. Johnsen refers to the above paper and says: "On the other hand, it seems remarkable that on this barren island the young were fledged as early as 24 June, especially as the snow, it is said (p. 285), lay almost everywhere until 10 June in 1932. On the continent, however, Redpolls have been known to lay in May and even April, but these early nests have always been found in wooded

districts as in Pasvik, in East Finnmark where Schaanning reports finding eggs of *A. l. holboelli* as early as 6 April" (505 : 70).

Until a nest with eggs or young is found, or young birds incapable of flying, we shall not know for certain whether the species is a breeder on Bjørnøya or not.

No. 90. *CARDUELIS H. HORNEMANNI* (Holb.)

Hornemann's Redpoll

First record

The first and only time the existence of this bird in Spitsbergen has been definitely proved, was in 1873 when Eaton found and shot a specimen in Wijdefjorden. It is possible that the species has been seen there on other occasions, but of this there is no absolute proof.

Records in chronological order

On 15 June 1766 when Čičagov's ship was at 78° 15′ N, 18° 08′ E, or as he says himself, 42 German miles from Bellsund, a small land-bird, which resembled a Siskin, came aboard at 12 o'clock. Čičagov thinks that the bird must have come from Greenland, because the species is unknown in Spitsbergen, but he adds in parentheses: "(Who is, however, able to confirm that this bird is an inhabitant of Greenland?)" (26 : 69).

When this was written, the Ferro meridian was in use and by modern reckoning the ship's position was therefore 0° 29′ E, i. e. between Greenland and Spitsbergen, but nearer to the latter.

The bird could not have been been a Snow-Bunting because Čičagow knew that it had not been found in Spitsbergen. He says that the bird resembled a Siskin, but in the German translation of his book there is no indication of what Čičagov has called the bird in the original Russian. It is not impossible that it was a Hornemann's Redpoll.

On 23 July 1818 Scoresby jun. landed on the shore of the north side of the entrance to Kongsfjorden (Kings Bay) and near to Kapp Mitra. Here he saw the "Crimson-headed Sparrow (*Fringilla flammea*)" (40 Vol. 1 : 131). On p. 537 he says: "*Fringilla linaria.* Lesser Redpole. On our approach to Spitzbergen, several of this species alighted on different parts of the ship, and were so wearied apparently with being on the wing, though our distance from the land was not above ten miles, that they allowed themselves to be taken alive."

Most of the ornithologists writing about this case agree that Scoresby must have mistaken young Snow-Buntings for redpolls, and they seem to be right: the birds seen at Kapp Mitra and also those which came aboard the ship were almost certainly not redpolls.

Hornemann's Redpoll is a sedentary bird, and on the few occasions it has been found outside the Polar Regions, it has certainly not been found in flocks. Both of Scoresby's observations must therefore be regarded as more or less unreliable, although we cannot absolutely deny that Scoresby did see a redpoll in the area.

Mandt mentions *Fringilla linaria* as an inhabitant of Spitsbergen (42 : 4).

Sundevall says that the bird could not find sufficient food in Spitsbergen and denies that it exists there (65 : 22). Torell puts the bird in a list of Spitsbergen birds (73 : 50). Quennerstedt says that the existence of the bird in Spitsbergen is problematical (81 : 18). Malmgren and Newton both judge that the existence of the species in the Spitsbergen area is impossible (85 : 117) and (96 : 502).

Eaton was the first to produce the absolute proof of the species as an inhabitant of Spitsbergen (130 : 3806).

On 27 May 1873 a redpoll which he identified as "*Linota linaria*" came aboard his ship, then in the western ice at 75° 13′ N and 2° 30′ W. However, this is nearer to Greenland than to Spitsbergen and probably therefore the bird was on its way to Greenland.

On the sixth Sunday after Trinity [20 July] 1873, Easton and his companion Mr. Kidd, landed somewhere on the eastern shore in Wijdefjorden, went far into a valley and climbed a mountain-side. Here a redpoll flew past. It was then heard singing and eventually shot. Then the author continues: "Apparently the redpolls are not uncommon in that part of Wijde Bay. Our men saw five or six on the uplands in the same neighbourhood. They also found a nest upon the ground, containing four eggs, blue spotted with reddish, which were possibly Redpolls' but may have been Snow-Buntings'. As they were hard set they did not bring them to me. The crop of the example shot by Kidd was full of small seeds".

In Dresser, *History of the Birds of Europe,* Vol. IV, published 1876, there is a coloured illustration of the species. Dresser says that the specimen used as a model was "ex Mus. Cantabr." i. e. Cambridge, and that it was shot in Spitsbergen on July 20th, 1873, and brought back by Mr. Eaton.

Kolthoff denies the existence of the bird in Spitsbergen, but he cannot have known of this publication (261 : 97). Schalow is also in doubt as to the occurrence of this species in the area (271 : 247).

Le Roi says that Eaton most certainly found the bird in Spitsbergen, but he doubts whether it was breeding there. The nest, he thinks, must have belonged to a Snow-Bunting (316 : 154). Nathorst discusses the problem, but arrives at the same conclusion as le Roi (347 : 204).

The nest found by the men of Eaton's party is said to have been placed on the ground. This is very interesting because the Snow-Bunting does not build its nest openly on the ground. (Le Roi refers to an open nest found on Dunøyane, but this is the only instance I have heard of.) Usually the Snow-Bunting's nest is extremely well hidden, under a big stone or in a hole or in a fissure in the rock, and in most cases it is very difficult to get at. It is also stated that the eggs which were found were blue, spotted with reddish, and the colour of the Snow-Bunting's eggs is hardly blue: They are more pale-blue or blue-white. I have not seen the eggs of Hornemann's Redpoll, but those of *Carduelis flammea* are certainly blue spotted with reddish, and not at all pale-blue, especially when seen in the nest. It is not absolutely impossible, therefore, that this nest did belong to *Carduelis hornemanni.* It is difficult to understand why it should be thought impossible for the bird to breed in Spitsbergen, when it is found far into the mountains of Greenland, so far inland that the species,

as Salomonsen relates, is seldom seen by expeditions (588 : 516). So far, of course, there is no absolutely reliable evidence of the breeding of the species in the Svalbard area, but I am confident that the actual proof will be produced sooner or later.

In this connection, there is a much more recent observation which should be mentioned. In 1948, Mr. Solheim, topographer at Norsk Polarinstitutt in Oslo, was engaged in taking measurements on the mountain Agardhfjellet on the east coast of Spitsbergen in the first half of August. On the top of the mountain there is a fairly thick layer of red sandstone with holes in it. Most of the holes were occupied by Mandt's Guillemots, but in one hole there was a pair of small birds with a nest in which young birds were being fed. Mr. Solheim described the bird as being somewhat smaller than a Snow-Bunting, and having a red plate or cap on its head. The birds were not at all shy, but hopped about near Mr. Solheim and his assistants when they worked with a theodolite on the mountain-top. Almost certainly this bird was *Carduelis hornemanni,* and I am sorry that it has been impossible for me to go to Agardhfjellet to investigate.

In the summer of 1954, when from 6 July to 23 August I stayed in Wijdefjorden, several excursions were made to look for Hornemann's Redpoll, but none were seen. Eaton does not describe exactly where he found his bird, and as the fjord is 120 km long, we could of course only search a few places.

No. 91. *LOXIA CURVIROSTRA CURVIROSTRA* L.

The Scandinavian Crossbill

Fries and Nyström relate that a small flock of the Scandinavian Crossbill was seen on Bjørnøya in 1868 (109 : 205). Malmgren relates that he shot two of them (111 : 230). Sundevall says that they were seen on 25 July, and that they were probably a pair of adults with their offspring (133 : 17). Holmgren states that the two specimens shot by Malmgren had eaten nothing but insects (110 : 5).

This is the only record for the Svalbard area.

No. 92. *EMBERIZA CITRINELLA CITRINELLA* L.

The Yellow Bunting

Mr. Ullring, radio operator on Bjørnøya, saw two or three Yellow Buntings on the island in (probably) 1928 (Johnsen 505 : 47).

This is the first record of the bird from the Svalbard area.

CALCARIUS LAPPONICUS LAPPONICUS (L.)

The Lapland Bunting

As early as 1860 Walker says: "This bird is generally found associated with the preceding *Plectrophenax nivalis,* and, like it, reaches so high north as Spitzbergen, and as far west as Behring Straits" (75 : 62).

Although the species, according to Bruce, has been found in Franz Josef Land (207 : 91), it has in fact never been observed in Spitsbergen.

No. 93. *PLECTROPHENAX NIVALIS NIVALIS* (L.)[1]

The Snow-Bunting

Geographical distribution

The Snow-Bunting is a holarctic species and it is found on Jan Mayen, Iceland, the Faroe Islands, Svalbard, Kolguev, Waigatz, Novaya Zemlya, Franz Josef Land, Norway, Sweden, Finland and Russia. It is further found in Siberia, in arctic North America and in Greenland.

Salomonsen says that the Snow-Bunting in Spitsbergen seems to belong to the nominate form. This race is found breeding in the northern parts both of America and of Eurasia. The form *P. n. subnivalis* (Brehm) occurs in NE Greenland, but from Salomonsen's paper it appears that the other Snow-Buntings from the east and the west coast of Greenland differ somewhat from *subnivalis* (474 : 69).

The Iceland bunting is the form *P. n. insulae* Salomonsen. Other forms are *P. n. townsendi* Ridgw. from the Aleutian Islands, the Commander Islands, the Siberian coast of the Bering Sea and the Pribilof Islands, and *P. n. hyperboreus* Ridgw. on Hall Island and St. Matthew's Island in the central Bering Sea.

Occurrence in Svalbard

With the exception of Kvitøya, where it has never been found, the Snow-Bunting breeds in the whole of the area from Bjørnøya in the south to the islands in the farthest north, and from Prins Karls Forland in the west to Kong Karls Land in the extreme east. It is most numerous on the west side of Vestspitsbergen.

Birds in aberrant plumage

A partially albino male, says le Roi, was shot on Gåsøyane in Isfjorden on 8 July 1907. With the exception of the feathers on the back and shoulders, which were of a light grey-brown colour, the entire plumage was white. The upper mandible was horn-brown, the lower mandible a little lighter with a yellow spot on the underside. Feet black-brown (316 : 147).

First records

Pole probably saw the Snow-Bunting in Spitsbergen in 1610. In a note on "what Beasts, Fowles, and Fishes were seen in this Land", he includes "a small land Bird, like a Sparrow, partly white, and partly browne" (4 : 23). Martens saw the bird in Spitsbergen in 1671 (12 : 53). Linnaeus knew that the bird was found in Spitsbergen, because in his 10th edition of *Systemae Naturae,* he writes, "Habitat in alpibus . . . Spitsbergae . . ." (16 : 176).
Martin mentions that the bird came aboard his ship outside Prins Karls Forland on 11 May 1758, and until the ship was 12 miles from Spitsbergen he also often saw them sitting on the ice. As this happened in May, these birds must have been on migration (17 : 115). Phipps says, "Found not only on the land of Spitsbergen, but also upon the ice adjacent to it, in large flocks: what its food

[1] Contour map showing distribution, see backflap.

can be is difficult to determine; to all appearance it is a granivorous bird, and the only one of that kind found in these climates, but how that one can procure food in a country which produces so few vegetables, is not easy to guess" (23 : 188). Bacstrom also mentions among the Spitsbergen birds "the snow-bird, whose note is as pleasing as that of the bullfinch or nightingale" (28 : 617). Pennant thinks it very probable that the bird breeds in Spitsbergen (24 Vol. II : 357) (See also Vol. I p. xc). Laing relates that the bird is found in vast numbers in Spitsbergen (31 : 114). Scoresby says that it occurs on the land and "less frequently, however, on the ice adjacent" (40 : 537).

Distribution. Sections I–XIV

S e c t i o n I. B j ø r n ø y a. — In migration time, both in the spring and in the autumn, the species has repeatedly been seen on the sea around the island.

On the island itself it breeds in fairly big numbers, especially along the coast, but also in the interior.

Snow-Buntings seem to be absent from the upper parts of Miserýfjellet and Antarcticfjellet, and also from almost the whole of the western part of the northern plateau. In neither of these places are there crevices for them to nest in. The geological map of the island (Horn and Orvin 1928) shows a wedge-shaped outcrop of sandstone narrowing from the NE to the SW and occupying about half of the island. Duffey and Sergeant say that this formation weathers to a carpet of large coarse blocks of stone with many holes and cracks suitable as nest sites for the buntings. They were absent, however, in the central part of "Steinflya", which is almost devoid of vegetation and consequently also of insect life (586 : 557).

S e c t i o n II. H o r n s u n d. — In this district the buntings breed on the islands as well as on the mainland, where they sometimes go high up on the mountain-sides. At lower altitudes they are found almost everywhere, but they seem to be absent from the nunataks on the glaciers.

S e c t i o n III. B e l l s u n d. — In Bellsund, in the bays Recherchefjorden, Van Keulenfjorden and Van Mijenfjorden, the species is found almost everywhere, both in the lowlands and on the mountain-sides. It has been recorded from the following places: Kapp Martin, Reiniusøyane, Akseløya and Mariaholmen, the inner part of Van Mijenfjorden, at the colliery Sveagruva, Midterhuken, Van Keulenfjorden, Recherchefjorden with Reinholmen and Kapp Lyell.

S e c t i o n IV. I s f j o r d e n. — Here also the species is found in great numbers almost everywhere, with the exception of the high mountain-tops and the glaciers. Because of the vegetation there is relatively rich insect-life and in some places the buntings breed in numbers. In the spring and the first part of the summer the males can be heard singing all along the coasts.

The birds have been seen and on several occasions found breeding in the following places: Kapp Linné, Grønfjorden, Colesbukta, Hotellneset, Longyearbyen, Adventdalen. In Adventdalen it was found by Conway at Breinosa in 1896. He named the mountain the "Bunting Bluff", but in the *'Place-names of Svalbard'* it is said that the name "Breinosa" is an adaptation of the English

name. This, however, is a misunderstanding, and the name of the mountain should have been "Snespurvfjellet" (554 : 81). The Snow-Bunting also breeds in De Geerdalen and near the house of Mr. Nøis in Sassendalen (1957).

The species has also been found around the shores of Sassenfjorden in such places as Hatten, Sveltihel, and it has been observed breeding at 2,000 feet on Vikinghøgda. In Sassendalen it has been found on Coloradofjella and farther in, in the valley Fulmardalen, and on the glacier Elfenbeinbreen.

The species has also been found on Tempelfjellet, Gåsøyane, Billefjorden including Petuniabukta, Ebbadalen, in Ragnardalen between Billefjorden and Wijdefjorden, Kapp Wijk, Dicksonfjorden, Ekmanfjorden, Sefströmbreen, on Bohemanneset, Erdmannodden and at Alkhornet.

Section V. Prins Karls Forland. — Here the species breeds in many places both on the islands outside and on the big island itself.

Section VI. Kongsfjorden. — The species breeds in almost all the suitable places in the lowlands, on the mountain-sides and even on the nunataks on the big glaciers many kilometres away from the shore. The birds have been found in the following places: on Brandalpynten, Ny-Ålesund, Prins Heinrichøya, Lovénøyane, Ossian Sarsfjellet, on the nunatak Nilsenfjellet on the glacier Kongsvegen, in "London" and Blomstrandhamna on the north side of the fjord and at Kapp Guissez at the entrance to Krossfjorden. In this fjord it has been found in several places, e. g. at the glacier Tinayrebreen, Møllerfjorden, on Christian Michelsenfjella, in and around Signehamna and on Nilspynten.

Section VII. NW Spitsbergen. — The Snow-Bunting breeds everywhere in the district and has been found in the following places: In Magdalenefjorden, on Moseøya and in Bjørnehamna in Sørgattet, in several places on Danskøya (e. g. in Virgohamna), on Albertøya not far from Smeerenburg and in other places in Smeerenburgfjorden, Amsterdamøya, in Albert I Land (between Smeerenburgfjorden and Fuglefjorden), on Klovningen, Arneliusneset, Norskøyane, on Flathuken and Bruceneset in Raudfjorden, on Biskayerhuken and Jermaktangen, in Breibogen, on Reinsdyrflya, on Måkeøyane and Lerneröyane in Liefdefjorden and at Gråhuken.

Section VIII. Wijdefjorden. — The species breeds on both sides of the fjord, and sometimes also far into the valleys. It has been observed in the following places: at Verlegenhuken, in Mosselbukta, around Femmilsjøen, at Dirksodden and at the lakes east of this point, especially at Røyetjørna. Buntings were also found far into the valley Reinbokkdalen, at Austfjordnes and on the island Bjørnnesholmen outside this ness, on Gyllensköldholmane, in Zeipeldalen at the head of Austfjorden, in Landingsdalen in Vestfjorden, on Krosspynten, in Kartdalen and in Purpurdalen.

Section IX. Hinlopen. — The bird has been found in relatively few places and only the following localities are known: Wahlbergøya, and the other islands in the sound, and Lomfjorden.

Section X. Nordaustlandet. — On Nordaustlandet there is only a scanty population of this bird, but it has been found in several places and is known to breed in the area. The localities are: Palanderbukta, Wahlenberg-

fjorden with Gyldénøyane, Marmorpynten on the NW corner of the island, south of Murchisonfjorden and around this fjord, and on Russøyane. It has also been found in Brennevinsfjorden, Kapp Hansteen on the west side of this fjord, on Chermsideøya at Nordkapp, on Waldenøya, Parryøya, Phippsøya, Ekstremhuken and between this point and Kapp Lindhagen, in Duvefjorden, Finn Malmgrenfjorden and on Karl XII Øyane. Besides these places it has been observed in the middle of the inland ice.

Section XI. Storfjorden. — On the two big islands on the east side of Storfjorden, Barentsøya and Edgeøya, the species is numerous on the west side, but the birds have not been recorded from the east side. As in other places they breed almost everywhere, wherever there are suitable localities for nest building . The buntings have been found in the following places: on Kong Ludvigøyane, Tusenøyane, in Tjuvfjorden, Kraussbukta, Kvalpynten, Diskobukta, Kapp Lee, Freemansundet, Mistakodden (westernmost point of Barentsøya), Ginevrabotn, the glacier Hayesbreen, Dunérbukta, Agardhfjellet and between Agardhbukta and Elfenbeinbreen.

Section XIII. Kong Karls Land. — The species breeds on both of the two biggest islands, Svenskøya and Kongsøya.

Section XIV. Hopen. — The species is a common breeder on the island.

Records from the sea around Svalbard

The North. — During the summer of 1896, when *Fram* was in the ice north of Spitsbergen, the first bird of the year, a Snow-Bunting, was seen on 25 April in latitude 84° 17′ N. It remained on board for a few days and disappeared on the 28th (237 : 44).

Worsley saw two buntings on 15 September 1925, when his ship was at 80° 27′ N, 30° 27′ E, somewhere north of the western end of Kvitøya (441 : 167).

The West. — Orleans observed one bunting on 8 July 1905 at 80° 5′ N, 8° 34′ E, NW of Amsterdamøya (277 : 338).

The South. — Quennerstadt saw a pair of buntings on 6 April 1863 at 73° 30′ N, 1° 20′ E. They were searching for food on the ice among refuse from the ship. They were there for several days and when there was sunshine their song was heard (106 : 29).

Munsterhjelm records that on 1 May 1910 at 73° 31′ N, 14° 50′ E, a bunting came on board the ship. It was washed overboard by a wave, however, and was afterwards seen floating on the sea. Then it was noticed by a Fulmar who captured and ate it. (Later in the day three buntings flew past the ship.) On the 9th a pair flew past towards NE at 75° N, 8° 15′ E. On the 11th, six birds flew towards NW at 74° 59′ N, 8° 23′ E. On the 13th, four buntings flew in the same direction at 74° 50′ N, 11° 43′ E. On the 18th, one bird flew towards NE at 75° 12′ N, 12° 8′ E. On 2 June, another bird flew NE at 75° 59′ N, 8° 34′ E. Only one of these birds rested on the ship (313 : 2).

Biological

Migration. — The Snow-Bunting arrives in the Svalbard area very early in the spring migration period. Both scientists and trappers have speculated

upon how it is possible for the bird to find sufficient food there, especially when the ground is covered by ice and snow.

The earliest records are from March, and the bird has been recorded once on the 23rd and twice on the 29th. From April there are 26 records and from May only 8, as follows:

Dates in April	3	5	6	7	10	12	15	16	17	18	19	20	21	23	24	25	26
No. of observations	1	1	3	1	1	1	1	2	1	1	1	2	1	2	1	1	1

	28	30	31
	1	2	1

Dates in May	2	3	11	14	16	20	21	27
No. of observations	1	1	1	1	1	1	1	1

But late-comers may arrive in June and twice it has happened that buntings have alighted on the expedition ship of Norsk Polarinstitutt, when it was at sea between Norway and Bjørnøya in the last half of June.

Nathorst relates that a bunting flew on board the ship on 8 June 1882, somewhere NW of Bjørnøya. It left soon afterwards and alighted on an ice-floe. Nathorst suggests that the drift-ice must be of great help to buntings on spring migration (155 : 12).

Klinckowström saw a pair of buntings on board his ship between Bjørnøya and Spitsbergen on 13 June 1890 (172 : 31). Kolthoff states that several buntings visited his ship in the ice west of Bjørnøya on 8 June 1900. See also under "Records from the sea around Svalbard" (250 : 23).

It seems that the majority of the Snow-Buntings arrive in Spitsbergen during April, and that the migration will then continue on a lesser scale in May.

In the autumn the different families seem to assemble in flocks of varying size at the end of August. These flocks stray, but they will possibly not go south until September. The autumn migration goes on during September and also throughout October. Even as late as November there are a few records from Spitsbergen, where buntings have been seen on the 5th, the 6th and the 22nd.

Dates in September	7	8	11	12	13	14	15	16	20	25	27	28
No. of observations	1	2	2	1	1	1	1	1	1	1	1	1

Dates in October	1	5	7	10	12	19	21	23	25	30	31
No. of observations	1	2	1	1	1	2	1	1	2	1	1

Especially among trappers there has been talk about the wintering of this bird in Spitsbergen, but so far there are no reliable records. Johnsen says that the bird does not winter on Bjørnøya, but in 1928 some buntings arrived there in January (505 : 47).

General habits. — The Snow-Bunting is distributed all over the area and is found everywhere with the exception of Kvitøya and the eastern parts of Barentsøya and Edgeøya.

It is found both on the lowlands and on the mountain-sides, and it has also

been found breeding on nunataks far inland on the big glaciers. It breeds on the sea-coasts as well as along the shores of the fjords.

Where it settles, however, it must have certain conditions which are necessary for nesting, and there must also be sufficient food.

As the bird never builds open nests, but hides them in hollows and crevices, it requires rocky ground for breeding, and will nest either on rock-walls, or amongst screes or boulders strewn over a hill-side or level ground. The nest is sometimes placed in a crevice in a boulder or beneath it in a hollow, but Snow-Bunting nests have also been found under flattish stones on level ground.

In addition the bird requires a certain amount of vegetation, because the young are fed with insects, and where there is no vegetation there are no insects. Therefore the species is not found on "Steinflya" on Bjørnøya, where there are adequate nest sites but vegetation is lacking.

Ponds, tarns, and small lakes in the lowlands often have mossy edges where insect life is abundant, and it seems that the birds often prefer the vicinity of such places for a nest site when the conditions otherwise are as they should be.

Snow-Buntings like to have shelter when roosting and families are often found during the night in crevices or in deep ledges of a rock. They are also fond of using the trappers' huts as sleeping-quarters. When the windows in these huts are not covered with shutters, they are as a rule broken by bears, and so the birds can find an entrance. In huts with broken windows the shelves are often covered with Snow-Bunting droppings. They also seek shelter from bad weather, and Kristoffersen describes how a flock took cover from the wind in a small valley (472 : 249). When they arrive in the spring and the land is snow-covered it is not impossible that they are even able to burrow in the snow. Bagg describes from America how 150–200 buntings sought shelter from the wind by digging themselves into the soft snow under the leeward edges of several shallow drifts in an open field (555 : 445).

At the nest they are often timid, but they can also be bold and fearless. Kristoffersen was once attacked by a pair of buntings at their nest and he caught the female in his cap (472 : 249). When danger threatens, the male bird will at once utter a warning note, says Løvenskiold, especially when it has seen an Arctic Fox. It will then follow the animal for a long way, constantly uttering its note of warning (615 : 9, 12).

The male birds have been heard singing from the ice during the northward migration. Certainly they begin to sing shortly after their arrival on the breeding ground, and within a relatively short period, depending on climatological factors, they will be in full song. The song period seems to be a long one, for they are often heard singing at the beginning of July, and even after the young birds have left the nest.

B r e e d i n g. — The timing of pairing and nest-building is of course dependent on how early or how late spring comes. Mr. Pike saw Snow-Buntings building in Virgohamna on Danskøya as early as 9 May 1889 (Chapman 195 : 349). Walter, on the other hand, found them building nests on Edgeøya as late as 5 June in the same year (169 : 240).

Bianchi relates that Dr. Bunge found them pairing in Hornsund on 29 May

1900 (253 : 11), and Malmgren saw birds copulate on the snow in Wijdefjorden on 4 June 1861 (85 : 99).

Snow-Buntings will not build their nests in bogs or on the tundra where there are no stones under which the nest can be hidden. They rarely build open nests, but try to get them as well out of sight as possible, although le Roi relates that on the islands Dunøyane a nest was built quite openly on a ledge of rock about 3 m from the ground. This is the only instance known from Spitsbergen of a Snow-Bunting nest built in the open (316 : 149).

The most natural nesting place seems to be a fissure in a rock, where the entrance is so narrow that the birds can just manage to slip through. The nest is often placed fairly deep in these crevices, from 60 to 100 cm from the entrance.

The buntings also breed on screes of larger or smaller stones, in the heaps of stones which are used to cover old graves, under boulders and under big stones which have been pressed up by the frost so that the birds can get under them.

Where the buntings can find such conditions they will breed from sea-level up to at least 600 m, along the coast, in the fjords, the inland valleys and also on nunataks on the big glaciers.

The nesting places, however, can be very varied. Congreve found a nest in the stone foundations of the quay in Ny-Ålesund, and in Moskushamna in Adventfjorden he found the bird nesting in rubbish heaps, in niches in empty houses and on the floor of an attic (403 : 18, 19). Montague found nests in the empty houses of the whaling station in Grønfjorden in 1924 (433 : 137). Tomkinson found nests mostly under stones in Longyearbyen in 1930, but he also found them in holes in the peat, in a box of scrap-iron, in a heap of old rusty wire, in an old tin and on shelves inside buildings (485 : 81–85). In 1936 Jung found buntings' nests under the roofs in Ny-Ålesund (539 : 120). Løvenskiold found them in ruins of the concrete buildings in Longyearbyen, in a nesting box, under a tarpaulin of the beach and also in cairns (615 : 7–11).

There are many descriptions of the nest of the Snow-Bunting from Spitsbergen and a very thorough description of different types of nests is given in *Avifauna Spitzbergensis* (316 : 149), but for the sake of brevity only one, described by Mathey-Dupraz, will be mentioned. The nest was found in a fissure in a rock and was built of *Poa arctica* straw (with small ears still attached to them), some stalks of *Salix polaris* with leaves on them, and moss. It was lined with the white feathers of gulls and Ptarmigan and with tufts of hair from a white Arctic Fox. The over-all diameter of the nest was 14 cm, the inner diameter 8 cm and the depth 5 cm (333 : 195).

The size of the nest is of course dependent on the space available to the bird. Sometimes more than one nest is found in one crevice, but then one of them is almost always from the previous year.

The number of eggs laid by Snow-Buntings in Spitsbergen is usually 5 or 6. In the tables below there are 15 clutches of 6 eggs (young or eggs) and 12 with 5. One nest has been found with 8 eggs and two with 7. There are also 6 clutches of 3 and 6 of 4. If we take the numerical values from the column for "Eggs presumably laid", we find that the eggs can be laid as early as 22 and 27 May, but this must be exceptionally early. Most of the egg-laying seems to take place in the last two-thirds of June, and a few nests have newly laid eggs

Table 41

Egg-laying

Date	No. of nests	No. of eggs	Presumed stage of incub.	Eggs presumably laid	Place	Author
17 June 1931	1	7	4 days	9 June	Adventfjorden	Tomkinson (485: 81)
17 » 1931	1	7	5 »	10 »	–»–	–»– –»–
17 » 1931	1	6	5 »	10 »	–»–	–»– –»–
17 » 1931	1	6	6 »	11 »	–»–	–»– –»–
17 » 1931	1	6	6 »	11 »	–»–	–»– –»–
17 » 1931	1	5	7 »	12 »	–»–	–»– –»–
17 » 1931	1	5	7 »	12 »	–»–	–»– –»–
17 » 1931	1	5	8 »	13 »	–»–	–»– –»–
26 » 1922	1	4 + 2 juv.	point of hatching	13 »	–»–	Congreve (403: 18)
14 » 1930	1	3	fresh	14 »	Tokrossøya	Kristoffersen (472: 249)
19 » 1930	many		5 days	14 »	Spitsbergen	Dalgety (470: 245)
28 » 1922	1	5	point of hatching	15 »	Adventfjorden	Congreve (403: 18)
26 » 1922	1	6	well incub.	16 »	Adventfjorden	Congreve (403: 18)
29 » 1922	many		point of hatching	16 »	–»–	–»– –»–
22 » 1930	1	6	5 days	17 »	Edgeøya	G. Bjørnnes (1929/30, 636)
1 July 1955	1	2 + 1 juv.	point of hatching	18 »	Sassenfjorden	Pennie (623: 62)
19 June 1930	many		fresh	19 »	Spitsbergen	Dalgety (470: 245)
29 » 1922	1	5	well incub.	19 »	Adventfjorden	Congreve (403: 18)
29 » 1922	1	6	–»–	19 »	–»–	–»– (403: 18)
30 » 1910	1	6	–»–	20 »	Forlandet	Munsterhjelm (313: 2)
20 » 1923	1	5	fresh	20 »	Dunøyane	Kristoffersen (432:193)
20 » 1923	1	4	–»–	20 »	–»–	–»– (432: 193)
22 » 1908	1	6	–»–	22 »	Sassenfjorden	Le Roi (316: 148)
22 » 1908	1	5	–»–	22 »	–»–	–»– –»–
24 » 1907	1	6	–»–	24 »	Forlandet	–»– –»–
24 » 1910	1	5	–»–	24 »	–»–	Munsterhjelm (313: 2)
5 July 1908	1	6	well incub.	25 »	K. Ludvigøyane	Le Roi (316: 148)
27 June 1908	1	5	fresh	27 »	Dunøyane	–»– –»–
28 » 1900	1	5	–»–	28 »	Hornsund	Bianchi (253: 310)
9 July 1864	1	4	well incub.	30 »	Isfjorden	Newton (96: 203)
9 » 1864	1	6	–»–	30 »	–»–	–»– –»–
30 June 1900	1	8	fresh	30 »	Hornsund	Bianchi (253: 309)
9 July 1907	1	4	well incub.	30 »	Sassenfjorden	Le Roi (316: 148)
1 » 1898	1	1	fresh	1 July	Bellsund	Kolthoff (309: 141)
5 » 1908	many		fresh	5 »	K. Ludvigøyane	Le Roi (316: 148)

Table 42

Hatching and young birds

Date	No. of nests	No. of young	Age	Eggs presumably laid	Place	Author
15 June 1910	1		10 days	22 May	Bellsund	Munsterhjelm (313: 2)
22 » 1949	many		left nest	27 »	Adventfjorden	Løvenskiold (615: 7)
24 » 1949	1	5	10 days	1 June	–»–	–»– –»–
26 » 1957	1	6	10 »	1 »	Raudfjorden	Bateson (1957, 650)
28 » 1956	1	5	10 »	3 »	Kongsfjorden	Løvenskiold (1956, 633)
28 » 1954	1	6	10 »	5 »	Adventfjorden	–»– (1954, 633)
1 July 1954	1	3	10 »	6 »	–»–	–»– (1954, 633)
2 » 1954	1		left nest	7 »	–»–	–»– (1954, 633)
6 » 1959	many		left nest	11 »	Sassenfjorden	Pennie (623: 62)
1 » 1898	1		6 days	12 »	Spitsbergen	Kolthoff (261: 34)
29 June 1873	1	3	2 »	14 »	Nordaustlandet	Eaton (130: 3805)
9 » 1949	many		left nest	15 »	Biskayerhuken	Løvenskiold (615: 7)
14 July 1954	1	4	point of leaving	15 »	Kongsfjorden	–»– (1954, 633)
12 » 1954	1	4	left nest	17 »	Wijdefjorden	–»– –»–
6 » 1950	1	3	hatched	23 »	Isfjorden	–»– (615: 7)
6 » 1957	1	6	»	23 »	Raudfjorden	Bateson (1957: 650)
18 » 1906	1	4	8 days	28 »	Bellsund	Mathey-Dupraz (311: 44)
13 » 1957	1	2+2 eggs	hatched	1 July	Raudfjorden	Bateson (1957, 650)
12 » 1957	1	6	left nest		–»–	–»– –»–
1 » 1955	1	1+2 eggs	hatched		Sassenfjorden	Pennie (623: 62)
27 » 1861	1		leaving	2 »	Nordaustlandet	Malmgren (85: 99)
29 » 1950	1		left nest	4 »	Sørkapp Land	Løvenskiold (615: 7)
5 Aug. 1936	1		–»–	10 »	Gråhuken	Jung (539: 120)
5 » 1936	1		–»–	10 »	–»–	–»– –»–

as late as the first days of July. We have then the following dates for the egg-laying (complete clutches).

Dates in June	1	3	5	6	7	9	10	11	12	13	14	15	16	17	18	19	20
No. of observations	2	1	1	1	1	1	2	3	3	3	3	3	2	2	1	3	3
	22	23	24	25	27	28	30										
	2	2	2	1	1	2	4										
Dates in July	1	2	4	5	10												
No. of observations	2	1	1	1	2												

The young birds leave the nest about 25 days after the incubation of the completed clutch has begun. They are fed by the parents for some time after leaving the nest. When they first leave the nest they can only flutter a short distance and then they can be quite easily caught for ringing purposes; but within a very short time they are able to fly very well. The family remains together until they unite into flocks with other families before the autumn migration.

F o o d. — There has been much speculation, particularly by the older authors, as to how it was possible for the Snow-Buntings to live in an area as barren as Spitsbergen (see Phipps, above, p. 363; Pennant (24 Vol. I : xc) and (24 Vol. II : 355); Laing (31 : 114) and several others.) It seems that Malmgren was the first to investigate the kind of food they were living on, and he states that it is made up of the seeds of *Crucifera* and other plants, and insects and their larvae (85 : 99). Heuglin states that in the autumn they take seeds of *Polygonum* and *Cochlearia* (132 : 97). Sundevall saw them take chironomid flies and their pupae at small ponds. He did not see them take seeds (133 : 17). Kjellman says that buntings shot on 7 May 1873, in Wijdefjorden, were very fat, and he could not understand what they were living on (135 : 265). Swenander says the buntings on Bjørnøya lived mainly on *Diptera,* but they also took seeds. In one stomach he found seeds of *Cochlearia* (247 : 14). Kolthoff saw young birds being fed with flies caught in damp places (261 : 34). Le Roi records that 17 males and females (all breeding birds) were investigated in Spitsbergen in June and July. Apart from a little sand and some small stones, their stomachs contained only vegetable matter, including the remains of leaves and ripe and unripe seeds of different phanerogams. This was in the west of Spitsbergen. In the east at Kong Ludvigøyane, he found remains of the leaves of a *Ranunculus,* some seeds, numerous fragments of moss, the remains of *Cladonia rangiferina* and 20 black *Thysanura.* In addition to a similar diet, another bird had taken 15 *Diptera* larvae (316 : 153). Munsterhjelm saw Snow-Buntings in July 1910 in Van Keulenfjorden among the skeletons of White Whales (*Delphinapterus leucas*) and thought that they were taking flies and their larvae, but in fact he found their stomachs to be full of the red bulbits of *Saxifraga cernua* (313 : 4). Summerhayes and Elton visited Bjørnøya in 1921, and in the time between 13 and 23 June they saw the birds eating sawflies (*Pontania birula*). One male bird which they obtained had in its bill 6 sawflies, *Amauronemantus* and other species (397 : 222, 226). Montague states that the stomachs of two specimens obtained on Nordaustlandet on 24 August 1924 were full of seeds (433 : 138). Summerhayes and Elton write: "The Snow-Bunting subsists on flies, etc., but supplements this diet with the seeds and leaves of plants. It appears, however, to be limited in its distribution on Nordaustlandet mainly by the presence or absence of chironomid flies, since wherever there were flies the buntings were also there, and where there were no flies the buntings were absent" (450 : 210). Bertram and Lack visited Bjørnøya between 20 June and 10 August 1932, and they state that chironomid flies formed a large part of the diet of the Snow-Buntings on Bjørnøya in 1936 (528 : 47). Jung found that the food consisted of animal as well as vegetable matter. In the stomachs of birds from NW Spitsbergen he found remains of moss and other plants but also the larvae of mosquitoes (539 : 122). Løvenskiold saw buntings along the beach between Biskayerhuken and Jermaktangen in July 1940. Here they were eagerly occupied in gathering food on the ice-foot from last winter, which was then melting. They were in company with Purple Sandpipers, and both species were without doubt taking *Lumbricillus aegialites* in the rotten ice. At that time the buntings were feeding young in the nest (615 :

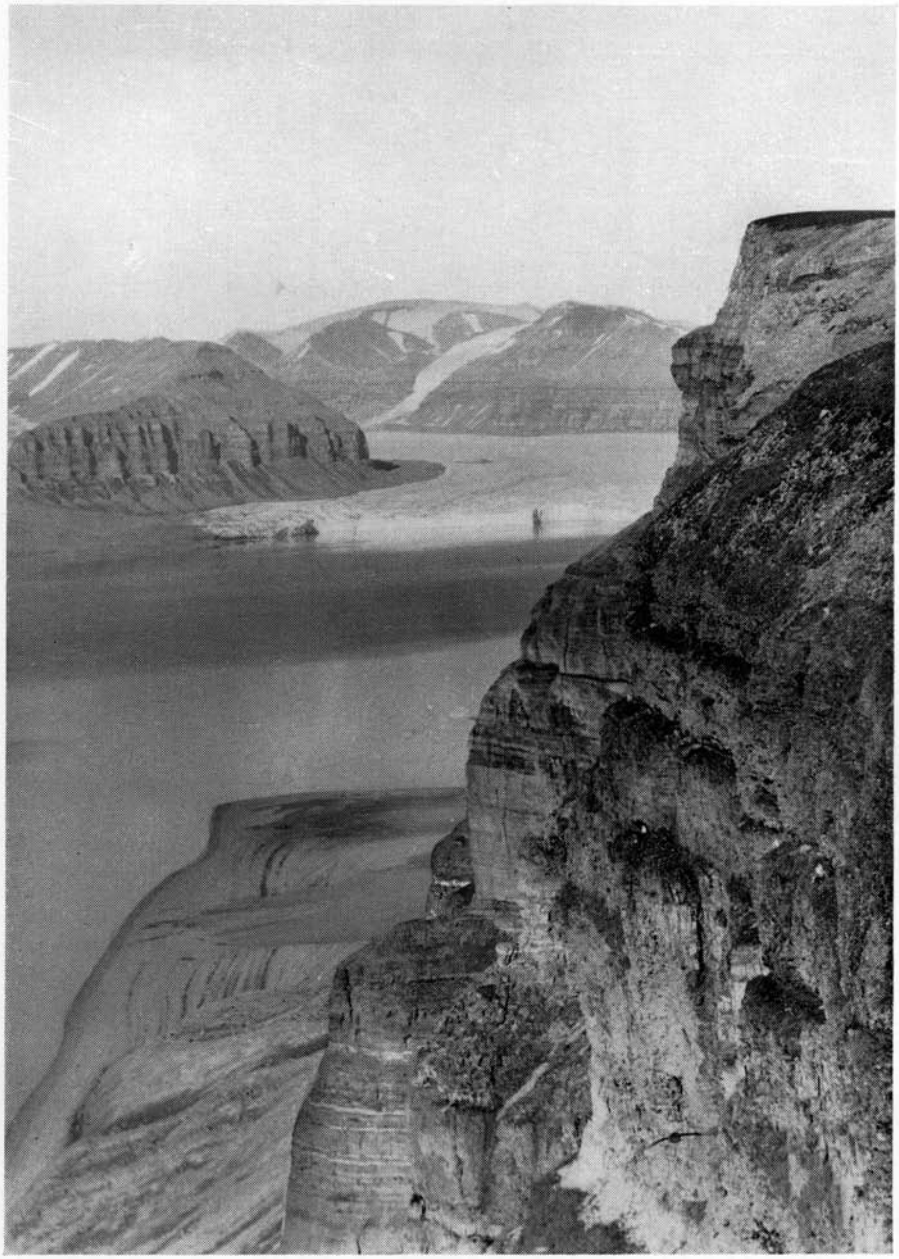
10, 11). On 10 August 1954 seed-capsules of *Papaver radicatum* were collected in Kartdalen in Wijdefjorden, but all the capsules were found to be opened and the seeds gone. A couple of Snow-Buntings were shot and their stomachs, when examined, were found to be full of the seeds of *Papaver* and bulbils of *Polygonum viviparum* (1954, 633). On 6 July 1956 and on the following days, buntings were seen gathering insects from the moss along the water's edge around some small tarns on Blomstrandhalvøya in Kongsfjorden (1956, 633).

In some instances it has been recorded that Snow-Buntings obtained in Spitsbergen were very fat. For a bird which has been shot in autumn, on 10 October, this is not very remarkable (Bianchi 253 : 310). But that a bird shot on 7 May should also be very fat when the land was completely snow-covered, suggests that the birds can provide for themselves even under very bad conditions (Kjellman 135 : 256). In connection with this it is quite interesting what Blurton Jones (in a personal communication) tells of birds which are fat on the spring migration. He writes: "L. Irving (Bulletin of American Museum) finds that most passerines are quite fat on arrival and that spring fat deposition is as much an adaptation to conditions on the breeding ground in early spring as to migration."

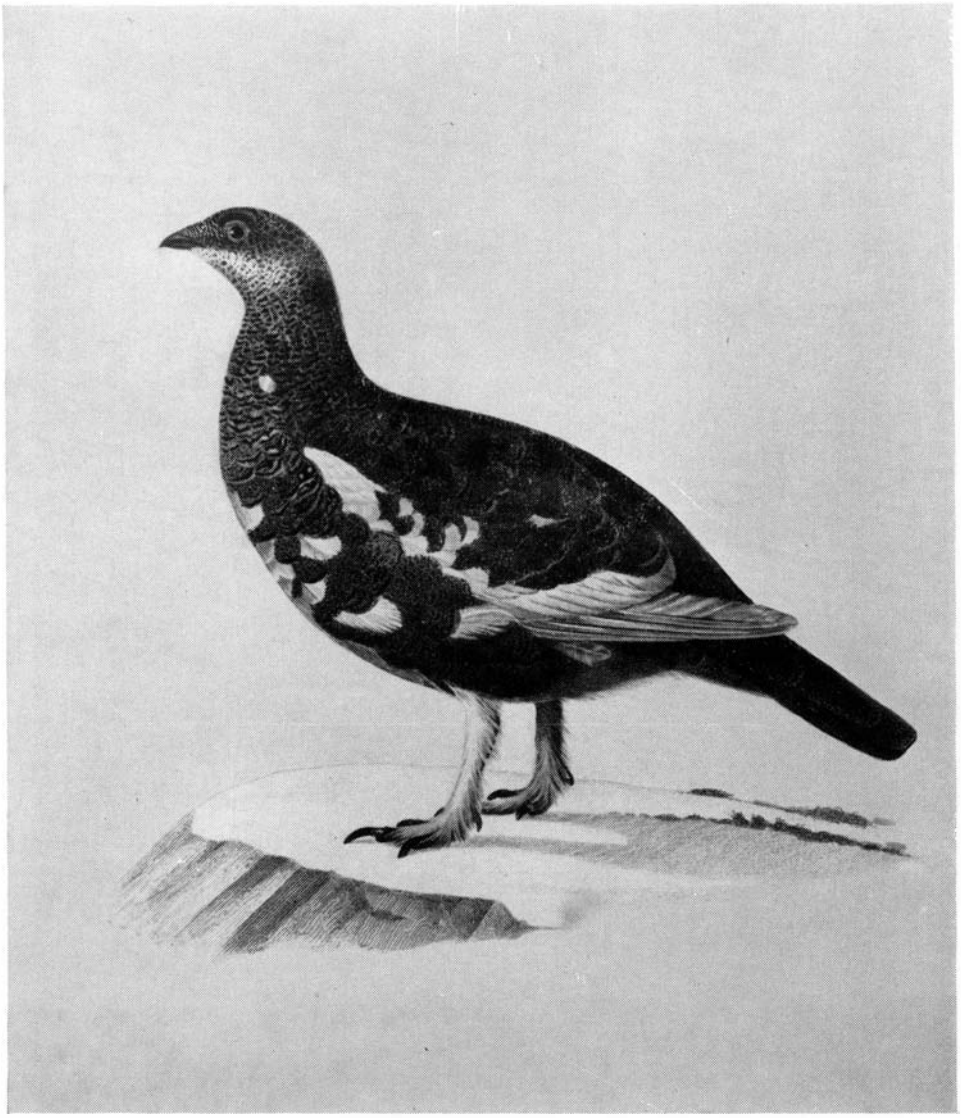
When the buntings arrive in April, they presumably have to live on seeds from the previous year. There will almost always be some bare patches along the beaches where they are able to find something to eat, and plants will push their heads through the snow in some places. It is also possible that some seeds may be found on the surface of the snow. When the warm weather comes and the snow melts, the birds will begin to live on insects in an ever greater degree as the time goes on. The young in the nests must also be fed mainly on insects. In the autumn the insect-life will wane and the birds will again go over to a vegetable diet, which, we have seen, is sufficient to enable them to build up fat before they start on the autumn migration.

ILLUSTRATIONS

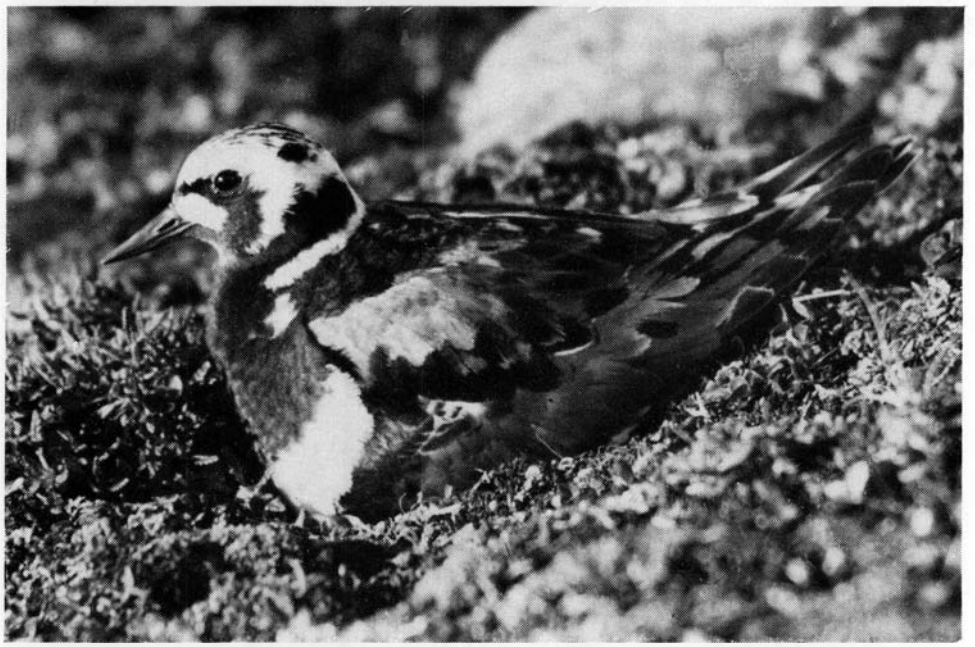
With exception of the picture of the Spitsbergen Ptarmigan (Pl. XII) all photographs have been taken by the author.



Mountain at the mouth of Tempelfjorden with breeding Fulmar Petrels on the ledges.

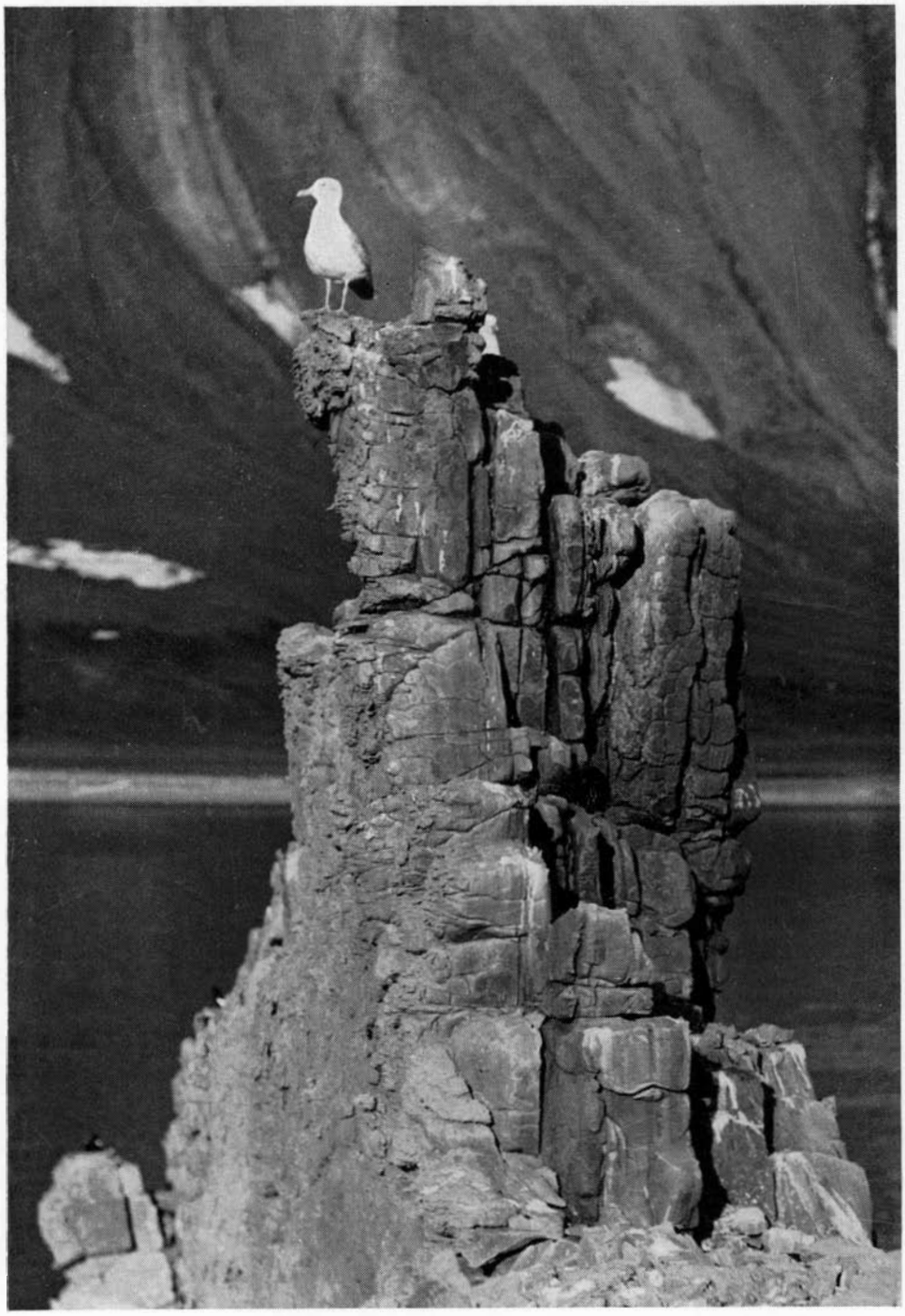


The Spitsbergen Ptarmigan. The first known picture from Gaimard 1845.

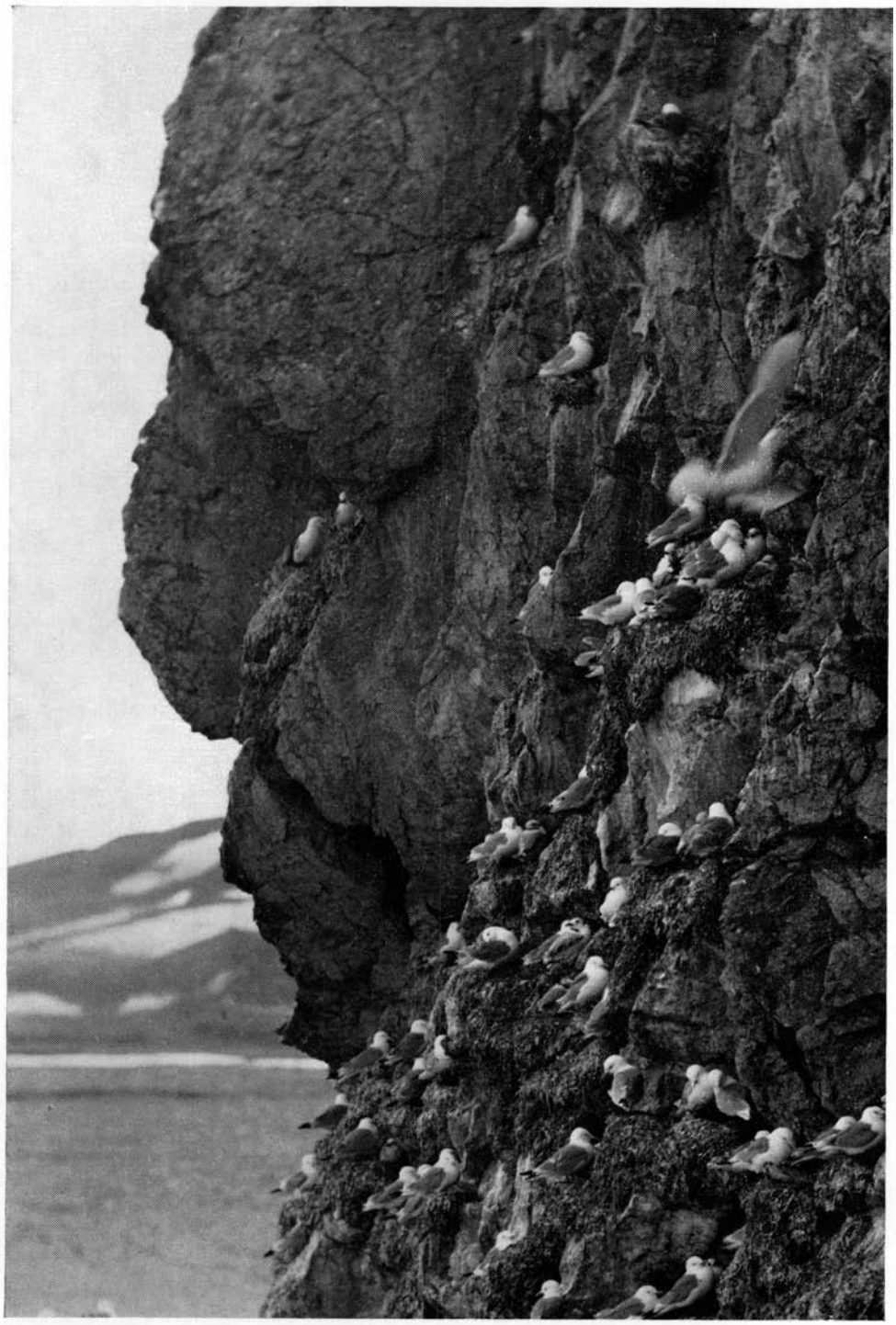


The Turnstone.

The Long-tailed Skua on her nest.

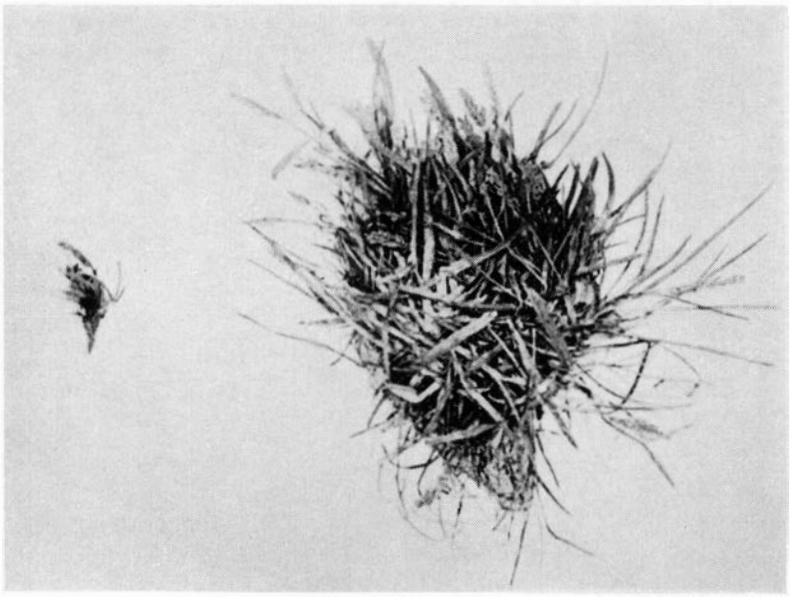


The Glaucous Gulls on the turret of their castle on Mariaholmen in Bellsund.



A colony of Kittiwakes.

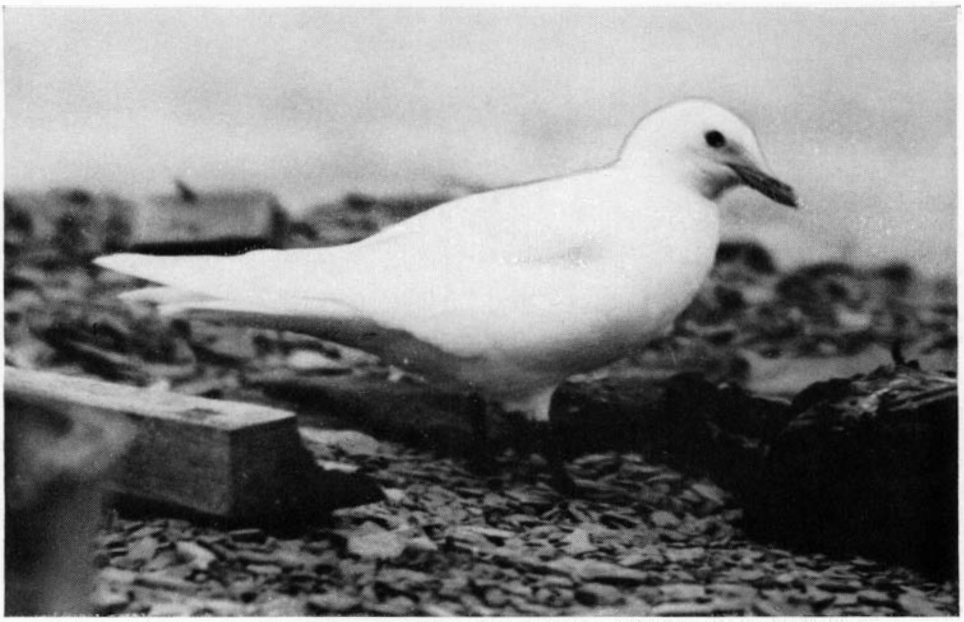
Pl. VI



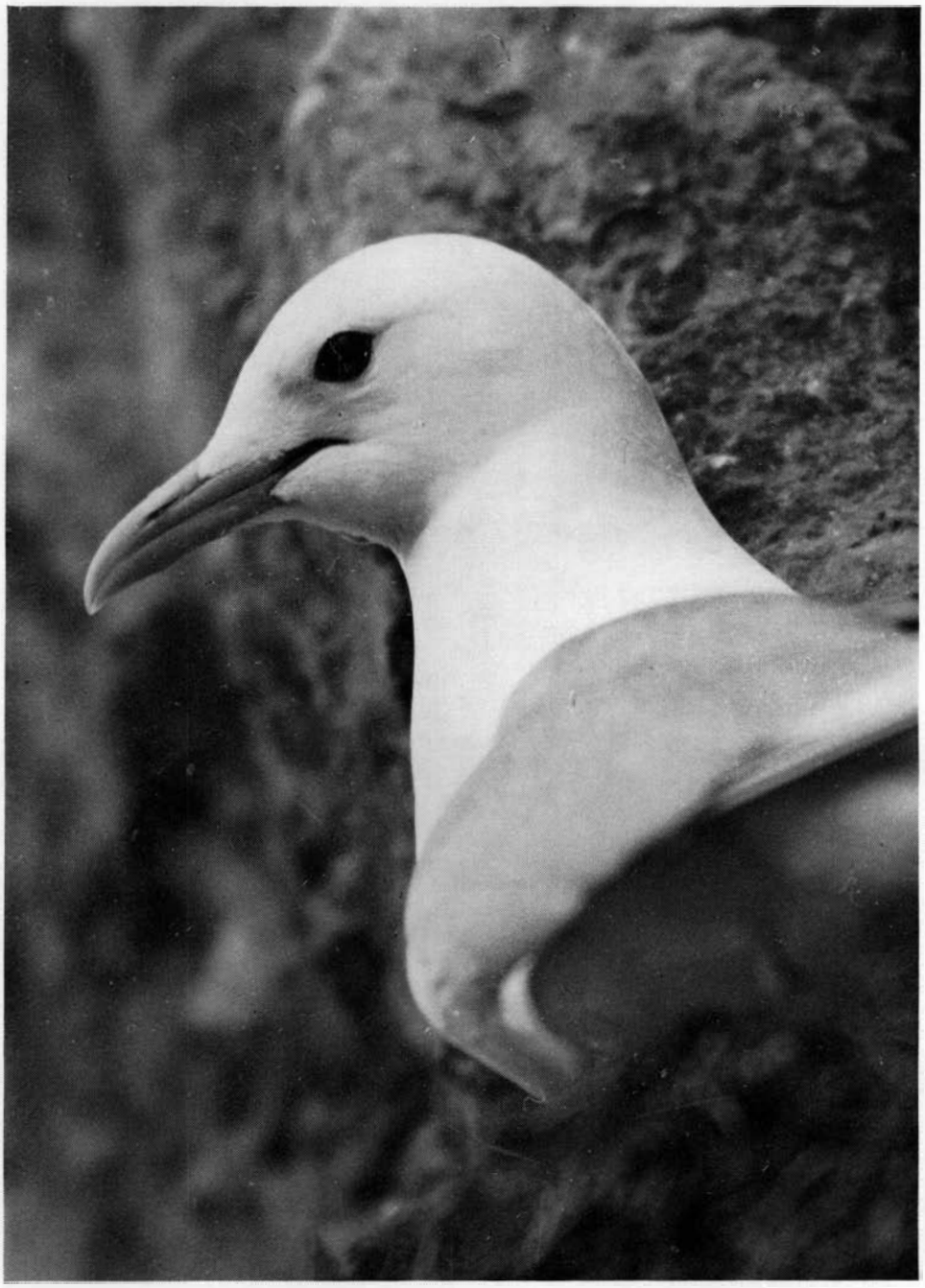
Phot. C. S. Elton.

The effect of increased nitrogen supply on plants: specimens of *Catabrosa algida* collected from dolerite rocks at a height of 4000 feet on Mount Scott-Keltie (at the bottom of Wood Bay). The large plant on the right was growing on manured soil below the nesting place of a Fulmar Petrel. The small one on the left was growing on an unmanured spot.

Reproduced from *Journal of Ecology,* Vol. XVI, Plate XXXIII, by kind permission of Blackwell Scientific Publications Ltd.

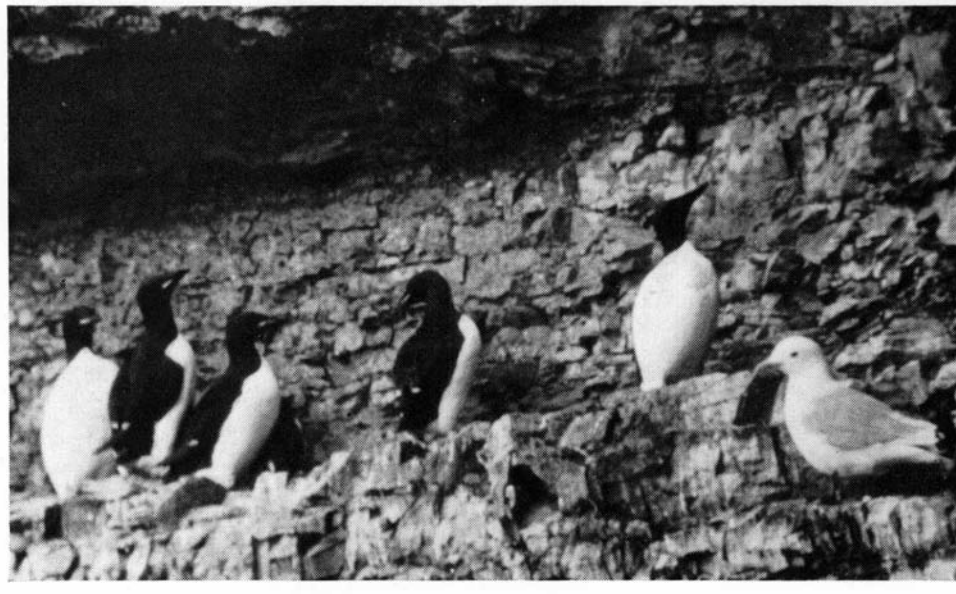


The Ivory Gull.

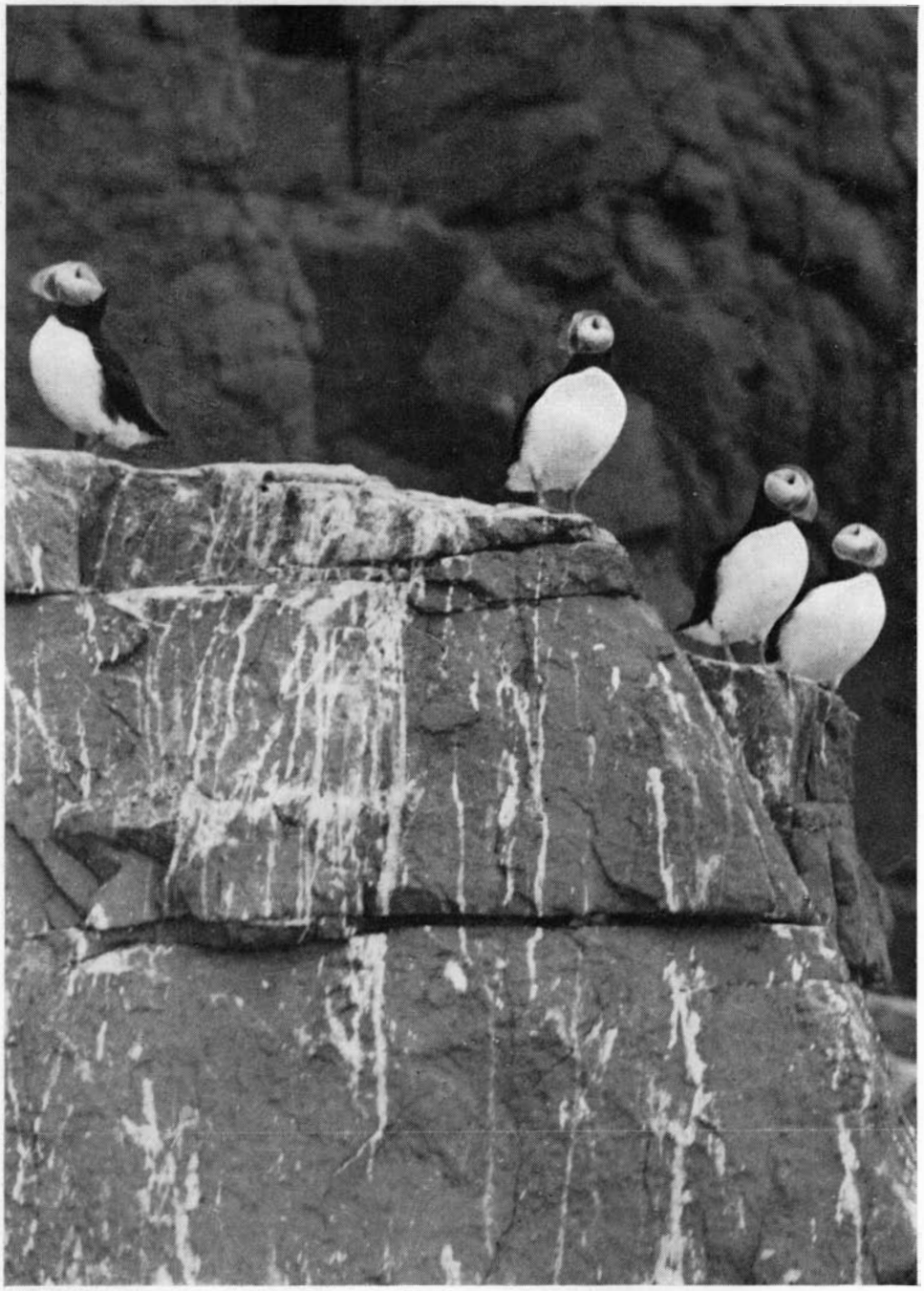


The profile of a Kittiwake.

Long-tailed Duck and Arctic Tern breeding together in a tern colony.



Brünnich's Guillemots breeding together with the Norwegian race on Bjørnøya in 1958.



The Spitsbergen Puffin.

The Red-throated Diver on the nest.

The Fulmar Petrel on the nest among Cochlearia.

The Long-tailed Duck beside her nest at the corner of a house in Kongsfjorden.

The Pink-footed Goose with newly hatched young.

The Barnacle Goose breeding on level ground.

The Spitsbergen Ptarmigan. Male bird in the middle of July. Photo. T. Winsnes.

The Purple Sandpiper. Good camouflage colours.

The female Grey Phalarope.

The male Grey Phalarope on the nest.

The Arctic Skua.

The Glaucous Gull.

The Arctic Tern on the nest.

The Little Auk.

Unnamed mountains at the head of Vestfjorden (Wijdefjorden).

The Polar Bear.

The Arctic Fox.

III. BIBLIOGRAPHY

Preface

This bibliography deals with books, papers, diaries and letters on birds in Spitsbergen and adjoining islands, from the first publication in 1598 and up to recent times, including the year 1958.

The books and papers have been arranged according to the year in which they were published, and under the different years the authors are listed alphabetically. Short accounts of ornithological value are given.

Most of the papers deal with Spitsbergen birds, but there are also some on the birds of Iceland, Greenland and Novaya Zemlya. Papers dealing with Spitsbergen birds met with in their winter-quarters or birds found very far away from their summer habitat, are also to be found.

That others may avoid reading a lot of papers and books containing little or nothing on Spitsbergen birds, I have taken such matter into the bibliography with an explanatory note in each case.

It is very difficult to get hold of everything published on birds in this area. I shall therefore be very thankful for any information about anything which I may have overlooked.

In the author index, only the numbers in the bibliography are referred to.

In most cases when a journal or a periodical has been referred to more than twice, the abbreviations from *Zoological Record* are used.

Bibliography

1598

1. VEER, GERRIT de. Waerachtige Beschryvinghe van drie seylagien. Amstreldam 1598.

   Narrative of Barents' three voyages and his discovery of Bjørnøya (Bear Island) and Spitsbergen. The first known record of breeding Branta bernicla hrota.

1604

2. POOLE, JONAS. Divers Voyages to Cherie Iland in the yeeres 1604. 1605. 1606. 1608. 1609. Written by Jonas Poole. Samuel Purchas. Hakluytus Posthumus or Purchas His Pilgrimes. London 1625. Reprinted Hakluyt Society Extra Series Vol. 13. Glasgow 1905—1907.

   The first record of the following birds from Bjørnøya: "Willocks (Uria lomvia), Gulles (Larus hyperboreus), Sea-mewes (Rissa tridactyla), a small Fowle like a Willocke (Plotus alle) and divers others as wilde Geese, Seapidgeons (Cepphus grylle mandtii), Oxbirds and such like".

1607

3. HUDSON, HENRY. Divers Voyages and Northerne Discoveries of that worthy irrecoverable Discoverer Master Henry Hudson. His Discoverie toward the North Pole, set forth at the charge of certaine Worshipfull Merchants of London, in May 1607. Samuel Purchas. Hakluytus Posthumus or Purchas His Pilgrimes. London 1625. Reprinted Hakluyt Society. Extra Series Vol. 13. Glasgow 1905—1907.

   The first record of the following birds from Spitsbergen: "Small flockes of birds with blacke Backes and white Bellies, and long speare Tayles (Clangula hyemalis). Birds with blacke backes, and white bellies in form much like a Ducke (Uria lomvia). Birds as the same sort as afore, and divers other of that colour, having red Heads (Fratercula arctica naumanni)". A second record of Branta bernicla hrota.

1610

4. POOLE, JONAS. A Voyage set forth by the Right Worshipfull Sir Thomas Smith, and the rest of the Muscovie Company to Cherry Iland... in the ship called the Amite. of burthen seventie tuns, in the which I Jonas Poole was Master. Having fourteene men and one boy: A. D. 1610. Samuel Purchas. Hakluytus Posthumus or Purchas His Pilgrimes. London 1625. Reprinted Hakluyt Society. Extra Series Vol. 14. Glasgow 1905—1907.

Near Bjørnøya he saw "wildgeese", Coludines (Somateria mollissima) and Willocks (Uria lomvia). "First records of the following birds from Spitsbergen: "white Partridges (Lagopus mutus hyperboreus), a small land bird, like a Sparrow, partly white, and partly browne (Plectrophenax nivalis), a Fowle with a combe and tayle like a Cock, a redde Fowle of the bignesse of a Pidgeon (Phalaropus fulicarius ?), a white Fowle with a greene bill, the top of the bill of it and the eyes were redde, with black feet (Pagophila eburnea). Wild geese, Coludines (Somateria mollissima), Gulls (Larus hyperboreus), Sea-mewes (Rissa tridactyla), Willockes (U. lomvia), Noddies, Ice-birds, Reeks and Sea-pidgeons (Cepphus grylle mandtii)".

1611

5. Poole, Jonas. A briefe Declaration of this my Voyage of discoverie to Greenland, and towards the West of this as follows: beeing set forth by the right Worshipfull Sir Thomas Smith, Governour of the right Worshipfull Company of new Trades & c. written by Jonas Poole. Samuel Purchas. Hakluytus Posthumus or Purchas His Pilgrimes. London 1625. Reprinted Hakluyt Society. Extra Vol. 14. Glasgow 1905—1907.

   He saw the following birds in Spitsbergen: Coludines (Somateria mollissima), white land Partridges, wild Geese, and Willocks (Uria lomvia). The first record of the "Allen" (Stercorarius parasiticus).

1613

6. Baffin, William. Second Recorded Voyage of William Baffin. A Journall of the Voyage made to Greenland with sixe English ships and a Pinasse, in the yeere 1613. Written by Master William Baffin. The Hakluyt Society Vol. 63. London 1881.

   He writes about the birds in Spitsbergen: "Upon this land ther be... great store of white fowle, as cueluerdunes, wild geese, sea-pigeons (Cepphus grylle mandtii), sea parots (Fratercula arctica naumanni), willocks (Uria lomvia), stint (Calidris maritima), guls (Larus hyperboreus) and diuers others, whereof some are unworthy of nameing and tasteing". First record of Calidris maritima.

7. Gerritszon van Assum, Hessel. Histoire du Pays nomé Spitsberghe. Amsterdam 1613. (Facsimile-Edition, Amsterdam 1872).

   He saw at least five different species of birds in Spitsbergen: Larus hyperboreus, Fratercula arctica naumanni, Uria lomvia, Somateria mollissima and Branta bernicla hrota. Without doubt he has taken the Fulmar for a gull.

1622

8. Fotherby, Robert. A description of Greenland. Samuel Purchas. Hakluytus Posthumus or Purchas His Pilgrimes. London 1625. Reprinted Hakluyt Society. Extra Series Vol. 13. Glasgow 1905—1907.

   He mentions the following birds from Spitsbergen: "Cutbert Duckes (Somateria mollissima), Willockes (Uria lomvia), Stints (Calidris maritima), Sea-pigeons (Cepphus grylle mandtii), Sea Parrets (Fratercula arctica naumanni), Gulls (Larus hyperboreus), Noddies (Uria lomvia), & c."

1631

9. PELLHAM, JOHN. Gods Pover and Providence, Shewed in the Miraculovs Preservation and Deliverance of eight Englishmen, left by mischance in Greenland, Anno 1630, nine months and twelve days. London 1631. Hakluyt Society Vol. 18. London 1855 (p. 251).

   Mentions Uria lomvia.

1672

10. MARTINIÈRE, de la. Voyage des Pays Septentrionavx. Paris 1672.

    The author says that penguins are found on the island Voygatt. On the strength of this, later authors have written that he found the Great Auk, Alca impennis, in the Waygatz Strait (Hinlopenstretet) in Spitsbergen. There is, however, no doubt that the island de la Martinière writes about is Vaigach, south of Novaya Zemlya.

1674

11. [La PEYRÈRE, ISAC.] Sievers Henrich. Bericht von Gröhnland. Hamburg 1674.

    Mentions Fratercula arctica.

1675

12. MARTENS, FRIEDRICH, vom Hamburg. Spitzbergische oder Groenlandische Reise Beschreibung gethan in Jahr 1671. Hamburg 1675. Facsimile-Edition Berlin 1923.

    He saw and described the following birds: Schnepfe (Calidris maritima), Schnee-Vogel (Plectrophenax nivalis), Eisz-Vogel (Lagopus mutus hyperboreus), Ratsherr (Pagophila eburnea), Taube (Cepphus grylle mandtii), Lumbe (Uria lomvia), Mewe die man Kutge Gehf nennet (Rissa tridactyla), Bürgermeister (Larus hyperboreus), Rotges (Plotus alle), Struntjager (Stercorarius parasiticus), Papageytaucher (Fratercula arctica naumanni), Berg Ente (Somateria mollissima), Kirmewe (Sterna macrura), Mallemucke (Fulmarus glacialis), Rotgänse (Branta bernicla hrota) and Johan van Gent (Sula basana). He was told about a black crow seen in Spitsbergen, but did not see the bird himself. First records of Fulmarus glacialis, Sterna macrura and Sula basana. A very fine account with good descriptions of the Spitsbergen birds.

13. MARTENS, FRIEDRICH. Voyages into Spitzbergen and Greenland. Translation to English from the German original by Adam White. A collection of documents on Spitzbergen and Greenland. Hakluyt Society Vol. 18. London 1855.

    The same birds are mentioned as in the original in German.

14. MARTINIÈRE. Neue Reise in die Nordischen Landschaften. Aus dem Englischen ins Deutsche übersetzt. Hamburg 1675.

    A translation from English to German from the above book in French by de la Martinière 1672.

1723

15. ZORGDRAGER, C. G. Alte und neue Grönländische Fischerei. Leipzig 1723.

General remarks on the biology of the Spitsbergen birds on pp. 222—223.

1758

16. LINNAEUS, CAROLUS. Systema Naturae Ed. X. Holmiae 1758.

Mentions only one bird "Emberiza nivalis" and says: Habitat in alpibus Spitsbergae.

17. MARTIN, ANTHON ROLANDSON. Dagbok hallen vid en resa till Norrpolen eller Spitsbergen 1758. Ymer 1. Stockholm 1881.

Mentions the following birds: Somateria mollissima, Fratercula arctica naumanni, Fulmarus glacialis, Plectrophenax nivalis, Larus hyperboreus, Pagophila eburnea, Calidris maritima and Plotus alle.

1759

18. MARTIN, ANTHON ROLANDSON. Beskrifning på en Procellaria som finnes vid Norrpolen. Kgl. Vet. Akad. Handl. 20. Stockholm 1759.

Description of Fulmarus glacialis.

1761

19. LINNAEUS, CAROLUS. Fauna Svecica. Editio Altera Auctior. Stockholm 1761.

Mentions six different Spitsbergen birds, all of them cited from Martens.

1764

20. BRÜNNICH, M. TH. Ornithologia Borealis. Hafniæ 1764.

Mentions Larus hyperboreus, cited from Martens.

1766

21. LINNÉ, CAROLI a. Systema Naturæ. Editio Duodecima Reformata Vol. 1. Holmiæ 1766.

Mentions four different birds from Spitsbergen, all of them cited from Martens. The statement about "Emberiza nivalis" from the 10th edition is repeated.

1767

22. LINNÉ, CAROLI a. Systema Naturæ. Editio decima tertia ad Editionem duodeciman reformatam Holmiensem. Vindobonae (Vienna). 1767.

In Tom. 1, Pars 1, the 12th edition is repeated.

1774

23. PHIPPS, CONSTANTINE JOHN. A Voyage towards the North Pole undertaken by His Majesty's Command 1773, by Constantine John Phipps. London 1774.

The following 14 birds are mentioned: Plectrophenax nivalis, Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Colymbus stellatus, Calidris maritima, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Uria lomvia, Cepphus grylle mandtii, Plotus alle and Fratercula arctica naumanni.

1774

24. PENNANT, THOMAS. Arctic Zoology. 2 Vols. London 1784—85.

15 species are mentioned as inhabitants of Spitsbergen. Colymbus immer is here mentioned for the first time.

1786

25. MOHR, N. Forsøg til en Islandsk Naturhistorie. Kiøbenhavn 1786.

On p. 50 about the food of the Iceland Ptarmigan.

26. [ČIČAGOV, VASILIJ JAKOLEVIČ]. Tschitschagov v. Reise nach dem Eismeer.

Mentions Somateria mollissima, a small wader (Calidris maritima ?) and probably the first record of a Redpoll (Carduelis hornemanni ?) from the sea W of Spitsbergen.

1795

27. ENGEL, SAMUEL. See-Reisen von Engländern ... näbst dem Tagebuch von Kapitän Phipps, jetzt Lord Mulgraves im Jahr 1773 gethanen Reise nach dem Nordpol. Bern 1795.

The cited diary of Captain Phipps has notes on about 16 different species of birds from Spitsbergen.

1808

28. BACSTROM, S. An Account of a Voyage to Spitsbergen In the Year 1780. By S. Bacstrom M. D. Communicated by the Author. Printed in the following publication of Mr. John Pinkerton. London 1808.

Most of the birds which he saw can be recognized, in all about 20, among these the snow-bird, "whose note is as pleasing as that of the bullfinch or nightingale", this must be the Snow-Bunting. Then there is a bird which is difficult to place among the Spitsbergen population, "the white duck with a beautiful scarlet head and yellow legs".

29. PINKERTON, JOHN. General Collection of Voyages and Travels. London 1808.

Amongst those, also on the voyage of Captain Phipps with notes on 16 species from Spitsbergen. (See 23.)

1813

30. MAVOR'S VOYAGES. A General Collection of Voyages and Travels. Vol. XI. London 1813.

On the island Moffen and some of the birds there.

1815

31. LAING, JOHN. Account of a Voyage to Spitsbergen. London 1815.

Mentions five species of birds.

32. TEMMINCK, C. J. Manual D'Ornithologie. Amsterdam 1815.

Mentions four species of birds, Somateria spectabilis for the first time.

1818

33. LAING, JOHN. A Voyage to Spitzbergen. Edinburgh 1818.

Mentions the same five birds as in the publication of 1815.

34. OKEN, LORENTZ. Fr. Martens von Hamburg Spitzbergische oder Grönländische Reise-Beschreibung gethan im Jahr 1671. (Isis, 1818. p. 365—372).

Cited after Koenig who says that Oken has misread several of the bird-names.

35. SABINE, JOSEPH. An Account of a new species of Gull lately discovered on the West Coast of Greenland. Trans. Linn. Soc. 12. London 1818.

Mr. Joseph Sabine describes a gull found by his brother Sir Edward Sabine and names it Larus sabini. The first known picture of Xema sabini.

1819

36. SCHLEEP, B. C. Ueber eine bisher noch unbekannte Mevenart. Neue Annalen der Wetterauischen Gesellschaft für die Naturkunde Bd. 1. Frankfurt am Main 1819.

Koenig says that the bird is nothing but "Larus glaucos", i.e. Larus hyperboreus. But I cannot find any reason to believe that the skins Mr. Schleep speaks about should originate from Spitsbergen. There is nothing in the paper to show that he had got his gulls from Spitsbergen.

37. LEACH, W. E. Notice of some Animals from the Arctic Region. Annals of Philosophy . . . By Thomas Thomson. London 1819.

Mentions Somateria mollissima, Fulmarus glacialis, Sterna macrura, Rissa tridactyla and Fratercula arctica naumanni.

1820

38. KÖHLER, FRIEDRICH GOTTLOB. Seilermeister in Pirna. Reise ins Eismeer und nach den Küsten von Grönland und Spitzbergen im Jahr 1801. Leipzig 1820.

Mentions Plectrophenax nivalis, Fulmarus glacialis and Calidris maritima.

39. KØHLER, F. G. Reis naar de Ijszee, en naar de kusten van Groenland en Spitsbergen in het Jahr 1801. Amsterdam 1820.

A Dutch translation from the above German publication.

40. SCORESBY, W. jun. An Account of the Arctic Regions. 2 Vols. Edinburgh 1820

The following birds are mentioned from Spitsbergen: Plectrophenax nivalis, Carduelis hornemanni, Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Colymbus immer, Calidris maritima, Sterna macrura, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Stercorarius longicaudus.

41. TEMMINCK, C. J. Manuel D'Ornithologie. 4 Vols. Second Edition. Paris 1820—1840.

In addition to the four birds mentioned in the edition of 1815, Temminck names Plectrophenax nivalis, Stercorarius parasiticus, Uria lomvia and Fratercula arctica naumanni from Spitsbergen.

1822

42. MANDT, M. W. Observationes in Historiam Naturalem et Anatomicam comparatam in Itinere Groenlandico Factae. Berlin 1822. (Thesis for the doctorate).

The following birds are mentioned from Spitsbergen: Carduelis hornemanni, Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Stercorarius longicaudus, Uria lomvia, Cepphus grylle mandtii, Plotus alle, and Fratercula arctica naumanni.

1824

43. SABINE, EDWARD. Birds. Supplement to the Appendix of Captain Parry's Voyage for the Discovery of a North-West Passage in the Years 1819—20. Natural History. London 1824.

Captain Sabine writes on the birds that were found by Captain Parry in West-Greenland and on the islands north of America, but there is nothing about birds from Spitsbergen. He says nothing about the two specimens of Xema sabini that he is supposed to have shot in Spitsbergen in the summer of 1823.

44. Spitsbergen og de nærliggende Øer. [From Scoresby's Account of the Arctic regions.] Edinburgh 1820. Hermoder, et Ugeblad af blandet Indhold. Christiania 1824.

Mentions some of the birds in Scoresby's book. Not important.

1825

45. FABER, FRIEDRICH. Das Leben der Hochnordischen Vögel. Leipzig 1825—1826.

Mentions the following birds from Spitsbergen: Somateria mollissima, Sula basana, Larus hyperboreus, Rissa tridactyla, Fulmarus glacialis, Uria lomvia, Cepphus grylle mandtii, (C. g. grylle has never been found there), Plotus alle and Fratercula arctica naumanni. He also writes about Eiders breeding in tern-colonies and about non-breeding birds.

1828

46. PARRY, WILLIAM EDWARD. Narrative of an Attempt to reach the North Pole. London 1828.

In an appendix the following birds are mentioned: Plectrophenax nivalis, Lagopus mutus hyperboreus, Charadrius hiaticula, Calidris maritima, Sterna macrura, Larus hyperboreus, Pagophila eburnea, Rissa tridactyla, Xema sabini, Rhodostethia rosea, Stercorarius parasiticus, S. pomarinus, Fulmarus glacialis, Branta bernicla hrota, Somateria mollissima, Colymbus stellatus, Uria lomvia, Cepphus grylle mandtii, Plotus alle, Frater-

cula arctica naumanni and Alca torda. Alca torda has to be eliminated. Xema sabini is uncertain, but the acceptance of the record cannot be absolutely refused. About R. rosea, Koenig says that they were only terns. He seems, however, to have overlooked that Parry's second in command was Lt. Ross, who found the bird for the first time in 1823. There are also later records that confirm that this bird is a more or less regular visitor to the ice at 82° north of Spitsbergen. Stercorarius pomarinus is a regular visitor in the Spitsbergen area in the autumn and has also, in a few instances, been seen there in summer-time.

1830

47. Löwenigh, Barto von. Reise nach Spitsbergen. Achen und Leipzig 1830.

Mentions Lagopus mutus hyperboreus.

1831

48. Keilhau, B. M. Reise i Øst- og Vest-Finmarken samt til Beeren-Eiland og Spitsbergen i Aarene 1827 og 1828. Christiania 1831.

Keilhau saw the following birds: Plectrophenax nivalis, Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Colymbus stellatus, Calidris maritima, Eudromias morinellus, Sterna macrura, Larus marinus = hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Alca torda = Uria lomvia, Cepphus grylle mandtii and Lagopus mutus hyperboreus. The only time the Dotterel has been found in Spitsbergen. Malmgren and later Koenig both exclude it from the fauna of the area, but in "Skandinaviens Fauna" by Sven Nilsson, we are told that Prof. Keilhau brought a Dotterel back with him from Spitsbergen.

49. Swainson, W. and J. Richardson. Fauna Boreale-Americana. London 1831.

Mentions Rhodostethia rosea, Xema sabini, Stercorarius parasiticus, S. cepphus, i.e. S. longicaudus and Uria troile, i.e. Uria lomvia from Spitsbergen. Almost certainly these birds are taken from the above publication of Parry.

1835

50. Nilsson, S. Skandinavisk Fauna. Foglarna. Ny omarbetad Upplaga. 2 Vols. Lund 1835.

The following birds are mentioned from Spitsbergen: Plectrophenax nivalis, Eudromias morinellus (footnote: Professor Keilhau has brought back a specimen from Spitsbergen), Calidris maritima, Pagophila eburnea, Larus hyperboreus, Stercorarius parasiticus, Fulmarus glacialis, Branta bernicla hrota, Somateria spectabilis, Colymbus stellatus and Plotus alle.

1837

51. Lovén, Sven Ludvig. [Diary notes from Spitsbergen 1837.] Obituary by H. Théel in: Lefnadsanteckningar öfver Kungl. Svenska Vetenskaps-Akademiens efter år 1854 aflidna Ledamöter. Vol. 4. Stockholm och Uppsala 1899—1912.

Lovén saw the following birds in Spitsbergen: Anser fabalis brachyrhynchus, Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Colymbus stellatus, Phalaropus fulicarius, Calidris maritima, Sterna macrura, Larus hyperboreus, Rissa tridactyla, Stercorarius parasiticus, Uria lomvia, Cepphus grylle mandtii, Plotus alle. Lovén has never published anything about the birds from Spitsbergen himself.

1838

52. SUNDEVALL, CARL J. Foglar sedda på Spetsbergen 1838. Printed in Malmgrens paper: Anteckningar till Spetsbergens Fogel-Fauna. Kgl. Sv. Vet. Akad. Öfversikt 1863. Stockholm 1864.

The following 18 birds were seen by Sundevall: Plectrophenax nivalis, Branta bernicla hrota, Somateria mollissima, Somateria spectabilis, Clangula hyemalis, Fulmarus glacialis, Phalaropus fulicarius, Calidris maritima, Sterna macrura, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Uria lomvia, Cepphus grylle mandtii, Plotus alle, Fratercula arctica naumanni and Lagopus mutus hyperboreus.

1840

53. KEYSERLING, A. GRAF und J. H. BLASIUS. Die Wirbelthiere Europas 1. Buch. Braunschweig 1840.

Mentions Cepphus grylle mandtii and Pagophila eburnea.

1843

54. AUDUBON, JOHN JAMES. The Birds of America. New York and Philadelphia 1843.

On p. 70 Branta leucopsis is mentioned as breeding in Spitsbergen. Koenig says that there is no record in the literature to build upon. Cited after Koenig.

55. AUDUBON, JOHN JAMES. The Birds of America. New print New York 1937.

Mentions Branta bernicla hrota, Branta leucopsis, Crocethia alba and Plotus alle as breeding birds from Spitsbergen.

56. BEECHEY, F. W. A Voyage of Discovery towards the North Pole. Performed in His Majesty's Ships *Dorothea* and *Trent* under the Command of Captain David Buchan R. N. 1818. London 1843.

The author mistakes Somateria spectabilis for S. mollissima. He describes the Eiders trying to protect their eggs by pouring out excrement on them, when leaving the nest in a hurry. He tried to count the numbers of the Little Auk. Mentions Colymbus stellatus, Larus hyperboreus and Uria lomvia. He also writes about a "cormorant", but this bird has never been seen in the area.

57. GAIMARD, PAUL. Voyages de la Commission Scientifique du Nord en Scandinavie, en Lapponie, au Spitsberg et aux Ferøe, pendant les années 1838, 1839 et 1840. 20 Vols. Part 2. Relation du Voyage. Paris 1843—1848.

On pp. 344—349 some remarks on the Spitsbergen birds. (Without any special interest).

1844

58. GRAY, G. R. List of the Specimens of Birds in the Collection of the British Museum. London 1844.

17 species of birds from Spitsbergen are mentioned. The first and only record of Actitis macularia.

1845

59. GAIMARD, PAUL. Voyages en Scandinavie, en Laponie, au Spitzberg et aux Ferøe. 3 vols. Atlas Geologique. Paris 1845.

This volume in big folio contains illustrations of: Lagopus mutus hyperboreus, Calidris maritima, Uria lomvia, Cepphus grylle mandtii, Uria lomvia juv. and Larus hyperboreus juv. A legend to the illustrations has never been printed.

1851

60. LESLIE, JOHN. Discoveries and Adventures in the Polar Seas and Regions. Edinburgh Cabinet Library. New Edition. London 1851.

Some general remarks about birds, but, as to the locality, it is difficult to tell if the author means Greenland or Spitsbergen. Without any special interest.

1852

61. KJÆRBØLLING, N. Danmarks Fugle. Kjøbenhavn 1852.

Mentions Plectrophenax nivalis, Branta bernicla hrota and Somateria spectabilis as breeding birds in Spitsbergen.

1853

62. PÄSSLER, W. Schraders Beobachtungen über die Vögel Lapplands. J. Orn. 1. Cassel 1853.

Branta bernicla hrota and Somateria spectabilis are mentioned as breeding birds in Spitsbergen.

1855

63. WHITE, ADAM. A Collection of Documents on Spitzbergen and Greenland. The Hakluyt Society Vol. 18. London 1855.

The author gives a very exact translation of Friderich Martens travels. In an appendix there is a summary of the following 24 birds: Carduelis hornemanni, Plectrophenax nivalis, Branta bernicla hrota, Somateria mollissima, S. spectabilis, Colymbus immer, C. stellatus (Actitis hypoleucos), Calidris maritima, Charadrius hiaticula, Sterna macrura, Xema sabini, Rhodostethia rosea, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius pomarinus, S. parasiticus, Uria lomvia, Cepphus grylle mandtii, Plotus alle, Fratercula arctica naumanni, Lagopus mutus hyperboreus. These birds have most certainly been taken from the papers of Martens, Phipps, Parry, Beechey and Gaimard. The common sandpiper Actitis hypoleucos, has of course never been found in Spitsbergen.

1856

64. STEENSTRUP, JAP. Et bidrag til Geirfuglens, Alca impennis Lin., Naturhistorie, og særligt til Kundskaben om dens tidligere Udbredningskreds. Videnskabelige Meddelelser fra den naturhistoriske Forening i Kjøbenhavn 1855 No. 3—7. Kjøbenhavn 1856—1857.

Steenstrup names some earlier authors who have written about the Great Auk in Spitsbergen (Martinière and Gould), but says himself that there is no proof at all that the bird has ever been seen there.

65. SUNDEVALL, C. J. Svenska Foglarna. Stockholm 1856—1871.

Mentions "Fringilla linaria" found by Scoresby and says that it is impossible for this bird to exist in Spitsbergen because it cannot find suitable food there. He also writes on the Spitsbergen Ptarmigan Lagopus mutus hyperboreus.

66. WOLLEY, JOHN. A Catalogue of Eggs collected in Lapland, chiefly in the year 1855, by John Wolley Junr. London 1856.

A record of Phalaropus fulicarius from Spitsbergen and a note on Colymbus stellatus. Cited after Koenig 1911.

1857

67. DUFFERIN, Lord.[Blackwood (Frederick Temple Hamilton Temple) Marquis of Dufferin and Ava.] Letters from High Latitudes. Being some Account of a Voyage in the Schooner Yacht "Foam", 85 O. M. to Iceland, Jan Mayen & Spitsbergen in 1856. London 1857.

Mentions Somateria mollissima, Pagophila eburnea and Lagopus mutus hyperboreus from Spitsbergen.

1858

68. GOULD, JOHN. On a new Species of Ptarmigan. Proc. Zool. Soc. London 1858.

Describes the Spitsbergen Ptarmigan, Lagopus hemilicurus.

69. HARTWIG, GEORG. Der Hohe Norden. Wiesbaden 1858.

Without any special interest. Mostly a summary of earlier papers.

70. NILSSON, S. Skandinavisk Fauna. Foglarna. (2 vols.) 3rd edition. Lund. 1858.

Exactly the same 11 species of birds from Spitsbergen as named in the edition of 1835.

71. WOLLEY, JOHN. A Catalogue of Eggs collected chiefly in Lapland in the year 1857 by John Wolley Junr. London 1858.

The eggs were sold at an auction in London. On pp. 18 and 19 notes on Phalaropus fulicarius and Branta bernicla hrota from Spitsbergen. Cited after Koenig 1911.

1859

72. EVANS, EDWARD and WILSON STURGE. Notes on the Birds of Western Spitzbergen, as observed in 1855. Ibis. London 1859.

The authors saw the following birds: Plectrophenax nivalis, Anser fabalis brachyrhynchus, Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Calidris maritima, Sterna macrura, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Uria lomvia, Cepphus grylle mandtii, Plotus alle, Fratercula arctica naumanni and Lagopus mutus hyperboreus. They also mention six birds from the publication of Mr. Ross: Colymbus stellatus, Charadrius hiaticula, Xema sabini, Rhodostethia rosea, Stercorarius pomarinus, (Alca torda) and five birds mentioned by others: Somateria spectabilis, Clangula hyemalis, Colymbus immer, Phalaropus fulicarius, (Cepphus g. grylle) and (Alca impennis). Of these Alca torda was found on Spitsbergen about 50 years later A. impennis and C. g. grylle have never been found in the area.

73. TORELL, OTTO. Bidrag till Spitsbergens Molluskfauna. Thesis for the doctorate. Stockholm 1859.

In this paper the author has a list of the following birds from Spitsbergen: Carduelis hornemanni (= Fringilla linaria), Plectrophenax nivalis, Anser fabalis brachyrhynchus, Branta bernicla hrota, Branta leucopsis, Somateria mollissima, S. spectabilis, Clangula hyemalis, Fulmarus glacialis, Colymbus stellatus, Phalaropus fulicarius, Calidris maritima, (Actitis hypoleucos), Eudromias morinellus, Charadrius hiaticula, Sterna macrura, Xema sabini, Rhodostethia rosea, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius pomarinus, S. parasiticus, Uria lomvia (Alca torda), Cepphus grylle mandtii, (C. g. grylle), Plotus alle, Fratercula arctica naumanni and Lagopus mutus hyperboreus. Of these A. hypoleucos and C. g. grylle have never been found in Spitsbergen.

1860

74. LAMONT, JAMES. Notes about Spitzbergen in 1859. The Quarterly Journal of the Geological Society of London. Vol. 16. London 1860.

Mentions Somateria mollissima and Plotus alle.

75. WALKER, DAVID. Notes on the last Arctic Expedition under Captain M'Clintock, R. N. Journal of the Royal Dublin Society Vol. 3. Dublin 1860.

Mentions 15 different birds apparently collected from the literary sources. Many errors about birds which have never been found in the area, such as Calcarius lapponicus and others. Without any value.

1861

76. LAMONT, J. Seasons with the Sea-Horses. London 1861.

Mentions ten birds: Branta bernicla hrota, Somateria mollissima, Fulmarus glacialis, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius parasiticus, Uria lomvia, Plotus alle and Lagopus mutus hyperboreus.

77. NEWTON, ALFRED. On some new or rare Birds Eggs. Proc. Zool. Soc. London 1861.

On some eggs of Pagophila eburnea from Spitsbergen.

78. NEWTON, ALFRED. Abstract of Mr. J. Wolley's Researches respecting the Gare-fowl or Great Auk (Alca impennis, Linn.). London 1861.

On the supposed occurrence of Alca impennis in Spitsbergen on p. 376.

79. SOMMERFELT, CHR. Fortegnelse over de i Øst-finnmarken iagttagne Fugle tilligemed enkelte Bemærkninger angaaende endel af disse. — Ved Chr. Sommerfelt, Sognepræst til Næsseby. Kgl. Sv. Vet. Akad. Öfversikt 1861. Stockholm 1861.

The author says that the Brent Goose visits East-Finnmark in spring and in the autumn on the migration to and from Spitsbergen, where it is breeding.

80. TORELL, OTTO. Über die physikalische Geographie der arctischen Region. Petermanns geogr. Mitt. 7. Gotha 1861.

A German translation of Torell's paper from 1859.

1862

81. QUENNERSTEDT, AUGUST. Några Anteckningar om Spetsbergens Däggdjur och Foglar. [Thesis for the Doctorate]. Lund 1862.

The author names the following birds from Spitsbergen: Plectrophenax nivalis, Anser fabalis brachyrhynchus, Branta bernicla hrota, Branta leucopsis, Somateria mollissima, Somateria spectabilis, Clangula hyemalis, Fulmarus glacialis, Colymbus stellatus, Phalaropus fulicarius, Calidris maritima, Eudromias morinellus, Charadrius hiaticula, (Actitis hypoleucos), Sterna macrura, Rhodostethia rosea, Xema sabini, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Stercorarius pomarinus, S. parasiticus, Uria lomvia, (Cepphus g. grylle), C. grylle mandtii, Plotus alle, Fratercula arctica naumanni and Lagopus mutus hyperboreus.

1863

82. MALMGREN, A. J. Anzeichnungen über die Vogel-Fauna Spitzbergens. J. Orn. 11. Cassel 1863.

A German translation of Malmgren's paper (85) which was published in Sweden in 1864.

83. MALMGREN, A. J. Die Schwedische Expedition nach Spitzbergen 1861. IV. Vogel-Fauna. Petermanns geogr. Mitt. 9. Gotha 18633.

A summary in German of the above paper by Malmgren.

1864

84. COLLETT, ROBERT. Oversigt af Christiania Omegns ornithologiske Fauna. Christiania 1864.

About Phalaropus fulicarius and Branta bernicla hrota. Collett says that the Grey Phalarope has never been found in Norway on the spring migration, but it has been found several times in the autumn. About the Brent Goose he says that it comes in enormous flocks to the west coast in spring, but it is rarely found in the eastern part of the country.

85. Malmgren, A. J. Anteckningar till Spetsbergens Fogel-Fauna. Kgl. Sv. Vet. Akad. Öfversikt 1863. Stockholm 1864.

The first critical paper on the birds of Spitsbergen. Dr. Malmgren went to Spitsbergen in 1861 and had a thorough knowledge of the ornithological literature of the area. From his own investigations and from what he knew from the literature he divided the birds there into 3 groups: a) Breeding birds: 1. Emberiza nivalis. 2. Lagopus hyperboreus. 3. Charadrius hiaticula. 4. Tringa maritima. 5. Phalaropus fulicarius. 6. Sterna arctica. 7. Larus eburneus. 8. Larus tridactylus. 9. Larus glaucus = L. hyperboreus. 10. Lestris parasitica. 11. Procellaria glacialis. 12. Anser bernicla. 13. Anser leucopsis. 14. Anser segetum. 15. Harelda glacialis. 16. Somateria mollissima. 17. S. spectabilis. 18. Colymbus septentrionalis. 19. Uria grylle. 20. Alca Brünnichi = Uria lomvia. 21. Mergulus alle. 22. Mormon arcticus.
b) Rare visitors: 1. Falco gyrfalco. 2. Strix nyctea. 3. Charadrius morinellus. 4. Anser cinereus = Anser anser. 5. Cygnus sp? 6. Lestris pomarina.
c) Birds which must be excluded from the Spitsbergen fauna: 1. Fringilla linaria = Carduelis hornemanni. 2. Tringa hypoleucos. 3. Larus sabini. 4. Larus rossi. 5. Larus marinus. 6. Colymbus glacialis. 7. Alca torda. Some of the birds excluded by Dr. Malmgren have later been found in the area, and of all the 35 birds mentioned by him, only two viz. b) 4. Anser anser and c) 2. Actitis hypoleucos have never been seen there. Anser segetum is of course A. fabalis brachyrhynchus. The paper also contains a list of 18 birds seen by Professor Sundevall in 1838.
This paper and the following ones from Dr. Malmgren are the foundation of all later ornithological work in Spitsbergen.

86. Newton, Alfred. Notes on the Zoology of Spitsbergen. Proc. Zool. Soc. London 1864.

Newton names only eleven birds seen by him in Spitsbergen and writes especially about Lagopus hemilencurus = L. mutus hyperboreus and about Anser brachyrhynchus.

87. Nordenskiöld, A. E. Geografisk och Geognostisk Beskrifning över Nordöstra Delarne af Spetsbergen och Hinlopen Strait. Kgl. Sv. Vet. Akad. Handl. 4. Stockholm 1864.

Mentions only six of the most common birds in Spitsbergen.

88. Ootheca Wolleyana. An illustrated catalogue of a collection of birds' eggs begun by the late John Wolley jun. and continued with addition by the editor Alfred Newton. 2 Vols. London 1864—1872.

The eggs of 16 different species of birds are described and particulars as to locality and breeding time are given. Some valuable information on the breeding of the Spitsbergen birds.

1865

89. CHYDENIUS, K. Svenska Expeditionen till Spetsbergen år 1861 under ledning af Otto Torell. Stockholm 1865.

The author mentions 20 of the most common birds in Spitsbergen and gives some details about them, but there is nothing new. All of it is to be found in the papers of Malmgren.

90. DUNÉR, N. och NORDENSKIÖLD, A. E. Anteckningar till Spetsbergens Geografi. Kgl. Sv. Vet. Akad. Handl. 6. Stockholm 1865.

Some general remarks about six species of birds. Some of the biggest bird-rocks are named.

91. ELLIOT, D. G. Monograph of the Tetraonidae. New York 1865.

Contains a good illustration of the Spitsbergen Ptarmigan and also some information about the bird.

92. MALMGREN, A. J. Nya Anteckningar till Spetsbergens fogelfauna. Kgl. Sv. Vet. Akad. Öfversikt 1864. Stockholm 1865.

Since 1863 Malmgren has increased the number of breeding birds in the area up to 23, with Stercorarius Buffoni = S. longicaudus, but, in fact, this bird was in reality not found breeding in Spitsbergen until 1930. In his list in the present paper only four "rare visitors" are left, because both Anser cinerius = Anser a. anser and Eudromias morinellus are cut out. In the list of 1863 there were seven birds totally excluded from the fauna of Spitsbergen. In his present list Malmgren now excludes six more: Anser cinereus, Charadrius morinellus, Plectrophanes lapponica, Tringa interpres, Colymbus arcticus and Alca impennis. Of the 40 birds mentioned, there are not more than five that have never been found in the area at all, viz. Calcarius lapponicus, Anser anser, Colymbus arcticus, Actitis hypoleucos and Alca impennis.

93. MALMGREN, A. J. Neue Anzeichnungen über die Vogel-Fauna Spitzbergens. J. Orn. 13. Cassel 1865.

A German translation of the above paper of Malmgren in Kgl. Sv. Vet. Akad. Förhandl. No. 8, 1864.

94. MALMGREN, A. J. Zur Vogelfauna Spitzbergens. J. Orn. 13. Cassel 1865.

A discussion with Alfred Newton, mainly upon the systematics; first records etc. of the birds of Spitsbergen. Much valuable information.

95. MARTINS, CHARLES. Du Spitzberg au Sahara. Paris 1865.

22 birds from Spitsbergen are mentioned on p. 110. Further on, the author mixes up Uria lomvia and Plotus alle. Moreover he says that on some bird-rocks the majority of the breeding gulls are Pagophila eburnea. But he had not been to the parts of Spitsbergen where these birds nest.

96. NEWTON, ALFRED. Notes on the birds of Spitsbergen. Ibis. London 1865.

The author writes about 22 birds he had seen in Spitsbergen himself. They are all of them identical with those published in Malmgren's lists. Some very valuable information.

1866

97. GRAD, CHARLES. Esquisse Physique des îles Spitsbergen et du Pole Arctique. Paris 1866.

The author states that 28 different species of birds have been found in Spitsbergen and names some of them. (Of no special importance).

1867

98. DUNÉR, N., A. J. MALMGREN, A. E. NORDENSKIÖLD, A. QUENNERSTEDT. Svenska Expeditionen till Spetsbergen och Jan Mayen utförda under Åren 1863 och 1864. Stockholm 1867.

Of the more common birds of Spitsbergen, 14 are mentioned. In addition Malmgren has a list of 25 birds, identical with the one published in Kgl. Sv. Vet. Akad. Förhandl. 1864.

99. GRAY, G. R. List of the Specimens of Birds in the Collection of the British Museum. Part 5. London 1867.

At this time there was one skin of Lagopus hemilicurus, "The Ice Grous", from Spitsbergen in the museum. It was presented by the Lord High Admiral, K. G.

100. HOLMGREN, A. E. Handbok i Zoologi. II Delen. Skandinaviens Foglar. 2 Vols. Stockholm 1867—1871.

Mentions 27 birds from Spitsbergen. Not important.

101. NEWTON, ALFRED. Zur Vogel-Fauna Spitzbergens. J. Orn. 15. Cassel 1867.

Mainly a discussion with Mr. Malmgren, especially about Lagopus hemilicurus versus L. hyperborea. Further about Arenaria interpres, Branta leucopsis, Stercorarius longicaudus, Phalaropus fulicarius, Somateria spectabilis, Cepphus grylle and Fratercula arctica.

1868

102. BROWN, R. Food of Oenanthe oenanthe taken on Walrus. Proc. Zool. Soc. London 1868.

103. COLLETT, ROBERT. Norges Fugle og deres geographiske Udbredelse i Landet. Forh. Vid. Selsk. 1868. Christiania 1868.

The author writes about the following nine Spitsbergen birds: Anser fabalis brachyrhynchus, Branta bernicla hrota, Branta leucopsis, Larus hyperboreus, Pagophila eburnea, Phalaropus fulicarius, Somateria spectabilis, Stercorarius pomarinus and Uria lomvia. About some of them he has the erroneous belief that they may breed in Norway.

104. MALMGREN, A. J. Bihang till berättelsen om den Svenska expeditionen till Spetsbergen 1864. Stockholm 1868. P. A. Nordstedt & Söner Kongl. Boktryckare.

The list of 27 birds published here is identical with the two preceding ones printed in 1864 and 1867.

105. MARTINS, CHARLES. Von Spitzbergen zur Sahara. Jena 1868.

A German translation of the French book. 22 species of Spitsbergen birds are mentioned. On p. 118 on the Arctic Lemming.

106. QUENNERSTEDT, A. Anteckningar om Djurlivet i Ishafvet mellan Spetsbergen och Grönland. Kgl. Sv. Vet. Akad. Handl. 7. Stockholm 1868.

Mentions birds seen on the sea in the months March—May, between 71° and 74° n.lat. and between 7°30 and 5° e.long.: Plectrophenax nivalis, Pagophila eburnea, Larus hyperboreus, Rissa tridactyla, Fulmarus glacialis, Somateria mollissima, Uria lomvia, Plotus alle and Fratercula arctica naumanni. In addition, a record of Branta leucopsis from Bellsund 1858.

1869

107. BOWDEN, J. The Naturalist in Norway or, Notes on the Wild Animals, Birds, Fishes and Plants of that Country. London 1869.

Contains a lot of incorrect information on the birds of Norway. Curiously enough the information given about eight species of Spitsbergen birds is very up to date for the time when the book was written.

108. DROSTE-HÜLSHOFF, FERDINAND von. Die Vertretung der Vogelwelt im hohen Norden. Ber. 17. Versaml. Deutsch. Ornith. Ges. Cassel 1869.

Professor Koenig says that the notes on the Spitsbergen birds are taken from the contemporary literature. Cited after Koenig 1911.

109. FRIES, TH. M. och NYSTRÖM, C. Svenska Polarexpeditionen År 1868. Stockholm 1869.

Mentions 29 birds from Spitsbergen, including the new record of Anthus sp? But this time it is stated to have been observed just south of Bjørnøya.

110. HOLMGREN, AUGUST EMIL. Bidrag till Kännedomen om Beeren Eilands och Spetsbergens Insekt-Fauna. Kgl. Sv. Vet. Akad. Handl. 8. Stockholm 1869.

Mentions 12 of the most common birds from Spitsbergen, but also the two new species Loxia curvirostra and Anthus sp? About the latter, Holmgren states that is was seen at sea close to the southern point of the mainland of Vest-Spitsbergen.

111. MALMGREN, A. J. A letter to the Editor of the Ibis, dated December 29. 1868. On some birds collected in Spitsbergen and on Bear Island. Ibis. London 1869.

Malmgren writes about Arenaria interpres and Branta leucopsis in Spitsbergen and about a flock of Loxia curvirostra on Bear Island. Of this flock he shot two birds.

112. TORELL, O. und A. E. NORDENSKIÖLD. Die schwedische Expeditionen nach Spitzbergen und Bären-Eiland ausgeführt in den Jahren 1861, 1864 und 1868. Jena 1869.

A great deal of notes about the birds and on pp. 513—514, Malmgren's list of 27 birds from 1864.

1870

113. COLLETT, ROBERT. A letter to the Editor of the Ibis, dated July 1870. Ibis. London 1870.

On Upupa epops taken in Spitsbergen in the summer of 1868.

1871

114. COLLETT, ROBERT. Supplement til «Norges Fugle og deres geographiske Udbredelse i Landet». (1868—70). Forh. Vid. Selsk. 1871. Christiania 1871.

Some remarks about Anser fabalis brachyrhynchus, Branta leucopsis and Phalaropus fulicarius on migration in Norway.

115. DRESSER, H. E. A History of the Birds of Europe. Vols. 1—9. London 1871—1881.

Dresser writes about 32 species of birds from Spitsbergen and refers to all the most important literature on the subject.

116. HEUGLIN, TH. v. Die Vogel-Fauna im hohen Norden. Petermanns geogr. Mitt. 17. Gotha 1871.

Heuglin writes about 24 species of birds seen by himself. He also mentions Alca torda, Histrionicus histrionicus and Crocethia alba, but he has no proof of having seen them. One of the best papers on the Spitsbergen birds.

117. HEUGLIN, TH. v. Die Vogel-Fauna im hohen Norden. J. Orn. 29. Leipzig 1871.

Contains almost the same as the preceding paper in Petermanns Mitteilungen.

118. HEUGLIN, TH. v. Nachtrag zu meinen Bericht über die Ornithologie Spitsbergens. J. Orn. 29. Leipzig 1871.

Mostly on Lagopus hyperboreus, Fulmarus glacialis and Cepphus grylle mandtii.

119. KOLDEWEY, K. Die Erste Deutsche Nordpolar-Expedition im Jahr 1868. Petermanns geogr. Mitt. Erg. hft. 28. Gotha 1871.

On pp. 29 and 41 the author writes about geese, but without any information as to the species.

120. NEWTON, ALFRED. A letter to the Editor of the Ibis, dated March 25. 1871. Ibis. London 1871.

On Lagopus hemileucurus = L. mutus hyperboreus in Spitsbergen.

121. PETERMANN, A. TH. v. Heuglins Aufnahmen in Ost-Spitzbergen, 1870. Petermanns geogr. Mitt. 17. Gotha 1871.

A few notes on the birds of East-Spitsbergen.

122. YARRELL, WILLIAM. A History of British Birds. Fourth Edition in 4 Volumes. London 1871—1885.

34 Spitsbergen birds are mentioned. In Vol. 3, page 576 some valuable remarks on Xema sabini.

1872

123. HEUGLIN, M. TH. von. Reisen nach dem Nordpolarmeer in den Jahren 1870 und 1871. Vol. 1. Braunschweig 1872.

One of the best accounts of the bird-life in the area. The author writes in Vol. 1 about 24 species of birds seen by him in Spitsbergen.

1873

124. COLLETT, ROBERT. Remarks on the Ornithology of Northern Norway. Forh. 1872. Christiania 1873.

Notes about some Spitsbergen birds and their wintering in Norway.

125. MOHN, H. Norske Fangst-Skipperes Opdagelse af Kong Karls Land. Forhandl. i Videnskabs-Selskabet i Christiania Aar 1872. Christiania 1873.

The first record of birds from Kong Karls Land is published in this paper. It contains a list of ten birds.

126. MOHN, H. König Karl-Land im Osten von Spitsbergen und seine Erreichung und Aufnahme durch Norwegische Schiffer im Sommer 1872. Petermanns geogr. Mitt. 19. Gotha 1873.

A translation into German from Professor Mohn's Norwegian publication.

127. PETERMANN, A. Die fünfte Schwedische Nordpolar-Expedition unter dem Commando von Professor Nordenskiöld 1872—73. Petermanns geogr. Mitt. 19. Gotha 1873.

Some remarks about Nyctea scandiaca and Lagopus mutus hyperboreus.

128. SPÖRER, J. Der hohe Norden in der Deutschen Reise-Literatur und Th. v. Heuglins Reisen nach dem Nordpolarmeer in den Jahren 1870 und 1871. Petermanns geogr. Mitt. 19. Gotha 1873.

A few unimportant notes about birds.

1874

129. DRASCHE-WARTINBERG, DR. RICHARD v. Reise nach Spitzbergen im Sommer 1873 mit dem Schooner «Polarstjernen». Wien 1874.

With a few exceptions, unimportant notes about birds.

130. EATON, A. E. Notes on the Fauna of Spitsbergen. Zoologist ser. 2. London 1874.

The author gives very valuable information about 24 species of birds from Spitsbergen and re-adds Carduelis hornemanni to the fauna of the area.

131. FINSCH, OTTO. Die zweite Deutsche Nordpolfahrt in den Jahren 1869 und 1870. 2 Vols. Leipzig 1874.

In Vol. 2 p. 180, Finsch has published a list of 23 birds from Spitsbergen. Not important.

132. HEUGLIN, M. TH. v. Reisen nach dem Nordpolarmeer in den Jahren 1870 und 1871. In drei Theilen. Dritter Theil. Braunschweig 1874.

One of the most important books on the avifauna of Spitsbergen. The author writes about 34 species of birds. New are Melanitta fusca and Podiceps griseigena.

133. SUNDEVALL, CARL J. Spetsbergens Foglar. Kgl. Sv. Vet. Akad. Öfversikt 1874. Stockholm 1874.

Notes on 28 birds. Most of them are common breeders.

134. ZWEITE DEUTSCHE NORDPOLFAHRT IN DEN JAHREN 1869 und 1870. Vol. 2. Cap. 4. Vögel. Bearbeitet von Otto Finsch. Leipzig 1874.

On p. 180 there is a list of 23 birds from Spitsbergen.

1875

135. KJELLMAN, R. Svenska Polar-Expeditionen År 1872—1873 under Ledning af A. E. Nordenskiöld. Stockholm 1875.

A great deal of valuable information about 26 species of birds from Spitsbergen.

136. KJÆRBØLLING, N. Skandinaviens Fugle, med særligt Hensyn til Danmark og de nordlige Bilande. Anden, fuldstendigt omarbeidede Udgave ved Jonas Collin. Kjøbenhavn 1875—1877.

Mentions four birds from Spitsbergen. Not important.

137. NEWTON, ALFRED. A letter to the Editor of the Ibis, dated March 20th 1875. Ibis. London 1875.

About Corvus corax and Hirundo rustica seen in Spitsbergen in the summer of 1874.

138. NORDENSKIÖLD, A. E. Redogjörelse för Den Svenska Polarexpeditionen År 1872—1873. Kgl. Sv. Vet. Akad. Bihang 2. Stockholm 1875.

Notes on 15 of the most common birds. Important are the dates for the spring migration.

1876.

139. LAMONT, JAMES. Yachting in the Arctic Seas or Notes of five Voyages of Sport and Discovery in the Neigbourhood of Spitsbergen and Novaya Zemlja. London 1876.

Notes on some of the more common Spitsbergen birds. Not very important.

140. PAYER, JULIUS. Die Österreich-Ungarische Nordpol-Expedition in den Jahren 1872—1874. Wien 1876.

With the exception of a note about Plotus alle and Uria lomvia from somewhere near Sydkapp, without any interest for the Spitsbergen area.

141. WELLS, JOHN C. The Gateway to Polynia, A Voyage to Spitzbergen. London 1876.

The author says, p. 204, that he "picked up two rare birds (Tringa cinerea)", i.e. young Calidris canutus and on p. 261 he describes how he found a large flock of "snow-geese". It does not seem to be very reliable.

1877

142. COLLETT, ROBERT. Mindre Meddelelser vedrørende Norges Fuglefauna i Aarene 1873—1876. Nyt Mag. Naturv. 23. Christiania 1877.

Some remarks on the wintering of various species of Spitsbergen birds in Norway.

1878

143. FEILDEN, H. W. On Rhodostethia rosea. Ibis. London 1878.

Mr. Feilden cites a letter from Mr. Julius Payer who shot a Ross's Gull south of Frans Josef Land during the summer of 1873. Mr. Payer was a member of the Austrian-Hungarian "Tegetthoff"-Expedition in 1873.

1879

144. SLUITER. Ornithologische Waarnemingen van de Noordelijke Ijszee. Tijdschrift der Nederlandsche Dierkundige Vereeniging. Del 4. (Verschlagen p. XLII—XLV). Leiden 1879.

Some remarks upon the Spitsbergen birds. The author states that he saw flocks of Mellanitta nigra, but not where and when he saw them.

1880

145. NORDENSKIÖLD, A. E. Vegas Färd kring Asien och Europa. Stockholm 1880.

On pp. 100—125 there is a whole chapter on the birds of Spitsbergen and Novaya Zemlya.

1881

146. COLLETT, ROBERT. Mindre Meddelelser vedrørende Norges Fuglefauna i Aarene 1877—1880. Nyt Mag. Naturv. 26. Christiania 1881.

Notes about some Spitsbergen birds and their occurrence in Norway.

147. MARKHAM, ALBERT H. A Polar Reconnaissance. London 1881.

Nothing about the birds of Spitsbergen, but there is a résumé on the avifauna of Novaya Zemlya which is interesting for the comparison of birds of the two areas.

148. SCHLEGEL, H. und C. HOEK. Die Vögel gesammelt während der Fahrten der «Wilhelm Barentz» in den Jahren 1878 und 1879, determiniert von Professor H. Schlegel. Niederländisches Archiv für Zoologie. Supplementband 1. p. 1—3. Leiden 1881—82.

Notes on some Spitsbergen birds. The record of "Tringa minuta" is erroneous; the bird has never been found in the area.

1882

149. COCKS, ALFRED HENNAGE. Notes of a Naturalist on the West Coast of Spitsbergen. Zoologist ser 3. 6. London 1882.

The author writes about 25 species of birds seen by him. A lot of reliable and valuable information. New record: Numenius phaeopus.

150. NORDENSKIÖLD, ADOLF ERIK. Die Umseglung Asiens und Europas auf der Vega. Erster Band. Leipzig 1882.

A translation into German from the original Swedish publication of 1880—1881. On pp. 94—114, remarks on the avifauna of Spitsbergen.

1883

151. COCKS, ALFRED HENNAGE. An autumn visit to Spitsbergen. Zoologist ser. 3. 7. London 1883.

Valuable biological information on the avifauna of Spitsbergen. A list of 32 species of birds.

1884

152. CHAPMAN, ABEL. A Voyage to Spitsbergen and the Arctic Seas 1881. Natural History Transactions of Northumberland, Durham and Newcastle on Tyne. Vol. 8. London 1884—89.

The author writes about 21 of the Spitsbergen birds. Some valuable information is given. First record of Numenius phaeopus (same as No. 149).

153. COCKS, ALFRED HENNAGE. The Avi-Fauna of Spitsbergen. Zoologist ser. 3. 8. London 1884.

A supplement to the two preceding papers.

154. M'Cormick, R. Voyages of Discovery in the Arctic Seas and Round the World. (2 vols.) Vol. 1. London 1884.

M'Cormick was Chief Medical Officer, Naturalist and Geologist to captain Parry on his attempt to reach the North Pole in 1827. He gives valuable information on 15 species of Spitsbergen birds.

155. Nathorst, A. G. Redogörelse för den tilsammans med G. de Geer År 1882 företagna Geologiska Expeditionen till Spetsbergen. Kgl. Sv. Akad. Bihang 9. Stockholm 1884.

Valuable information about 18 Spitsbergen birds. First record of Colymbus immer from Bjørnøya.

156. Phillips-Wolley, Clive. The Trottings of a Tenderfoot. A visit to Columbian Fjords and Spitsbergen. London 1884.

Many notes on Spitsbergen birds, but not very important. Among other birds, a Whimbrel and a Turnstone are mentioned.

1887

157. Kückenthal, W. Das nördliche Eismeer und Spitzbergen. Verh. der Ges. für Erdkunde zu Berl. Vol. 14. Berlin 1887.

Several notes about birds, but the author omits to tell where and when they have been seen.

158. Nordenskiöld, A. E. Vegaexpeditionens Vetenskapliga Iakttagelser. Vol. 5. Stockholm 1887.

See Palmén's paper about the birds.

159. Palmén, J. A. Bidrag til Kännedom om Siberiska Ishafskustens Fogelfauna. Vega-Expeditionens Vetenskapliga Iakttagelser Vol. 5. Utgifna af A. E. Nordenskiöld. Stockholm 1887.

At the end of the paper, the author has published extensive lists where the Spitsbergen birds are also to be found. Besides this there are also many references to the avifauna of the Spitsbergen area in the part describing the geographical distribution of the species.

1888

160. Bendire, Ch. E. Eggs of Pagophila eburnea taken at Great Island, Spitsbergen. Auk 5. Cambridge, Mass. 1888.

On some eggs of Pagophila eburnea taken on Storøya, east of Nordaustlandet.

161. Collett, Robert. Om 4 for Norges Fauna nye Fugle fundne i 1885 og 1886. Forh. Vid. Selsk. 1887. Christiania 1888.

On the first find of Xema sabini in Norway.

162. Collett, Robert. On a Breeding-colony of Larus eburneus on Spitsbergen. Ibis. London 1888.

On a colony of breeding Pagophila eburnea found in 1887 on Storøya east of Nordaustlandet, Spitsbergen.

163. KÜKENTHAL, WILLY. Bericht über eine Reise in das nördliche Eismeer und nach Spitzbergen im Jahre 1886. D. Geogr. Blätter 11. Bremen 1888.

Important records of several species, but the numbers of birds seem to be somewhat exaggerated.

1889

164. KÜKENTHAL, WILLY und ALFRED WALTHER. Die von der Bremer Geographische Gesellschaft veranstaltete zoologische Forschungsreise in das nördliche Eismeer D. Geogr. Blätter 12. Bremen 1889.

No records on birds.

1890

165. COLLETT, ROBERT. En rugende Coloni af Larus eburneus paa Spitsbergen. Tromsø Museums Aarshefter 13. Tromsø 1890.

About a breeding colony of Pagophila eburnea found on Spitsbergen in 1887.

166. LINDEMAN, M. Kükenthals Spitzbergenfahrten. Das Ausland Jahrg. 63. Stuttgart 1890.

Unimportant notes about birds. The description of Mandt's guillemot is wrong. The bill is black, not red.

167. KÜKENTHAL, W. Bericht über die von der Geographischen Gesellschaft in Bremen im Jahre 1889 veranstaltede Reise nach Ostspitzbergen (Dr. Kükenthal und Dr. Walter). Petermanns geogr. Mitt. 36. Gotha 1890.

Some more or less unimportant notes on birds. The ornithological results of the journey are published in a paper by Dr. Walter.

168. KÜKENTHAL, WILLY. Bericht über die von der Geographischen Gesellschaft in Bremen Veranstaltete Forschungsreise in das europäische Eismeer. (Dr. Kükenthal und Dr. Walter). D. Geogr. Blätter 13. Bremen 1900.

Notes on several birds. Tringa minuta on p. 84, is Pelidna alpina, i.e. Calidris alpina. Cited after Koenig (1911).

169. WALTER, ALFRED. Ornithologische Ergebnisse der von der Bremer geographischer Gesellschaft im Jahre 1889 veranstaltete Reise nach Ostspitzbergen. J. Orn. 38. Leipzig 1890.

Published by Professor Dr. Willy Kükenthal from Dr. Walter's posthumous papers. Very valuable information on the avifauna of Spitsbergen. Dr. Walter went to places seldom visited by scientists. New records of Crocethia alba, Calidris alpina and Calidris canutus.

1891

170 a. BARTH, J. B. Erfaringer fra Jagten paa det mindre Vildt i Norge. 2nd. Ed. Kristiania 1891.

On the game-birds and wildfowl of Norway.

170 b. COLLETT, ROBERT. Om 6 for Norges Fauna nye Fugle fundne i 1887—1889. Forh. 1890. Christiania 1891.

About the first Anser hyperboreus found in Norway and some remarks on the three Spitsbergen geese.

171. HARTERT, ERNST. Katalog der Vogelsamlung im Museum der Seckenbergischen Naturforschenden Gesellschaft in Frankfurt am Main. Frankfurt am Main 1891.

Only a single bird from Spitsbergen in the collection of the Museum.

172. KLINCKOWSTRÖM, A. Tre Månaders Dag. Stockholm 1891.

Mentions 18 species of birds from Spitsbergen. Some valuable ornithological information.

1892

173. COLLETT, ROBERT. Über eine Brutcolonie von Larus eburneus auf Spitzbergen. Z. Ooologie 1. Berlin 1892.

On a breeding colony of Pagophila eburnea in Spitsbergen.

174. COLLETT, ROBERT. Zur Ornis von Spitzbergen. Orn. Jahrb. 3. Hallein 1892.

On Oenanthe oenanthe, Numenius phaeopus and a new record: Apus apus.

175. CREMER, LEO. Ein Ausflug nach Spitzbergen. Berlin 1892.

Almost nothing about birds. Not important.

176. KLINCKOWSTRÖM, A. Öfversikt af de geologiska arbetena under expeditionen till Spetsbergen 1890. G. Nordenskiöld: Den Svenska Expeditionen till Spetsbergen 1890. Kgl. Sv. Vet. Akad. Bihang 17. Stockholm 1892.

On pp. 91—92 a list of 23 birds from Spitsbergen with notes on their geographical distribution in the area.

177. NATHORST, A. G. Jaktminnen från polartrakterna. Sv. Jägareförb. Nya Tidskr. 30. Stockholm 1892.

Some remarks on the Spitsbergen birds. Especially interesting about Charadrius hiaticula.

178. NORDENSKIÖLD, G. Redogörelse för Den Svenska Expeditionen till Spetsbergen 1890. Kgl. Sv. Vet. Akad. Bihang 17. Stockholm 1892.

Notes about birds on pp. 19, 22, 33, 44, 45, 52, 56 and 67. Some of these are very important.

179. ZEPPELIN, MAX von. Reisebilder aus Spitzbergen, Bären-Eiland und Norwegen. Stuttgart 1892.

Some more or less unimportant remarks on Spitsbergen birds.

1894

180. Barry, Richard Ritter von. Zwei Fahrten in das nördliche Eismeer nach Spitzbergen und Novaya Zemlja. Wien 1894.

A lot of ornithological information, but not always correct. The bird called U. lomvia should be Fratercula a. naumanni and Alca torda is Uria lomvia. The Arctic Tern does not breed on bird-rocks and Pagophila eburnea is never seen swimming among Kittiwakes and Eiders. All authorities seem to agree that this bird will never (or at least very rarely) be seen swimming on the sea.

181. Chapman, Abel. On the Lagopus of Spitsbergen. Ibis. London 1894.

Mr. Chapman had the idea that the Spitsbergen Lagopus was nearer related to Lagopus lagopus than to Lagopus mutus, a theory that has later been proved to be wrong.

182. Collett, Robert. Mindre Meddelelser vedrørende Norges Fuglefauna i Aarene 1881—1892. Nyt Mag. Naturv. 35. Christiania 1894.

Some notes about Spitsbergen birds and their occurrence in Norway.

183. Couteaud, P. Rapport Sommaire sur les Collections D'Histoire Naturelle faites pendant la Campagne. Ministère de L'Instruction Publique. Voyage de «La Manche» à L'Île Jan Mayen et au Spitzberg (Juillet-Août 1892). Paris 1894.

Some remarks on Somateria mollissima and Pagophila eburnea.

184. Gratzl, A. Der Besuch der Insel Jan Mayen und Spitzbergen im Sommer des Jahres 1892. Denkschr. Kais. Akad. Wiss. Wien. Math. Nat. Kl. Vol. 61. pp. 297—308. Wien 1894.

Some unimportant notes about birds.

185. Harvie Brown, J. A. On Diomedea melanophrys. Zoologist ser. 3. 18. London 1894.

In 1882 Mr. Harvie Brown visited the Petershead Museum in Scotland where he saw an Albatross, killed W of Spitsbergen in 1878.

186. Oustalet, M. E. Catalogue des Oiseaux obtenus par la Mission de la Manche en Islande, aux Ferøe, à l'Ile Jan Mayen et au Spitzberg. Ministère de L'Instruction Publique. Voyage de «La Manche» à l'Île Jan Mayen, et au Spitzberg (Juillet-Août 1892). Paris 1894.

A few notes on 9 species of birds collected in Spitsbergen.

187. Rabot, Charles. Exploration dans L'Oceane Glacial Arctique. Islande Jan Mayen-Spitzberg. Bull. de la Société de Géographie. Septième Serie. Vol. 15. Paris 1894.

A single remark about Pagophila eburnea.

1895

188. Coke, C. H. Visit of the Training Squadron to Spitzbergen in the Summer of 1895. Geogr. J. 6. London 1895.

Some unimportant notes about a few birds.

189. Feilden, H. D. A Flying visit to Spitsbergen. Zoologist ser. 3 19. London 1895.

A very fine paper on the Spitsbergen birds. It deals with 21 species of that area.

190. Gätke, Heinrich. Heligoland as an Ornithological Observatory. Edinburgh 1895.

20 species of birds from the Svalbard area are mentioned.

1896

191. Geer, Gerhard de. Rapport om den svenska geologiska expeditionen till Isfjorden på Spetsbergen sommaren 1896. Ymer 16. Stockholm 1896.

A few unimportant remarks about birds.

192. Gregory, J. W. The Conway Expedition to Spitzbergen. Nature 54. London 1896.

Almost nothing about birds, only a few notes and among them one about an unknown bird seen on the shore of Agardhbukta.

193. Hamberg, Axel. En resa till norra Ishafvet sommaren 1892. Ymer 14. Stockholm 1895.

A few unimportant notes on birds.

194. Lumholtz, Ludv. Fra Spitsbergen. Norsk Jæger f. Tidsskr. 25. Kristiania 1896.

Notes about Nyctea scandiaca and Lagopus mutus hyperboreus.

1897

195. Chapman, Abel. Wild Norway. London 1897.

A very important paper. Contains the diary of Mr. Arnold Pike, with very valuable information on the avifauna of Spitsbergen. (See below, 200).

196. Conway, W. M. The First Crossing of Spitsbergen. London 1897.

Notes on 20 species of birds. Valuable information from the inland of the area. Cepphus g. grylle, the common black Guillemot, has of course never been found in Spitsbergen.

197. Garwood, Edmund J. Across Spitzbergen with Sir Martin Conway, with an account of the Ascent of Hornsundtind. The Alpine Journ. Vol. 18. London 1897.

Apart from a note on a Snow-Bunting in Fulmardalen, nothing on birds.

198. JACKSON, F. G. Journal from Franz Josef Land on 5 July, 1897. The journal is kept in the library of the Scott Polar Research Institute, Cambridge.

"Going outside the house after dinner with Armitage who had his binoculars with him I heard the strange cry of a bird (somewhat like an ivory gull's) and looking up into the air I saw flying some 200 ft. up, between the house and the rocks an adult Ross's Gull. (Breast and neck a bright rosy colour becoming less marked towards the tail, endtips of the wings strongly marked in a dark colour. I could not see the upper surface of the bird's body and wings)."

199. LETELLIER, M. A travers la Norvège et Spitsbergen. Paris 1897.

Mostly unimportant notes about birds with the exception of a record of Branta bernicla hrota in Liefdefjorden.

200. PIKE, ARNOLD. A Winter in the Eightieth Degree. Abel Chapman's "Wild Norway" pp. 343—351. London 1897.

A very good account of the birds of the NW corner of Spitsbergen. Contains very valuable information.

201. SCLATER, P. L. A short account of his 48-hour visit to Spitsbergen in 1896. Ibis. London 1897.

Notes about Plectrophenax nivalis, Calidris maritima, Pagophila eburnea, Stercorarius longicaudus and Lagopus mutus hyperboreus.

202. SPITSBERGEN GAZETTE. Tromsø 1897.

Some scattered information about the Spitsbergen birds. A few records are valuable, but most of the information given here is without any interest.

203. TREVOR-BATTYE, AUBYN. The Birds of Spitsbergen, as at present determined. Ibis. London 1897.

Trevor-Battye was zoologist to the Conway-expedition of 1896. He gives account of 29 birds. A very valuable paper.

204. WEGENER, GEORG. Zum ewigen Eise. Berlin 1897.

A few unimportant remarks about birds.

1898

205. ALBERT Ier Prince de Monaco. Exploration Océanographique aux Régions Polaires. Extrait 1. Ornis 9. Paris 1898.

Mentions only a few birds. Without any special interest.

206. ANONYMOUS. Winter-birds in Spitsbergen. Ibis. London 1898.

About Lagopus mutus hyperboreus, Cepphus grylle mandtii, Uria lomvia, Somateria mollissima and Fulmarus glacialis, wintering at Danskegattet 1888—1889. From Mr. Pike's diaries, published in Abel Chapman's "Wild Norway". Presumably written by P. L. Sclater, one of the two editors of the Ibis in 1898.

207. BRUCE, W. S. and W. E. CLARKE. The Mammalia and Birds of Franz Josef Land. Proc. Royal. Physical. Soc. of Edinburgh. Vol. 14. Edinburgh 1897—1901. 16th March 1898.

Interesting for comparison with the birds of the Spitsbergen area.

208. CONWAY, W. M. With Ski & Sledges over Arctic Glaciers. London 1898.

Mentions only 10 of the more common Spitsbergen birds. The book is, however, of great interest because it is the first to deal with the bird-population on the Nunataks far in on the glaciers.

209. KOLTHOFF, GUSTAF och L. A. JÄGERSKIÖLD. Nordens Foglar. Stockholm 1898.

Mentions 27 birds from Spitsbergen. There are also some valuable records and among them one about the breeding of Xema sabini on Storøya, East-Spitsbergen in 1898 (Given in a letter from F. Schaudin).

210. MEISENBACH, G. En färd till Sjuöarne sommaren 1897. Ymer 18. Stockholm 1898.

The only points of ornithological interest are the notes on the Eiders on the island Moffen.

211. NATHORST, A. G. Om 1898 års svenska polarexpeditionen. Ymer 18. Stockholm 1898.

Some interesting records of Pagophila eburnea from Kong Karls Land. Also some biological notes on Phalaropus fulicarius and Calidris maritima.

212. NATHORST, A. G. 1898 års svenska polarexpedition från jaktlig synspunkt. Sv. Jägareförb. Nya Tidskr. 36. Stockholm 1898.

On pp. 96—98 an account of the birds of the area, but no dates.

213. OUSTALET, M. E. Liste des Oiseaux Recueillis dans le Cours de la dernière Campagne Scientifique de S. A. S. le Prince Albert Ier de Monaco. Ornis 9. Paris 1898.

Mentions 15 birds, but nothing about where and when they were seen. Larus canus has of course never been seen in Spitsbergen.

214. OUSTALET, M. E. Note sur la Distribution Géographique de la Mouette de Sabine (X. sabini). Ornis 9. Paris 1898.

About the distribution of Xema sabini.

215. PIKE, ARNOLD. A Cruise on the East of Spitsbergen. Geogr. J. 11. London 1898.

About Lagopus mutus hyperboreus, Rissa tridactyla and Cepphus grylle mandtii, seen in Kong Karls Land.

216. RÜDIGER, W. Allgemeines über den Verlauf der Expeditionen nach dem europäischen Nord-Meer an Bord des Dampfers «Helgoland». Verh. Ges. für Erdkunde pp. 430—448. Berlin 1898.

Unimportant notes on birds.

217. TRAUTZSCH, HERMANN. Die geographische Verbreitung der Wirbeltiere in der Grönland- und Spitzbergensee, mit Berücksichtigung der Beobachtungen Nansens. Biologisches Centralblatt Bd. 18. Leipzig 1898.

Mentions 31 species of birds from the Svalbard area.

218. WINGE, HERLUF. Grønlands Fugle. Medd. Grønland 21. Kjøbenhavn 1898.

Of a certain interest for comparison with the birds of the Spitsbergen area.

1899

219. BRUCE, W. S. With the Yachts "Blencathra" and "Princesse Alice" to the Barents and Greenland Seas. Scot. Geogr. Mag. 15. Edinburgh 1899.

Some notes on the birds from Bjørnøya and Hopen.

220. CLARKE, WILLIAM EAGLE. An Epitome of Dr. Walters Ornithological Results of a Voyage to East Spitsbergen in the Year 1889. Ibis. London 1899.

A translation into English from the publication of Dr. Walter by Professor Kükenthal in Journ. für Ornithologie.

221. EKSTAM, OTTO. Einige blütenbiologische Beobachtungen auf Spitsbergen. Tromsø Mus. Aarshefter No. 20. 1897. Tromsø 1899.

Some remarks about plant-eating birds, especially Lagopus mutus hyperboreus.

222. GRUNACK, A. Ein Brutplatz der Elfenbeinmöve. Z. Oologie 8. Berlin 1899.

Notes on the travels of Römer and Schaudin. See "Fauna Arctica" 1900. Cited after Koenig (1911).

223. HARTLAUB, CLEMENS. Megalestris cataractes auf Spitzbergen erlegt. Orn. Monatsb. 7. Berlin 1899.

The first record of Stercorarius skua from Spitsbergen.

224. JACKSON, F. G. A Thousand days in the Arctic. London 1899.

Vol. 2 pp. 321 and 403 on Rhodostethia rosea.

225. KOLDERUP, CARL FRED. Bjørnøen. Naturen 23. Bergen 1899.

Some unimportant notes on birds.

226. KOLTHOFF, GUSTAF. Ur Djurens Lif. (2 Vols.) Stockholm 1899 & 1901.

A great deal of biological notes on Spitsbergen birds. Important, especially as there are several notes not published before in Mr. Kolthoff's earlier publications.

227. LORENTZEN, A. König Karls-Land. Globus Vol. 76. Braunschweig 1899.

Mentions that Kolthoff has seen 18 species of birds on the island.

228. NATHORST, A. G. Kung Karls Land. Ymer 19. Stockholm 1899.

Names 10 birds as breeding, 5 as possibly breeding and another 4 birds as not breeding. Besides this some valuable ornithological remarks in a footnote.

229. NATHORST, A. G. Några upplysningar till den nya kartan öfver Beeren Eiland. Ymer 19. Stockholm 1899.

A few unimportant remarks on birds. Almost everything already published.

230. NATHORST, A. G. The Swedish Arctic Expedition of 1898. Geogr. J. 14. London 1899.

Very little about birds; see, however, the two preceding papers of Mr. Nathorst.

231. OUSTALET, M. E. Liste des oiseaux, recueillis dans le cours de la dernière campagne scientifique de S. A. S. le prince Albert Ier de Monaco. Bull. Mus. d'Hist. Nat. Paris 1899.

Cited after Koenig. Probably of the same content as the paper in the Ornis in 1898. See 213.

232. SCHALOW, HERMAN. Einige Bemerkungen zur Vogelfauna von Spitzbergen. J. Orn. 47. Leipzig 1899.

A summary on recent ornithological literature of Spitsbergen. Also notes on several birds of the area.

233. THÉEL, HJALMAR. Sven Lovén. Lefnadsanteckningar öfver Kungl. Svenska Vetenskapsakademiens efter År 1854 aflidna Ledamöter. Vol. 4. Stockholm 1899—1912.

Obituary on Professor Sven Lovén with notes from his diary from Spitsbergen in 1837.

1900

234. ANDERSSON, JOH. GUNNAR. Den Svenska Expeditionen till Beeren Eiland Sommaren 1899. Ymer 20. Stockholm 1900.

Mr. Andersson cites Swenander and mentions that Alca torda was found on Bjørnøya in 1898. Apart from this notice, very little information on birds.

235. BRUCE, W. S. Spitzbergen. 1898 and 1899 voyages with H. S. H. the Prince of Monaco. Scot. Geogr. Mag. 16. Edinburgh 1900.

Apart from a note on the breeding of Pagophila eburnea in Liefdefjorden, nothing of importance about birds.

236. CARLHEIM-GYLLENSKÖLD, V. På Åttionde Breddgraden. Stockholm 1900.

From the Swedish-Russian expedition to Spitsbergen in 1898. A few remarks on birds.

237. COLLETT, ROBERT and FRIDTJOF NANSEN. The Norwegian North Polar Expedition 1893—1896. Vol. 1. Christiania 1900.

Especially interesting because of the Ross Gulls seen by Nansen near Franz Josef Land between 82° 10′ and 81° 30′ N. lat. and on board the *Fram* between 84° 41′ and 84° 27′ N. lat. An observation of Xema sabini from 83° N. lat. north of Spitsbergen is also of great interest.

238. GÄTKE, HEINRICH. Die Vogelwarte Helgoland. Braunschweig 1900. 2. Ed.

21 species of birds from the Svalbard area are mentioned.

239. HARTLAUB, CLEMENS. Zoologische Ergebnisse einer Untersuchungsfahrt nach der Bäreninsel und Westspitzbergen. Wissenschaftliche Meeresuntersuchungen... Neue Folge. Bd. 4. Abt. Helgoland. Kiel und Leipzig 1900.

Much ornithological information, but most of it without any special interest.

240. HERWIG. Die Expedition des Deutschen Seefischerei-Vereins in das nördliche Eismeer, vom Jahre 1899. Mitteilungen des Deutschen Seefischerei-Vereins Bd. 16. No. 1. Berlin 1900.

A few ornithological notes. The first record of Arenaria interpres from Bjørnøya.

241. KOLTHOFF, GUSTAF. Kort meddelande om 1900 års Zoologiska Polarexpedition. Sv. Jägareförb. Nya Tidskr. 38. Stockholm 1900.

Some notes on birds, of special interest on Stercorarius pomarinus.

242. KOLTHOFF, GUSTAF. An den Nistplätzen der Eismöve (Pagophila eburnea). Naturwissenschaftliche Wochenschrift Bd. 15. Berlin 1900.

A German translation from Mr. Kolthoff's book "Ur Djurens Lif". An excellent paper on the Ivory Gull.

243. NATHORST, A. G. Två Somrar i Ishafvet. Vol. 1. Stockholm 1900.

A great deal of valuable information on 25 species of birds from Spitsbergen and the adjoining islands. That Stercorarius longicaudus should be a breeder on Kong Karls Land does not seem to have been proved, and the remark about the goslings of Anser fabalis brachyrhynchus being fed by the goose is entirely incorrect.

244. R)6 390 JULES. Notes d'excursions au Spitsberg et aux iles voisines. Compt. rendus des Séances de la Soc. Géogr. Année 1899. Paris 1900.

A great deal of ornithological information from Spitsbergen and the adjoining islands.

245. RÖMER, FRITZ und FRITZ SCHAUDIN. Fauna Arctica. Bd. 1. Jena 1900.

On 28 species of birds from the German Expedition to the Polar Seas in 1898. Valuable ornithological information.

246. RØMER, FRITZ und FRITZ SCHAUDIN. Über die Lebensweise der Vögel Spitzbergens. Ornithologische Monatsberichte Bd. 8. Berlin 1900.

A summary of "Fauna Arctica" by the same authors.

247. SWENANDER, G. Beiträge zur Fauna der Bären Insel. Kgl. Sv. Vet. Akad. Bihang 26. Stockholm 1900.

A very fine paper on the birds of Bjørnøya. It deals with 22 species. New records for this island of Clangula hyemalis and Sterna macrura.

1901

248. DITTMER, R. Das Nord-Polarmeer. Hannover und Leipzig 1901.

Some scattered ornithological notes. The remark that the down of the King Eider (Somateria spectabilis) was collected by Norwegians trappers is nonsense.

249. HENKING, K. Die Expedition nach der Bären Insel im Jahre 1900. Mitteilungen des Deutschen Seefischerei-Vereins Bd. 17. Berlin 1901.

Notes on 15 species of birds from Bjørnøya.

250. KOLTHOFF, GUSTAF. Till Spetsbergen och Nordöstra Grönland År 1900. Stockholm 1901.

A great deal of biological notes on 27 species of birds. Very valuable information. Records of Phalaropus lobatus and Colymbus immer.

251. KOLTHOFF, GUSTAF. Om det högra djurlivet i norra polartrakterna. Sv. Jägareförb. Nya Tidskr. 39. Stockholm 1901.

Mostly extracts from earlier papers, nothing of a special interest.

252. SALVADORI, TOMMASO. Intorno ad aleuni ucelli delle Spitzberghe. Boll. Mus. Zool. Anat. comp. della R. Univers. di Torino. Vol. 16. No. 388. Torino 1901.

On 14 species of birds collected by the Prince of Naples in 1898.

1902

253. BIANCHI, V. Zoologische Ergebnisse der Russischen Expeditionen nach Spitzbergen. Ueber die in den Jahren 1899—1901 auf Spitzbergen gesammelten Vögel. Annu. Mus. Zool. Acad. 7. St. Petersburg 1902.

A very important paper on the Spitsbergen birds. New records of (probably) Corvus frugilegus, Turdus musicus and Anas crecca. There is also a list of 46 birds found in the area. Valuable observations were made during migration time, and there is also much excellent biological information.

254. DUNÉR, N. Fast i isen. Minnen från 1902 års gradmätningsexpedition till Spetsbergen. Sv. Jägareförb. Nya Tidskr. 40 och 41. Stockholm 1902 och 1903.

Ornithological notes from the pack-ice north of Spitsbergen and from the southern part of Hinlopenstretet.

255. FAUSTINI, A. Un viaggio alle Spitzbergen nell anno 1671. Societa Cattolica Italiana par gli studi scientifici Rivista di Fisica, Matematica a Scienze Naturali. Vol. 6. Pavia 1902.

A summary in Italian from Marten's voyage in 1671.

256. KOLTHOFF, GUSTAF och L. A. JÄGERSKIÖLD. Nordens Fåglar. Nya Tillägg och Rättelser. Stockholm 1902.

Of the Spitsbergen birds the following are mentioned: Lagopus mutus hyperboreus, Crocethia alba, Phalaropus fulicarius, Numenius phaeopus, Anas acuta, Melanitta nigra, Colymbus immer, Uria lomvia and Plotus alle.

257. ROTH, J., A. BERGER und O. GRAF ZEDLITZ. Deutsches Weidwerk unter der Mitternachtsonne. Berlin 1902.

Ornithological notes from a shooting trip to Spitsbergen.

258. SCHALOW, HERMAN. On the occurrence of Anas crecca in Spitsbergen. J. Orn. 50. Leipzig 1902. (p. 126).

Some remarks on Anas crecca found in Spitsbergen by Mr. Bauendahl.

259. WALLSEE, H. E. Der Nordland- und Spitzbergenfahrer. Hamburg 1902.

A few ornithological notes.

1903

260. HARTERT, ERNST. Die Vögel der Paläarktischen Fauna. 3 vols. + 1 Suppl.-vol. Berlin 1903—1938.

Names 39 birds as belonging to the Svalbard area.

261. KOLTHOFF, GUSTAF. Bidrag till Kännedom om Norra Polartrakternas Däggdjur och Foglar. Kgl. Sv. Vet. Akad. Handl. 36. Stockholm 1903.

A very fine paper with exceedingly valuable information on the birds of the Svalbard area. The first record of Anas acuta from Bjørnøya.

262. MELA, A. J. Huippuvorten linnut. Muutamia tietoja. Luonnon Ystävä. Helsingfors 1903.

A Finnish paper on the birds of the Svalbard Area. The author has made no investigations himself. A summary taken from divers publications.

1904

263. BIDENKAMP, O. Spitsbergens høiere dyreliv. Naturen 28. Bergen 1904.

About 20 species of birds are mentioned. Everything is taken from recent publications. There are no new records and the paper is of small importance.

264. Schönrock, A. Jagdliches von Spitzbergen. Baltischer Weidmannsblatt Vol. 4. pp. 201—203, 222—224. 1904.

Cited after Pleske, who says that there are some unimportant notes on birds in this publication.

1905

265. Ingram, Collingwood. The Little Auk in Spitzbergen. Avicultural Mag. New Series Vol. 3. London 1905.

A short paper on the behaviour and distribution of the Little Auk in Spitsbergen.

266. Naumann. Naturgeschichte der Vögel Mitteleuropas. Bd. 1—12. Gera 1905.

Names 34 birds from Spitsbergen.

267. Römer, Fritz. Die Tierwelt des nördlichen Eismeeres. Jahrb. Nass. Verein Naturk. Bd. 58. Wiesbaden 1905.

Ornithological notes on pp. XXVIII—XXXI. With exception of the remarks on Pagophila eburnea, of very little importance.

1906

268. Conway, M. No Man's Land. Cambridge 1906.

Contains a very valuable bibliography on Spitsbergen papers and books.

269. Dietrich, Franz. Ein Besuch der Gooseinseln im Eisfjord bei Spitzbergen. Z. Oologie 16. Berlin 1906.

Notes about the birds breeding on the islands of Gåsøyane in Isfjorden in the summer of 1906.

270. Römer, Fritz und Fritz Schaudin. Fauna Arctica. Bd. 4. Jena 1906.

Contains "Die Vögel der Arktis" by Herman Schalow (see there).

271. Schalow, Herman. Die Vögel der Arktis. In "Fauna Arctica" by Römer und Schaudin. Bd. 4. Jena 1906.

A summary of everything known about arctic birds at that time. A very valuable paper. It also contains a very good bibliography.

1907

272. Bruce, W. S. Prince Charles Foreland. Scot. Geogr. Mag. 23. Edinburgh 1907.

Deals with 17 species of birds. New records of Alca torda for Spitsbergen and the first find of breeding Crocethia alba. In this paper there is a reference to "The Mammals and Birds of Prince Charles Foreland", in the Proc. Roy. Phys. Soc. Edinburgh. Vol. 17 1906/07. This lecture was read by Mr. Bruce on November 26. 1906, and it is much to be regretted that it has never been printed.

273. DIETRICH, FRANZ. Eine Reise nach Spitzbergen. Wissentschaftliche Beilage zum Bericht der Unterichts-Anstalt des Klosters St. Johannes über das Schuljahr 1906—1907. Progr. No. 16. Hamburg 1907.

Notes on 21 species of birds.

274. ISACHSEN, GUNNAR. Spitsbergenexpeditionen 1906. Det Norske Geogr. Selskab. Vol. 18. 1906/1907. Kristiania 1907.

Some interesting observations of Pagophila eburnea.

275. MILLER, W. de W. A letter to the Editor of the Ibis from the Assist. Ornithologist of the American Museum of Nat. Hist. Ibis. London 1907.

About a couple of Spitsbergen Ptarmigan shot on Franz Josef Land in June 1904.

276. NORDENSKIÖLD, OTTO. Det moderna Spetsbergen. Varia Bd. 10. Göteborg. 1907.

The author writes among other things about the tourists who shoot down thousands of harmless birds to no earthly purpose at all.

277. ORLÉANS, DUC d'. A Travers la Banquise du Spitzberg au Cap Phillipe. Paris 1907.

Several notes on birds. On p. 328 a list of birds seen, but nothing about where they were found. In a journal at the end of the book there are several notes, but at least Larus leucopterus has never been found in the area and Uria troile must be Uria lomvia.

278. ORLÉANS, DUC d'. Crosière Océanographique dans le Mer du Grönland en 1905. Bruxelles 1907.

The content of the book is the same as in "A Travers la Banquise", but on p. 566 the results of investigations on the ventricle contents of Calidris maritima are given.

279. PEARSON, HENRY J. A letter to the Editor of the Ibis. London 1907.

On two Spitsbergen Ptarmigan shot by the Ziegler Expedition on Franz Josef Land in 1904.

280. RÖMER, FRITZ. Die Abnahme der Tierarten mit der Zunahme der geographischen Breite. Ber. Senckenb. Ges. Frankfurt am Main 1907.

About birds on pp. 80—86. Nothing important from Spitsbergen.

1908

281. BERKOWITZ, A. Reise nach Spitzbergen und von dort nordwärtz zum ewigen Eise. Korrespondenzblatt des Naturforscher-Verein zu Riga Bd. 51. Riga 1908.

Unimportant notes on birds.

282. BRUCE, W. S. The Exploration of Prince Charles Foreland 1906—1907. Geogr. J. 32. London 1908.

On p. 147 some ornithological remarks on the find of young Crocethia alba in down, the first record of Alca torda from Spitsbergen and an observation of Xema sabini. In all 28 species of birds were seen.

283. GUTTMANN, HERMANN. Führer von Spitzbergen. 3. Aufl. Berlin 1908.

On p. 68 a few unimportant notes on birds.

284. HAAG, FERD. Über die Elfenbeinmöve Pagophila eburnea (Phipps). Z. Oologie 18. Berlin 1908.

Biological notes on birds from the sea East of Spitsbergen, where the author went in the summer of 1908.

285. HANTZSCHER, B. Über das Studium der arktischen Vögel. J. Orn. 56. Leipzig 1908.

A paper on studies of arctic birds, but nothing of special interest from Spitsbergen.

286. KOENIG, ALEXANDER. Kurzer vorläufiger Bericht über meine Reise nach der Bäreninsel und nach Spitzbergen, unternommen in Juni und Juli 1907. Vortrag gehalten auf der 57. Jahresversammlung der Deutschen Ornithol. Gesellschaft in Berlin. J. Orn. 56. Leipzig 1908.

About Koenig's journeys to Spitsbergen in 1905 and 1907. New records for Bjørnøya, Charadrius hiaticula, Phalaropus fulicarius, Melanitta nigra, Sturnus vulgaris, Turdus merula, Turdus musicus and Anas crecca. First finds of Melanitta nigra and Xema sabini as breeding birds in Spitsbergen.

287. KOENIG, ALEXANDER. Reiseskizzen und Vogelbilder aus dem hohen Norden. Orn. Jahrb. 19. Hallein 1908.

A paper read in Bonn and Frankfurt am Main. The content is about the same as in the preceding publication by Professor Koenig.

288. KOENIG, ALEXANDER. Vogelleben und Vogelbilder aus hohem Norden. Ber. Senckenb. Ges. Frankfurt am Main 1908.

A short extract from Professor Koenig's lecture. About this Koenig says: "This extract is not written by the lecturer himself, and it contains several errors. Branta leucopsis is not a new record for Spitsbergen. Anas penelope was seen, not shot, and from Scolopax rusticola only feathers were found".

289. REICHENOW, ANTON. Vögel des Weltmeeres. Deutsche Südpolexpedition 1901—1903. Bd. 9. Zoologie 1. Berlin 1908.

A few notes on the birds from Spitsbergen.

1909

290. Clarke, W. Eagle. The Chicks of the Sanderling. Brit. Birds 3. London 1909.

About Mr. Bruce's find of a Sanderling with a brood of 4 on Prins Karls Forland in 1906.

291. Geer, Gerhard de. Något om Spetsbergen. Ord och Bild. Stockholm 1909.

Unimportant notes on birds.

292. Haag, Ferd. Über die Elfenbeinmöve. Z. Oologie 18. Berlin 1909.

About the breeding of the Ivory Gull on Kong Karls Land in 1908.

293. Haag, Ferd. Plattschnäbliger Wassertreter (Phalaropus fulicarius L.) Z. Oologie 19. Berlin 1909.

Biological notes on the Grey Phalarope from Spitsbergen 1909.

294. Högbom, B. Snöskata funnen på Spetsbergen. Fauna och Flora 4. Uppsala 1909.

About a Fieldfare found dead in Hornsund 1908.

295. Hulth, J. M. Swedish Spitsbergen Bibliography. Ymer 29. Stockholm 1909.

Of special interest is the part about Zoology, pp. 65—77.

296. Koenig, Alexander. Birds of Bear Island and Spitzbergen. Ibis. London 1909.

A short extract of Professor Koenig's lecture in the Senckenberg. Naturforschende Gesellschaft. See Koenig 1908. 288.

297. Nathorst, A. G. Swedish explorations in Spitsbergen 1758—1908. Historical sketch. Ymer 29. Stockholm 1909.

In this paper all the Swedish expeditions to Spitsbergen in the years between 1758 and 1908 are shortly mentioned. Regarding birds there is only a single note on Martin's description of the Fulmar from 1758.

1910

298. Birulja, A. Zoologičeskie resul'taty russkich èkspedicij na Spičbergen Biologičeskija nabljudenija nad pticami Spičbergena.

(Zoologische Ergebnisse der russischen Expeditionen nach Spitzbergen. A. Birula. Biologische Beobachtungen über die Vögel Spitzbergens).

Annu. Mus. Zool. Acad. 15. St. Pétersbourg 1910.

Biological notes on about 20 birds, a very valuable paper. A translation from Russian to Norwegian by Natascha Heintz is kept in the library of Norsk Polarinstitutt, Oslo.

299. Collett, Robert. Zwei Passeres von Spitzbergen. Orn. Monatsb. 18. Berlin 1910.

On Turdus musicus and Oenanthe oenanthe seen in Bellsund in August 1908.

300. Gauert, Otto. Aus meiner Reise nach Spitzbergen. Z. Oologie 19. Berlin 1910.

A lot of valueless information. Wrong names are used for most of the species. The paper is worthless and cannot be taken into account.

301. GEYR von SCHWEPPENBURG, H. Bemerkungen zu dem Artikkel XIX p. 150 ff. Z. Oologie 19. Berlin 1910.

A criticism of the paper of Mr. Gauert in the above journal, correcting the errors.

302. HOLMSEN, GUNNAR. Meine Spitsbergenexpedition 1909. Petermanns Mitt. 56. Gotha 1910.

A few unimportant notes on birds.

303. HULTH, J. M. Swedish Arctic and Antarctic Explorations 1758—1910. Bibliography. Kgl. Sv. Vet. Akad. Årsbok för År 1910. Bilaga 2. Stockholm 1910. 294.

Of the same content as Mr. Hulth's publication in the journal "Ymer" 1909.

304. NILSSON, R. Über Skandinavische Euleneier. Z. Ooologie 20. Berlin 1910.

In the paper there is mentioned a clutch of 7 eggs of Nyctea scandiaca from Spitsbergen. The clutch is dated "Spitzbergen 3. VI", but neither the locality nor the year is given. There is, however, no reason to believe that the Snowy Owl has ever bred in the Spitsbergen area.

1911

305. FILCHNER, WILHELM und HEINRICH SEELHEIM. Quer durch Spitzbergen. Berlin 1911.

A narrative of a crossing from Tempelfjorden over the von Post glacier and the Luitpoldglacier to Storfjorden. Few and unimportant notes on birds. The photograph Taf. 8, p. 89 is not of guillemots but of Cepphus grylle mandtii.

306. HOLMSEN, GUNNAR. Spitsbergens Natur og Historie. Kristiania 1911.

The notes about birds are of no special importance.

307. HOLMSEN, GUNNAR. Spitzbergens Natur und Geschichte. Berlin Hallensee 1911.

A translation into German from the above Norwegian book.

308. KOENIG, ALEXANDER. Avifauna Spitzbergensis. Bonn 1911.

The standard work on the birds of Spitsbergen. The special part of the book, dealing exclusively with birds, is written by Dr. le Roi.

309. KOLTHOFF, GUSTAF. Från När och Fjärran. Stockholm 1911.

Ornithological notes from hunting trips. Some of them from Spitsbergen and other areas in the Polar region.

310. LEHN SCHIØLER, E. Podiceps Griseigena Major Temm. & Schl. og Tringa Maculata Viell. Skudte Paa Island. Dansk Orn. Foren. Tidsskr. 5. Kjøbenhavn 1911.

About Podiceps griseigena holboelli. Reinh. and Calidris melanotus (Viell.) found in Iceland.

311. MATHEY-DUPRAZ, A. Notes Ornithologiques recueillies au cours des croisières de l' «Île de France» en Norvège et au Spitzberg. Neuchâtel Bull. Soc. Sci. Nat. 38. Neuchâtel 1911.

A very fine paper on the birds of Spitsbergen. The author found 33 species of birds and of these 21 were breeding. A most important contribution to our knowledge about the avifauna of the area.

312. MIETHE, A. und H. HERGESELL. Mit Zeppelin nach Spitzbergen. Berlin 1911.

23 species of birds from Spitsbergen are mentioned. Not especially important. The book also contains a chapter: Streifzüge eines Ornithologen in Spitzbergen, by Otto Graf von Zedlitz and Trützschler.

313. MUNSTERHJELM, LUDV. Beobachtungen während einer ornithologischen Studienreise nach dem Nordpolarmeer und Spitzbergen im sommer 1910. Öfversikt af Finska Vet.-Soc. Förh. Bd. 53. 1910—1911. Afd. A. No. 20. Helsingfors 1911.

An important paper. The author gives very much valuable information about 29 species of birds from Spitsbergen.

314. MUNSTERHJELM, LUDV. Falco gyrfalco funnen på Spetsbergen. Fauna och Flora 6. Uppsala 1911.

On a specimen of Falco rusticolus islandus found dead in Recherchefjorden, Spitsbergen in 1910. But it is more probable that the specimen was a Greenland Falcon.

315. ORLÉANS, DUC d'. Hunters and Hunting in the Arctic. London 1911.

A few unimportant notes on birds from Spitsbergen and also some from Franz Josef Land.

316. ROI, O. le. «Avifauna Spitzbergensis». Bonn 1911.

Dr. le Roi wrote the special part on the birds in Professor Koenig's standard work on the Spitsbergen birds.

317. SCHALOW, HERMAN. Beziehungen zwischen Ost-Grönland und Spitzbergen. Verh. V. Internat. Ornitholog. Kongr. 1910. Berlin 1911.

The birds mentioned are A. f. brachyrhynchus, Actitis macularia and Saxicola oenanthe leucorrhoa.

318. ZEDLITZ, O. GRAF von. Streifzüge eines Ornithologen in Spitzbergen.

Published in: Miethe und Hergesell, «Mit Zeppelin nach Spitzbergen».

319. ZEDLITZ, O. GRAF von. Ornithologische Notizen von der «Zeppelin-Studienfahrt» Spitzbergen, Sommer 1910. J. Orn. 59. Leipzig 1911.

28 species of birds seen by the author in the Spitsbergen area are mentioned.

320. ZEDLITZ, O. GRAF von. Über Sterna macrura und eine ihr nahestehende schwarzfüssige Form von Spitzbergen. J. Orn 59. Leipzig 1911.

On specimens of Sterna macrura from Spitsbergen. The specimens related to have black feet and a black bill. The author supposes them to be a new race, but they are nothing but young birds, probably in the plumage of the first summer.

1912

321. HOEL, ADOLF. En Slædetur paa Spitsbergen. Den Norske Turistf. Aarb. for 1912. Kristiania 1912.

A few notes on birds, mostly about Plotus alle and Somateria mollissima.

322. HOLMSEN, GUNNAR. Beretning om en geologisk ekspedition til Spitsbergen 1909. Bergens Mus. Aarb. 1911. Bergen 1912.

A few unimportant notes on birds.

323. ISACHSEN, GUNNAR. Rapport sur l'Expédition Isachsen au Spitsberg 1909—1910. Videnskapsselskapets Skrifter I. Mat.-Naturv. Klasse 1912. No. 15. Christiania 1912.

A few unimportant notes on birds.

324. ISACHSEN, GUNNAR. The Hydrographic Observations of the Isachsen Spitsbergen Expedition 1909—1910. Videnskapsselskapets Skrifter I. Mat.-Naturv. Klasse 1912. No. 14. Christiania 1912.

A few remarks on the breeding of Eiders.

325. MANNICHE, A. L. V. The Terrestrial Mammals and Birds of North-East Greenland. Biological Observations. Medd. Grønland 45. Kjøbenhavn 1912.

No notes on Spitsbergen birds, but the paper is valuable for comparison between the avifauna of the two areas.

326. ROI, O. le. Über Somateria mollissima borealis von Spitzbergen Orn. Monatsb. 20. Berlin 1912.

On the validity of the race Somateria mollissima borealis and a discussion with Graf Zedlitz and Mr. Schalow on this subject.

327. SCHALOW, H. O. Graf Zedlitz: Ornithologische Notizen von der «Zeppelin-Studienfahrt» Spitzbergen Sommer 1910. Orn. Monatsb. 20. Berlin 1912.

A review of Graf Zedlitz' paper. See also le Roi: Über Somateria mollissima borealis von Spitzbergen.

328. SCHALOW, HERMAN. Alexander Koenig: Avifauna Spitzbergensis. Bonn 1911. J. Orn. 60. Leipzig 1912.

A very thorough review of the above work. In the library of the Edward Grey Institute, Oxford, there is a reprint from the journal, sent to the Rev. C. R. Jourdain by the author.

329. SCHULTZ, CARL. Fra Spitsbergen. Trondhjem Turistforening 25-aars Jubilæum. Trondhjem 1912.

A few unimportant notes on birds.

1913

330. ANONYMOUS. Rödvingetrast på Spetsbergen. Fauna och Flora 8. Uppsala 1913.

About a dead Redwing (Turdus musicus) found in Grønfjorden (Green Harbour) in Spitsbergen.

331. GEER, GERHARD DE. The North Coast of Spitsbergen. Ymer 33. Stockholm 1914.

No important notes on birds, but on p. 255 is described how Barents came from the north to Fair Haven between the islands Fuglesangen and Klovningen (Cloven Cliff).

332. LAUSBERG, KARL. Das Nordland. Leipzig 1913.

The author says that he shot 5 species of birds unknown to the avifauna of Spitsbergen in 1913 and names others who have done the same. The first record of Larus marinus is from 1930, Larus argentatus was first seen in 1950. The Albatross, the Cormorant and the Jack Snipe have never been recorded from the mainland of Spitsbergen. The first one has once been shot in the vicinity of Svalbard, but far out to sea. The two others have never been found either near or on the islands. The notes on birds in this book cannot therefore be taken seriously.

333. MATHEY-DUPRAZ, A. Notes Ornithologiques receueillies au cours de la croisières du «Grosser Kurfürst» au Spitzberg entre le 18 juillet et le 16 août 1911. Neuchâtel Bull. Soc. Sci. Nat. 39. Neuchâtel 1913.

A very fine paper on the Spitsbergen birds. Biological observations on 38 species of birds seen by the author.

334. OGILVIE-GRANT, W. R. Remarks on the Spitzbergen Ptarmigan (Lagopus hyperboreus). Bull. Brit. Orn. Cl. 33. London 1913.

5 specimens of this bird were exhibited at a meeting in the Club on October 10. 1913.

335. SCHALOW, H. Über Achanthis in Spitzbergen. J. Orn. 61. Leipzig 1913.

A note on the remarkable tameness of Carduelis hornemanni in Spitsbergen. (p. 174).

336. WAHNSCHAFFE, F. Die Arktische Natur Spitzbergens. Neue Wissenschaftliche Rundschau. No. 2. Jahrg. 1913. Berlin 1913.

Unimportant notes on birds.

337. ZEDLITZ, O. GRAF von. Ein Beitrag zur Biologie des Polartauchers, Urinator arcticus. J. Orn. 61. Leipzig 1913.

The author states that Colymbus arcticus has never been found so far north as Bjørnøya.

1914

338. CONWENTZ, H. Über den Schutz der Natur Spitsbergens. Beiträge zur Naturdenkmalpflege. Berlin 1914.

On the protection of plants and animal life in Spitsbergen. 23 birds from the area are mentioned.

339. LOWE, P. R. Remarks on the Grey Phalarope. Brit. Orn. Cl. 33. London 1914.

On two specimens of Phalaropus fulicarius caught in the Atlantic W of Africa.

340. NORDBERG, H. L. Snöskata som förirrat sig till Spetsbergen. Fauna och Flora. 9. Uppsala 1914.

A Fieldfare was found dead in Bellsund in November 1913.

341. PHILIPP, H. Ergebnisse der W. Filchnerschen Vorexpedition nach Spitzbergen 1910. Petermanns geogr. Mitt. Erg. hft. 179. Gotha 1914.

A few unimportant notes on birds.

342. REICHENOW, ANTON. Die Vögel. Handbuch der systematischen Ornithologie. Zwei Bände. Stutgart 1913—1914.

Only a few birds (about 8) are named from the Spitsbergen area.

1915

343. HESSE, ERICH. Bernard Hantzsches ornithologische Ausbeute in Baffinsland. J. Orn. 63. Leipzig 1915.

The paper is interesting for comparison between the birds of the two areas.

344. ISACHSEN, GUNNAR. Green Harbour, Spitsbergen. Scot. Geogr. Mag. 31. Edinburgh 1915.

Not much about birds, but there is a note on gulls killed by strychnine.

345. ISACHSEN, G. Travaux Topographique de l'Expedition Isachsen 1909—10. Kristiania 1915.

Very good maps of the NW parts of Spitsbergen.

364. MATHEY-DUPRAZ, A. Un Voyage Dans L'Arctique 18 Juillet—16 Août 1911. Bull. de la Soc. Neuchâteloise de Geogr. Vol. 24. Neuchâtel 1915.

Some interesting notes on birds, but they are more or less the same as in the author's preceding papers of 1911 and 1913.

347. NATHORST, A. G. Den högnordiska gråsiskans (Acanthis Hornemannii Holb.) förekomst på Spetsbergen. Fauna och Flora 10. Uppsala 1915.

A very interesting paper on the occurrence of Carduelis hornemanni in Spitsbergen.

348. SCHAANNING, H. THO. L. Bidrag til Novaja Semlja Fauna. Dansk Orn. Foren. Tidsskr. 10. Kjøbenhavn 1915—16.

On pp. 155—158 Nyctea scandiaca.

1916

349. CHRISTIANI, A. Om Fund af Geirfuglknogler paa Vardø (Norge). Dansk Orn. Foren. Tidsskr. 11. Kjøbenhavn 1916—1917.

On some bones of Alca impennis found near Vardø in Finnmark, Norway.

350. HILDEBRANDT, HUGO. Ornithologische Beobachtungen an der Wattenküste des südlichen Schleswig. J. Orn. 64. Leipzig 1916.

Among other things there are some notes on the wintering of Branta bernicla on the W coast of Schleswig.

351. SCHAANNING, H. THO. L. Norges Fuglefauna. Kristiania 1916.

Of the birds breeding in Spitsbergen, 10 are mentioned.

352. SPITZBERGEN HANDBUCH. Reichs-Marine Amt. Berlin 1916.

Very little about birds and some of the information given is entirely wrong. The King Eider, for instance, is by no means more common than Somateria mollissima, and the down of Somateria spectabilis is not collected by the trappers.

1917

353. JACOBI, ARNOLD. Artsberechtigung, Winterkleid und Melanismus von Uria mandtii Licht. J. Orn. 65. Leipzig 1917.

The author writes about the validity of the species Uria mandtii Licht., (Cepphus grylle mandtii Mandt), the winter-plumage of the bird and the melanism in C. g. grylle and C. g. mandtii.

354. KOLTHOFF, KJELL. Expeditionsminnen. Stockholm 1917.

Among other things, about a summer's visit to Spitsbergen. Several notes on birds, mostly without any importance. In one instance, however, the author records a specimen of the dark phase of Stercorarius pomarinus. He got this extremely rare bird close to Bjørnøya, probably in June 1910.

355. MATHEY-DUPRAZ, A. Contribution à l'ornithologie du Spitsberg. Ornithol. Beobachter. Bâle 1917.

Biological remarks on several Spitsbergen birds. Also some notes on birds found by Friederich Martens in 1671.

356. NATHORST, A. G. En naturforskare af Guds nåd. Den norske bonden och Spetsbergenfararen Hans Nordberg död. Svenska Dagbladet No. 293. October 29. 1917. Stockholm 1917.

Obituary. In letters to Professor Nathorst, Hans Nordberg has given a great deal of valuable information, especially on the zoology of Spitsbergen. Among other things he reported a Raven from Sassen.

1919

357. CONWAY, W. M. The Political Status of Spitsbergen. Geogr. J. 53. London 1919.

General remarks on birds and mammals, but no notes of a special interest.

1920

358. BROWN, R. N. RUDMOSE. Spitsbergen. London 1920.

Very little about birds and only general remarks.

359. GEER, GERHARD de. Om Spetsbergens Natur i Sveagruvens Omneid. Ymer 30. Stockholm 1920.

A few unimportant notes on birds.

360. NANSEN, FRIDTJOF. En Ferd til Spitsbergen. Kristiania 1920.

A fine book on Spitsbergen. Some notes on birds here and there, but nothing of a special interest.

361. SCHAANNING, H. THO. L. Spitsbergens Vertebrater. Norsk Jæger f. Tidsskr. 49. Kristiania 1920.

A very good paper on the vertebrates of Spitsbergen. 59 birds found in the area named, but of these some are doubtful.

362. SCHAANNING, H. THO. L. Tabellarisk Oversikt av Norges Fugler. Norsk Orn. Tidsskr. 1. Stavanger 1920.

In Mr. Schaanning's list there are 50 birds from Spitsbergen and 36 from Bjørnøya.

1921

363. COLLETT, ROBERT. Norges Fugle. (3 vols.) Kristiania 1921.

Posthumous papers of Professor Collett, edited and published in 1921 by Dr. Ørjan Olsen. About 29 birds from Spitsbergen are named.

364. GRIEG, J. A. Spitsbergens Dyreliv. Naturen 45. Bergen 1921.

About the animal life in Spitsbergen. Nothing of importance on birds. It is mentioned that 52 species have been found in the area and of these 25 are breeding.

365. HUXLEY, J. S. Science and Spitsbergen. Cornhill Mag. London 1921.

Several birds from Spitsbergen are mentioned, but only general remarks are given. Therefore not important.

366. IREDALE, T. A new form of the Grey Phalarope. Bull. Brit. Orn. Cl. 42. London 1921.

On the form Phalaropus fulicarius jourdaini Iredale, from Spitsbergen. On pp. 25—27 there is a discussion between Mr. Jourdain and Mr. Meinertzhagen. The first finds the form valid, the other not.

367. ISACHSEN, GUNNAR. En hvit ærfugl-hun. Naturen 45. Bergen 1921.

On an albino female Eider, shot on the nest in Hinlopenstretet, Spitsbergen.

368. JOURDAIN, F. C. R. The Oxford Expedition to Spitsbergen, 1921. Nature 108. London 1921.

This paper is more or less a short review of the results of the expedition. The later papers by the author are more extensive. This one is, however, interesting, especially on account of what is said about the Ptarmigan.

369. JOURDAIN, F. C. R. Remarks on the eggs and nests of Spitsbergen Geese. Bull. Brit. Orn. Cl. 42. London 1921.

Especially on eggs of Branta leucopsis collected in Spitsbergen.

370. OORDT, G. van. Ornithological notes from Spitsbergen and Northern Scandinavia 1921. Ardea 10. Leiden 1921.

A very valuable paper, with a lot of information and observations on the Spitsbergen birds. In a list, 55 species from the area are named.

371. REICHLING, HERMANN. Der kleine Krabbentaucler Alle alle L., in Westfalen, sein Vorkommen im inneren von Deutschland und an den deutschen Küsten. J. Orn. 69. Leipzig 1921.

On the Little Auk found in central Germany and recent similar observations.

372. SCHNEIDER, K. M. Fulmarus glacialis in Sachsen. J. Orn. 69. Leipzig 1921.

About a Fulmar found in Saxonia in Germany.

373. SCHLATER, WILLIAM LUTELEY. The Oxford Expedition to Spitsbergen 1921. Ibis. London 1921.

A note on the results of the expedition by the Editor of the Ibis.

1922

374. BAYLIS, H. A. A new Cestode and other Parasitic Worms from Spitsbergen . . . Annals and Magazine of Natural History. Ser. 9. Vol. 9. London 1922.

On some internal parasites found in a Turnstone from Spitsbergen.

375. DOLE, N. H. America in Spitsbergen. Boston 1922.

No original notes on birds, only an epitome of the papers of Graf Zedlitz.

376. FRAZER, R. A. The Topographical Work of the Oxford University Expedition to Spitsbergen. (1921). Geogr. J. 60. London 1922.

Notes on Fulmarus glacialis and Pagophila eburnea from the interior of Spitsbergen, viz. the land to the NE of Billefjord.

377. GORDON, SETON. Amid Snowy Wastes. London 1922.

An excellent book full of information on the bird-life in Spitsbergen. Very many valuable observations. In The Illustrated London News, Vol. 19, 1922 there is an illustrated review. Mr. Gordon was the photographer of the Oxford Expedition in 1921. (See Jourdain 381.)

378. HOEL, ADOLF. Expéditions Norvégiennes au Spitsberg. Revue de Geogr. T. 9. 1916—1921. Paris 1922.

On p. 9, a note on a colony of breeding Ivory Gulls (Pagophila eburnea) south of Hornsund.

379. JOHANSEN, HELMER. Tre År på Spetsbergen. Stockholm 1922.

A single unimportant note on birds.

380. JOHNSON, SIGURD. Vannriks (Rallus aquaticus L.) på Spitsbergen. Naturen 46. Bergen 1922.

On a Rallus aquaticus found in the south of Spitsbergen.

381. JOURDAIN, F. C. R. The Birds of Spitsbergen and Bear Island. Ibis. London 1922.

The most important paper on the birds of Svalbard since the publication of Professor Koenig's "Avifauna Spitzbergensis" in 1911. It deals with 61 species of birds from the area.

382. JOURDAIN, F. C. R. A little known American bird. (Fratercula arctica naumanni). J. Mus. Comp. Ool. S. Barbara Cal. 2. 1922.

On nests and eggs of the Spitsbergen Puffin.

383. JOURDAIN, F. C. R. Remarks on the Spitzbergen Phalarope. Bull. Brit. Orn. Cl. 42. London 1922.

The author takes part in a discussion upon the validity of the race Phalaropus fulicarius jourdaini Iredale.

384. JOURDAIN, F. C. R. The Breeding habits of the Barnacle Goose. Auk 39. Cambridge, Mass. 1922.

5 nests with eggs were found in Longyeardalen, Spitsbergen, and several pairs of birds were seen in inaccessible places. Very much valuable information about this rare bird.

385. NANSEN, FRIDTJOF. Spitzbergen. 2. Aufl. Leipzig 1922.

A translation into German from the author's book "En Ferd til Spitsbergen" Kristiania 1920. Several notes on birds, but nothing of special interest.

386. OORDT, G. J. van and J. S. HUXLEY. Some Observations on the Habits of the Red-throated Diver in Spitsbergen. Brit. Birds 16. London 1922.

On a Red-throated Diver which attacked visitors who came up to her nest. There is also valuable information on other birds.

387. SCLATER, W. L. (?) Van Oordt on Spitsbergen Birds. London 1922.

A revue on van Oordt's paper in Ardea 1921, possibly written Mr. Sclater, who was then Editor of the Ibis.

388. WATERSTON, JAMES. On the Mallophaga of the Spitsbergen Expedition. Trans. of the Entomol. Soc. of London July 1922. London 1922.

This is one of the results of the Oxford Spitsbergen Expeditions of 1921. Mallophaga were found on Branta leucopsis, Anser fabalis branchyrhynchus, Phalaropus fulicarius, Calidris maritima and Fulmaris glacialis.

389. WILKES, A. H PAGET. On the nesting of the Barnacle Goose in Spitsbergen. J. Mus. Comp. Ool. S. Barbara Cal. 2. 1922.

On 5 nests of the Barnacle Goose found in Spitsbergen.

390. WILKES, A. H. PAGET. On the Breeding Habits of the Turnstone as observed in Spitsbergen. Brit. Birds 15. London 1922.

About 20 pairs of birds and 19 nests found in Liefdefjorden, Spitsbergen. The information given here is very valuable.

391. WILKES, A. H. PAGET. On the Breeding Habits of the Glaucous Gull as observed on Bear Island and in the Spitsbergen Archipelago. Brit. Birds 16. London 1922.

Valuable information on the breeding of the Glaucous Gull.

392. WOLLEBÆK, ALF. Heire (Ardea cinerea) på Spitsbergen. Naturen 46. Bergen 1922.

On a Heron shot in Spitsbergen in the autumn of 1920.

1923

393. HANSSEN, OLAF. Ei liti utferd på Bjørnøya. Naturen 47. Bergen 1923.

On p. 254 about Colymbus immer.

394. HUXLEY, J. S. Courtship Activities in the Red-throated Diver (Colymbus stellatus Pontopp.) . . . J. Linn. Soc. 35. London 1923.

A very interesting paper on the sexual behaviour of the Red-throated Diver as seen on Prins Karls Forland in June—July 1921.

395. SCHAANNING, H. THO. L. Om endel nye fugler for Spitsbergen-Området. Norsk Orn. Tidsskr. 4. Stavanger 1923.

On six new birds for the Svalbard area. These are: Columba palumbus, Colymbus arcticus, Rallus aquaticus, Ardea cinerea, Haematopus ostralegus and Histrionicus histrionicus. As breeding birds there are records for Arenaria interpres, Calidris alpina (not proved), and Larus marinus. Besides this there is a note on Podiceps griseigena.

396. SCHALOW, H. Die Erforschung des Spitzbergen-Archipels. J. Orn. 71. Berlin 1923.

A lecture on the investigation of the Svalbard area, held in Berlin on February 5th 1923. The newest records for the area were given. Of no special importance.

397. SUMMERHAYES, V. S. and C. S. ELTON. Contributions to the Ecology of Spitsbergen and Bear Island. J. Ecology 11. London 1923.

An excellent paper on the animal life of Svalbard with very many interesting observations on the bird life.

398. WERENSKIOLD, WERNER. Fra Spitsbergen. Kristiania 1923.

The book contains chapters on Plotus alle, Uria lomvia, Stercorarius parasiticus, Fulmarus glacialis, Somateria mollissima, Anser fabalis brachyrhynchus and Branta bernicla hrota. There are many biological facts.

1924

399. ANONYMOUS. En ismås. Pagophila eburnea. Fauna och Flora 19. Uppsala 1924.

A Pagophila eburnea was shot in Piteå in Sweden in January 1924.

400. ANONYMOUS. Fauna och Flora 19. Uppsala 1924.

A Pagophila eburnea was shot in Kolari on the Finnish side of the frontier between Sweden and Finland.

401. ANONYMOUS. Additions to the Natural History Museum. Ibis London 1924.

From Mr. George Binney — An egg of the Sanderling together with one of the parents in breeding-plumage, a Spitsbergen Ptarmigan and a young Sabine's Gull — all from Spitsbergen.

402. CHAPMAN, ABEL. The Borders and Beyond. London 1924.

The author says that the Spitsbergen Ptarmigan is not a Ptarmigan but a Willow Grouse.

403. CONGREVE, W. M. An oologist in Spitsbergen. J. Mus. Comp. Ool. S. Barbara Cal. 1. 1924.

A very valuable paper dealing with 22 species of birds from Spitsbergen.

404. FAXSÉN, LARS. Stormfåglens spridningshistoria. Fauna och Flora 19. Uppsala 1924.

Notes on the first records of the Fulmar from Spitsbergen and Bjørnøya.

405. FRAZER, R. A. Central Spitsbergen and North-East Land. Geogr. J. 64. London 1924.

Only a few remarks on birds in general from Ny Friesland, including a note on the Ivory Gull.

406. HOLMBOE, JENS. Hvad lirypen lever av i Norge. Bergens Mus. Aarb. 1922—23. Naturv. R. Bergen 1924.

The paper contains a note on the food of the Spitsbergen Ptarmigan, but this is a summary from earlier publications, nothing new.

407. LONGSTAFF, T. G. Notes from Spitsbergen 1923. Ibis. London 1924.

This paper deals with 23 species of birds from central Spitsbergen (Ny Friesland) and Nordaustlandet. A valuable paper with a great deal of biological information on bird-life in parts of Spitsbergen where ornithologists seldom come.

408. LÖNNBERG, EINAR. Brent Geese. Brit. Birds 18. London 1924.

The author states that there are light-bellied Branta bernicla hrota from Spitsbergen in Swedish museums.

409. LÖNNBERG, EINAR. See M., W. & F. von Wright: Svenska Fåglar. (412.)

410. MICHEL, J. und O. REISER. Zwei Fälle des Vorkommens der Eissturmvogels, Fulmarus glacialis, im inneren des Europaeischen Festlandes. J. Orn. 72 Berlin 1924.

On two records of the Fulmar from Central Europe.

411. SCHAANNING, H. THO. L. Alaska-snipen, Erolia maculata (Vieillot 1819). Ny for Norges Fauna. Norsk Orn. Tidsskr. 5. Stavanger 1924.

In September 1924 a specimen of Calidris acuminata was shot at Jæren near Stavanger. Wings and head of the bird were saved and sent to Stavanger Museum.

412. WRIGHT, M., W. och F. von. Svenska Foglar. Efter Naturen Och På Sten Ritade. Med text af Professor Einar Lönnberg. Stockholm 1924—1929.

Mentions 46 species of birds from the Svalbard area. The second record of a Woodcock from Spitsbergen.

1925

413. BINNEY, GEORGE. With Seaplane and Sledge in the Arctic. London 1925.

Very valuable information on 18 species of birds from Nordaustlandet. These birds are also referred to in the following paper in the Geogr. Journ.

414. BINNEY, GEORGE. The Oxford University Arctic Expedition 1924. Geogr. J. 66. London 1925.

In appendix 1, there is a very interesting chapter on ornithology. Notes on Cygnus bewickii, a breeding place of Pagophila eburnea, a nest of Crocethia alba and Xema sabini.

415. ELTON, C. S. Biology in Relation to Geography. The Oxford University Arctic Expedition 1924. Appendices to the Narrative by Mr. F. G. Binney, published in the July Journal. Ornithology, p. 113. Geogr. J. 66. London 1925.

About Crocethia alba, Colymbus immer, Xema sabini, Pagophila eburnea and Cygnus bewickii. See Binney 413 & 414.

416. HANSSEN, OLAF and JENS HOLMBOE. The Vascular Plants of Bear Island. Nyt Mag. Naturv. 62. Oslo 1925.

In his paper "Notes on the Birds of Svalbard", Bergens Museums Årbok 1933, Mr. Johnson refers to the above paper and to a collection of birds and eggs taken by Mr. Olaf Hanssen on Bjørnøya in 1925. In the present paper, however, no birds are mentioned.

417. LEHN SCHIØLER, E. Om de i Grønland forekommende Racer af Fjældrypen, Lagopus mutus mutus (Montin). Dansk Orn. Foren. Tidsskr. 19. Kjøbenhavn 1925.

It is stated that Lagopus mutus hyperboreus, which is to be found in Spitsbergen and Franz Josef Land, is by far the largest of the forms.

418. LEHN SCHIØLER, E. Danmarks Fugle. 3 Vols. København 1925—1931.

Mentions 9 races and species of birds from Spitsbergen, especially ducks, geese and two races of the Gerfalcon.

419. LÖNNBERG, EINAR. Några ord om Storlommen och des Släktningar. Fauna och Flora 20. Uppsala 1925.

Professor Lönnberg states that Colymbus arcticus has been found in Spitsbergen in a few instances, but he says that the bird has never been found breeding there.

420. MECKING, L. Die Polarländer. Leipzig 1925.

A few remarks on birds, but of no special interest.

421. MEINERTZHAGEN, R. The Distribution of the Phalaropes. Ibis. London 1925.

A valuable account on the breeding-grounds and wintering areas of the Phalaropes.

422. MIETHE, A. Spitzbergen. Das Alpenland im Eismeer. Berlin 1925.

A few notes on common birds, no dates. On p. 248 the author says that nobody knows where the Ivory Gull breeds, a somewhat curious statement, even at that time.

423. MONTAGUE, F. A. Notes on the Summer Habits of the Northern Eider. Brit. Birds 19. London 1925.

A very interesting paper on the Somateria mollissima from Spitsbergen, with many valuable facts on the birds.

424. MURPHY, R. C. Bird Islands of Peru. New York 1925.

About the Humboldt Current, and the abundance of birds on the Guano Islands arising from the wealth of fish in the Current.

425. OLOFSSON, OSSIAN. Huru lämna alkungarna sine häckplatser. Fauna och Flora 20. Uppsala 1925.

At Diabasodden in Isfjorden, Spitsbergen, the author saw the young Uria lomvia leaving the cliff to go to sea. In one instance he described how one adult bird got a grip with its bill in the back of the young bird and freighted it down from the cliff to the sea.

426. SPITSBERGEN PAPERS. Scientific Results of the First Oxford University Expedition to Spitsbergen 1921. Vol. 1. Oxford 1925.

This volume is a collection of reprints of all the papers which had appeared up to 1925 of the expedition of 1921. There are several valuable papers upon birds. All of them are to be found under the names of their special authors in this bibliography.

1926

427. ANONYMOUS. Spitsbergen Papers. Scientific Results of the first Oxford University Expedition (1921) Oxford (University Press), 1925. Ibis. London 1926.

A review on the ornithological papers in the above collection of reprints.

428. HAGERMAN, TOR H. Om Spetsbergen och dess utforskande. Stockholm 1926.

Some unimportant notes on birds.

429. HINTON, MARTIN, A. C. Monograph of the Voles and Lemmings (Microtinae). Vol. 1. London 1926.

Mr. Hinton states that no lemmings have been brought back from Spitsbergen, either by scientific or other expeditions. He names, however, earlier authors who claim to have seen nests of lemmings in the Adventfjorden area.

430. IVERSEN, THOR. Hopen Svaldbard. Det norske Videnskaps-Akademi i Oslo. Resultater av de norske statsunderstøttede Spitsbergenekspedisjoner. Bd. 1. Oslo 1926.

The following 6 birds are said to be inhabitants of Hopen island: Uria lomvia, Larus hyperboreus, Rissa tridactyla, Stercorarius parasiticus, Somateria mollissima and Erolia maritima.

431. JÄGERSKIÖLD, L. A. och GUSTAF KOLTHOFF. Nordens Foglar. Stockholm 1926.

37 species of birds from the Svalbard area are mentioned. Some of the notes on Spitsbergen birds are very interesting. Among other things there is a record of a raven from 1917.

432. KRISTOFFERSEN, SIGFRED. Iakttagelser over fuglelivet ved Hornsund, Svalbard, fra høsten 1923 til våren 1924. Norsk Orn. Tidsskr. 7. Stavanger 1926.

Mr. Kristoffersen wintered in Hornsund 1923/1924 and in his paper he gives account of 29 species of birds. A very valuable paper. As far as can be seen, this is the first reliable record of Pagophila eburnea building its nest on a grounded ice-block.

433. MONTAGUE, FRANCIS A. Notes from Spitsbergen. Ibis. London 1926.

A very interesting paper. It deals with 26 species of birds. First reliable record of Cygnus bewickii.

434. SSEREBROWSKY, P. Uebersicht der in Russland vorkommende Formen von Lagopus mutus Montin. J. Orn. 74 Berlin 1926.

Measurements for wing, bill and tarsus of Lagopus mutus hyperboreus are given. The specimens from which these measurements are taken seem to belong to the private collection of Professor Dr. P. Suschkin, and they are now in the Zoological Museum of the Academy of Science in Leningrad.

435. SZIELASKO, A. Geschichtlicher Ueberblick über die Vogelkolonien des Nördlich-Europäischen Eismeer und der Nachbarländer. J. Orn. 74. Berlin 1926.

General remarks on birds are of little importance. When the author says that Barents found about a dozen different birds in Spitsbergen and the adjoining seas, he seems to have misunderstood the papers and books from that period. In Gerrit de Veer's book on Barents' travels only Branta bernicla is mentioned.

1927

436. LID, JOHANNES. Om fjeldrypens næring. Norsk Jæger F. Tidsskr. 56. Oslo. 1927.

On the food of the Norwegian Ptarmigan.

437. RESVOLL-HOLMSEN, HANNA. Svalbards Flora. Oslo 1927.

438. SALOMONSEN, FINN. The Distribution of the Wheatear collected in Denmark. Ibis. London 1927.

Dr. Salomonsen mentions the four female Wheatears collected by Professor Koenig in Spitsbergen. He puts them down to be Oenanthe oenanthe schiøleri Salom. and not leucorrhoa.

439. SAUNDERS, HOWARD. Manual of British Birds. London 1927.

59 species of birds from the Svalbard area are mentioned. The book also has some valuable information on dates and localities for several species.

440. SCHAANNING, H. THO. L. Rekord-observationer 6. Nye tillegg til Norges fauna. Norsk Orn. Tidsskr. 8. Stavanger 1927.

During the autumn migration in 1926, the Pomathorine Skua was abundant along the Norwegian coast. 6 specimens were shot by a taxidermist from one of the museums.

441. WORSLEY, F. A. Under Sail in the Frozen North. London 1927.

A great deal of information on Spitsbergen birds. Some of it is very valuable.

1928

442. DALGETY, C. T. The Birds of Edge Island. Report of the Cambridge Ornithological Club, 1927. Cambridge 1928.

The paper deals with 22 species of birds from Edgeøya, a place difficult to get to for investigation. A paper of great interest with many valuable observations.

443. DALGETY, C. T. The Birds of Edge Island. Geogr. J. 72. London 1928.

In appendix 4 to Mr. H. G. Watkin's paper "The Cambridge Expedition to Edge Island" in the above journal, Mr. Dalgety gives an account of the bird-life of the island. See, however, the preceding paper of Mr. Dalgety.

444. HENNICKE, C. R. Zwei Beobachtungen aus Norwegen und Spitzbergen. Orn. Monatsb. 53 Gera 1928.

The second record of the Shore Lake from Spitsbergen.

445. HORN, GUNNAR and ANDERS K. ORVIN. Geology of Bear Island. Skrifter om Svalbard og Ishavet No. 15. Oslo 1928.

A few remarks on birds. Of great interest is a picture on page 11 of the Spitsbergen Ptarmigan on Bjørnøya.

446. ISACHSEN, GUNNAR. En Ishavsskippers Saga. Oslo 1928.

The skipper Sivert Tobiesen from Tromsø wintered on Bjørnøya 1865—1866. In his diary, published in the above book, there is much valuable information on the birds and their migration to and from Bjørnøya.

447. LUNDBORG, EINAR. När Nobile räddades. Mina upplevelser under den svenska Spetsbergensexpeditionen 1928. Stockholm 1928.

A few unimportant notes on birds.

448. PLESKE, THEODORE. Birds of the Eurasian Tundra. Memoirs of the Boston Society of Natural History. Vol. 6. No. 3. Boston 1928.

In a list of the literature on Spitsbergen birds, the author refers to Professor Koenig's "Avifauna Spitzbergensis" and the bibliography there. He adds some papers before 1911 and also some from that year up to 1926. He starts with a paper by Professor Alfred Newton in 1859. This publication is non-existent as Newton's first paper on Spitsbergen birds was published in 1865. The references given for the "paper of 1859", correspond with the pages in the publication by Professor Newton in the Ibis in 1865. In the present paper the references to earlier publications will have to be verified. In 18 references to the Snow Bunting, checked by myself, 12 are entirely wrong. For example the first reference for the breeding of the bird is given as June 2nd 1882. In reality, this refers to a bunting that came aboard the ship of the Swe-

dish expedition of that year, between Bjørnøya and Spitsbergen (a publication by Professor Nathorst). The author says among other things that the Snowy Owl is entirely independent of micromammalia when breeding. I am of exactly the opposite opinion. This bird breeds both in Greenland and in Novaya Zemlya, but not in Spitsbergen. In the two first named places there are lemmings, but not in the Svalbard area. In Norway the Snowy Owl will not breed when there is not a lemming-year, or at least a sufficient stock of other small rodents in the mountains. The present paper deals with 67 species of birds from Spitsbergen and 43 from Bjørnøya. There is a great deal of valuable information on the birds of the Svalbard area, but before this is used, the references will have to be looked up in the original papers.

449. SCHAANNING, H. THO. L. Rekord-observasjoner 7. Nye tillegg til Norges fauna. Norsk Orn. Tidsskr. 9. Stavanger 1928.

On Anser fabalis brachyrhynchus and Branta leucopsis shot near Stavanger in the autumns and winters of 1926, 1927 and 1928.

450. SUMMERHAYES V. C. and C. S. ELTON. Further Contributions to the Ecology of Spitsbergen. J. Ecology 16. London 1928.

This is the second of two papers dealing with the ecology of Spitsbergen. The first (1923) deals with the west coast; the second with Nordaustlandet and Hinlopenstretet. As in the paper of 1923, the present one has a lot of valuable information on birds and it is in the highest degree important for the understanding of the avifauna of the area.

1929

451. CHRISTOLEIT, E. Bemerkungen zur Biologie der Gänse. J. Orn. 77. Berlin 1929.

Some biological remarks on the three species of Spitsbergen geese.

452. GAFVELIN, ERNST. Från Spetsbergen och Nordland. En resa sommaren 1911. Umeå 1911. (Found in a catalogue on Geographical travels. Stockholm 1929.)

A single remark on the multitude of Fulmars at the whaling station in Grønfjorden (Green Harbour).

453. HAVERSCHMIDT, F. An Invasion of Little Auks and Puffins after a storm on December 12. 1929. Ardea 19. Leiden 1930.

On a big invasion of Plotus alle and Fratercula arctica in the winter of 1929—1930 in Holland. Also on invasions of Plotus alle in December 1878, November 1910, Jan./Feb. 1912 and in 1917 also in Great Britain.

454. HEINTZ, A. Fra fuglelivet på Spitsbergen. Naturen 53. Bergen 1929.

Biological remarks on 10 species of birds, especially the Eider.

455. HORTLING, IVAR. Ornithologisk Handbok. Helsingfors 1929.

Mentions 53 species of birds as found in Spitsbergen and the Svalbard area.

456. HØEG, OVE ARBO. Food of the Spitsbergen Ptarmigan in September. Det Kongelige Norske Videnskabers Selskab. Forhandlinger Bd. 1. No. 65. Trondhjem 1929.

An analysis of the contents of crops from 18 Spitsbergen Ptarmigans shot in September 1929.

457. JOHANSEN, HELMER. Fem År på Spetsbergen. Stockholm 1929.

A single unimportant note on birds.

458. NORDHAGEN, ROLF. Rypeår og bærår. Bergens Mus. Årb. Naturv. R. 1928. Bergen 1929.

On the food of the Norwegian Willow Grouse.

459. OORDT, G. J. van. Observations of a Red-throated Diver at the nest. Verhandlungen des VI Internationalen Ornithologen-Kongresses in Kopenhagen 1926. Berlin 1929.

460. SPITSBERGEN PAPERS. Scientific Results of the Second and Third Oxford University Expeditions to Spitsbergen in 1923 and 1924. Vol. 2. Oxford 1929.

This volume is a collection of reprints of most of the papers from the expeditions in 1923 and 1924. Also here there are valuable papers on birds. These papers are to be found under the names of their special authors in this bibliography.

1930

461. ANDRÉE, S. A., NILS STRINDBERG och KNUT FRÆNKEL: Med Örnen mot Polen. Stockholm 1930.

A book on S. A. Andrée and his comrades. It contains a chapter written by Professor Lönnberg on the animal life in the ice north of Spitsbergen. (See also Lönnberg, Geogr. Annaler Bd. 3, 1931). There is also a chapter by Dr. Horn, describing how he and the men of his expedition found Andrée on Kvitøya. Here Dr. Horn saw a colony of the Ivory Gull.

462. HENNICKE, C. R. Ohrenlerche in Spitzbergen. Jahresber. der Ges. der Freunde der Naturwissenschaften zu Gera 1914—1924. Gera 1930.

The second record of the Shore Lark from Spitsbergen.

463. HORN, GUNNAR, See Andrée, Strindberg och Frænkel: Med Örnen mot Polen. Stockholm 1930.

464. MOLINEUX, H. G. K. A Catalogue of Birds. Eastbourne 1930—1931.

Names 66 species and races of birds from the Svalbard area.

465. SALOMONSEN, FINN. Bemerkungen über die geographische Variation von Charadrius hiaticula. J. Orn. 78. Berlin 1930.

A very interesting paper on the forms of Charadrius hiaticula, but no birds from Spitsbergen are mentioned.

466. SCHAANNING, H. THO. L. Revidert Oversikt av Norges Fugler, inclusive Svalbard og Jan Mayens Fauna. Norsk Orn. Tidsskr. 12. Stavanger 1931.

On Mr. Schaanning's list there are 61 birds from Spitsbergen and 37 from Bjørnøya.

1931

467. AHLMANN, HANS W:SON och SIGVARD MALMBERG. Sommar vid Polhavet. Stockholm 1931.

Many interesting and valuable notes on birds.

468. CHIGI, A. Uccelli. Speditioni Albertini nello Svalbard Nord-Orientale. Boll. Zool. Napoli 2. Napoli 1931.

Mentions 10 species of birds from Spitsbergen with the dates and localities where they were collected.

469. CHIGI, A. (Uccelli). Materiale zoologici raccolti dalla speditione Albertini nello Svalbard Nord-Orientale. Elenco delle Specie Animale Reccolte. Estratto del Bolletino di Zoologica publicato dell Unione Zoologica Italiana, Anno II. No. 4. Napoli 1931.

Probably a summary of the preceding paper.

470. DALGETY, C. T., J. H. MCNEILE and M. J. INGRAM. Notes on birds in Spitsbergen during the spring of 1930. Ibis. London 1931.

A very interesting paper. Notes on 34 species of birds and among these, the Teal, nests and eggs of the Sanderling, the Knot etc.

471. KNOTHE, HERBERT. Spitzbergen. Eine Landeskundliche Studie. Petermanns geogr. Mitt. Erg. hft. 211. Gotha 1931.

Remarks on about 19 species of birds, not important. The author mentions Pagophila eburnea and says that many people think that it will nest on the ice, but he does not think that this is proved. He says nothing, however, about where these interesting remarks on the breeding of the bird are to be found.

472. KRISTOFFERSEN, SIGFRED. Fugleobservasjoner fra Syd-Kapp på Svalbard (76°30′ n.br., 16°30′ østl. l.) 1929—1930. Norsk Orn. Tidsskr. 12. Stavanger 1931.

Mr. Kristoffersen wintered on Sørkappøya, Spitsbergen 1929—1930. In his paper he gives a very interesting account of 29 species of birds. The first record of breeding Larus marinus.

473. LÖNNBERG, EINAR. Scientific Results of the Andrée-Expedition. 2. Mammals, Birds And Fishes. Mentioned By S. A. Andrée In His Diary. Geogr. Annaler. Bd. 13. Stockholm 1931.

After his landing on the ice, Andrée saw 8 species of birds during his wandering towards Kvitøya. They were: Plotus alle, Fulmarus glacialis, Uria lomvia, Cepphus grylle mandtii, Stercorarius parasiticus, Larus hyperboreus, Pagophila eburnea and Rhodostethia rosea. The last is particularly interesting, not least because doubts have been expressed as to the validity of Parry's observations of this gull in almost the same place in 1827.

474. SALOMONSEN, FINN. On the Geographical Variation of the Snow-Bunting (Plectrophenax nivalis). Ibis. London 1931.

The author states that the Spitsbergen Snow-Bunting belongs to the nominate form from the Scandinavian Peninsula.

475. TICEHURST, C. B. On Calidris canutus. Bull. Brit. Orn. Cl. 51. London 1931.

Dr. Ticehurst exhibited young of the Knot in down, at a meeting of the Club. The young birds were taken by Mr. Ingram on the Reindeer Peninsula (Reinsdyrflya), Spitsbergen on July 13. 1930.

1932

476. DALGETY, C. T. Notes on Spitsbergen, oological. Bull. Brit. Ool. Assoc. 32. London 1932.

In a meeting in the British Oological Association in November 1931, Mr. Dalgety gave account of trips to Spitsbergen in 1930 and 1931. The paper gives valuable information on several species of birds. Especially interesting are the notes on Crocethia alba, Pagophila eburnea, Arenaria interpres and Calidris canutus.

477. DALGETY, C. T. The Ivory Gull in Spitsbergen. Brit. Birds 26. London 1932.

Notes on Pagophila eburnea from different parts of Spitsbergen.

478. GORBUNOW, G. Die Vögel von Franz-Joseph Land. Russian with a German summary. Transact. of the Arctic Inst. Vol. 4. Leningrad 1932.

Interesting for comparison with the birds of the Svalbard area.

479. HORTLING & BAKER. Bird-notes on a Trip to Lapland. Ibis. London 1932.

On p. 110 about Oenanthe oenanthe.

480. JOURDAIN, F. C. R. Notes on Spitsbergen. Bull. Brit. Ool. Assoc. 32. London 1932.

Notes on the ornithological history of Spitsbergen from 1675 up to 1931.

281. LINGS, G. H. Notes on Spitsbergen, oological. Bull. Brit. Ool. Assoc. 32. London 1932.

Remarks upon the number of eggs in the nests of Pagophila eburnea and Sterna macrura. Also some notes on the King Eider.

482. LØPPENTHIN, B. Die Vögel Nordostgrönlands zwischen 73°0′ und 75°30′ N Br. With an English summary. Medd. Grønland 91. København 1932.

Interesting for the comparison with the birds of Spitsbergen.

483. McNeile and C. T. Dalgety. Notes on Spitsbergen, oological. Bull. Brit. Ool. Assoc. London 1932.

Interesting remarks on several Spitsbergen birds. See also Dalgety, the same bull. 1932. (476).

484. Salomonsen, Finn. Description of Three New Guillemots. (Uria aalge). Ibis. London 1932.

Uria aalge hyperborea is said to occur only on Bjørnøya.

485. Tomkinson, G. Notes on Spitsbergen, oological. Bull. Brit. Ool. Assoc. 32. London 1932.

Very interesting notes on a number of Spitsbergen birds, especially the first record of breeding Stercorarius longicaudus in Adventdalen.

1933

486. Belopolski, L. O. Zur Frage der Quantitativen Verteilung von Fulmarus glacialis und Rissa rissa (Seu tridactyla) in der Barents See. Russian with a German summary. Transact. of the Arctic Inst. 8. Leningrad 1933.

The author shows that the greatest number of both species of birds are to be found on the borders of the Gulf Stream, where the cold water from the east meets the warm Atlantic current. In such places there is usually a big concentration of plankton and also of course of fish.

487. Bertram, G. C. L. and David Lack. Bear Island. Geogr. J. 81. London 1933.

A very good description of the island. Notes on about 17 different species of birds from Bjørnøya.

488. Bertram, G. C. L. and David Lack. Notes on the Birds of Bear Island. Ibis. London 1933.

A very important paper, dealing with 41 species of birds from Bjørnøya. One of the best accounts on the bird-life of the island.

489. Handbuch der Geographischen Wissenschaft.
Sorge, Ernst. Die Arktis. Potsdam 1933.

A few or unimportant notes on birds.

490. Johnsen, Sigurd. Nye fugl for Svalbard. Naturen 57. Bergen 1933.

The author has collected new records for the Svalbard area and gives them together with a discussion on some of the species of birds living there, especially the Spitsbergen Ptarmigan.

491. Lack, David. Nesting Conditions as a Factor Controlling Breeding Time in Birds. Proceed. Zool. Soc. London 1933.

Important notes on the breeding of terns on Bjørnøya.

492. LID, JOHANNES. Crop Contents of Ptarmigans from Taimyr. The Norwegian North Polar Expedition with the "Maud" 1918—25. Scientific Results Vol. 5, No. 2. Bergen 1933.

493. OLIVIER, G. Notes du Spitzberg. Oiseau. Paris 1932.

Notes on 20 Spitsbergen birds. In Kongsfjorden (Kings Bay) the author states that he has seen either Anas crecca or A. querquedula. As the latter has never been found so far north, it must have been the Teal he has seen, as this bird has been recorded several times from the area. Mr. Olivier also saw a goose of the Branta family, but as B. leucopsis has rarely been found in Kings Bay and B. bernicla hrota is fairly common, it seems to me that he has seen the latter.

494. PEDERSEN, ALWIN. Die Ornis des mittleren Teiles der Nordostküste Grönlands. Medd. Grønland 100. København 1933.

Bird and Bird, in Ibis 1941, p. 136 show that the bird Mr. Pedersen describes from Petersbugt on Hochstetters Vorland on East Greenland, is Branta leucopsis and not B. bernicla.

495. SCHAANNING, H. THO. L. Rekord-observationer 9. Nye tillegg til Norges fauna. Norsk Orn. Tidsskr. 13. Stavanger 1933.

On Branta leucopsis and Pagophila eburnea found in Norway.

496. SORGE, ERNST. Die Arktis. Potsdam 1933.

See: Handbuch der Geographischen Wissenschaften. (489). Unimportant.

497. TIMMERMANN, GÜNTHER. Die Kurzschnabelgans in Island. J. Orn. 81. Berlin 1933.

On four breeding-places of Anser fabalis brachyrhynchus in the interior of Iceland.

498. TÅNING, Å. WEDEL. The Winter Quarters of the Phalaropes. Ibis. London 1933.

More than thousand birds were seen on 14 March, 1930, between the African coast and Cap de Verde Is.

1934

499. ANONYMOUS. Johnsen on the Birds of Svalbard. Ibis. London 1934.

A review of Mr. Johnsen's paper in Bergens Museums Årbok for 1933, printed in Bergen 1934.

500. BERTRAM, G. C. L., DAVID LACK and B. B. ROBERTS. Notes on the East Greenland Birds, with a Discussion of the Periodic Non-breeding among Arctic Birds. Ibis. London 1934.

Very useful for comparison with the "Non-breeding" which occurs in Spitsbergen.

501. GLEN, A. R. The Oxford University Expedition to Spitsbergen, 1933. Geogr. J. 84. London 1934.

A few scattered notes on birds. See, however, C. H. Hartley, Appendix 5: Bird Ecology.

502. HARTLEY, C. H. The Oxford University Expedition to Spitsbergen 1933. Appendix 5: Bird Ecology. Geogr. J. 84. London 1934.

A very interesting paper on a feeding ground of the sea-birds.

503. HARTLEY, C. H. Sea-birds of West-Spitsbergen, — their food-supply. Bull. Brit. Orn. Cl. 54. London 1934.

Mr. Hartley gave a lecture in the above club and described the bird-population and its food in a certain part of Billefjorden (a branch of Isfjorden). For particulars see Hartley and Fisher, Journ. of Animal Ecology. Cambridge 1936. (513).

504. HØRRING, R. Danmarks Fauna. Fugle. København 1934.

Mentions 23 birds from the Svalbard area. (Unimportant).

505. JOHNSEN, SIGURD. Notes on the Birds of Svalbard. Bergens Mus. Årb. Naturv. R. 1933. Bergen 1934.

Although the late Mr. Johnsen never went to Spitsbergen himself, he has given us a very valuable paper on the birds of the Svalbard area. In a list he refers to 78 birds seen there.

506. MATHEWS, GREGORY M. Synonymy of Fulmarus glacialis (L.) Ibis. London 1934.

The author states that Linnaeus's name glacialis was derived from the Mallemucke of Friedrich Martens. Type locality is therefore Spitsbergen.

507. PEDERSEN, ALWIN. Polardyr. København 1934.

A book dealing with the animals of Greenland. On p. 137 Mr. Pedersen describes how two Barnacle Geese came flying down with one small newly hatched gosling each in their beaks. The birds came from a great height to the shore of a small freshwater lake.

1935

508. GLEN, A. R. Young Men in the Arctic. The Oxford University Arctic Expedition to Spitsbergen 1933. London 1935.

Several interesting notes on birds. Especially on two new colonies of Pagophila eburnea. — On p. 309, Appendix 6. Bird Biology by C. H. Hartley.

509. GLEN, A. R. and D. B. KEITH. The Oxford University Arctic Expedition 1935—1936. Nature 135. London 1935.

On the forthcoming expedition to Spitsbergen and also references to observations on birds made on earlier expeditions.

510. GORDON, SETON. The Eider Duck (Somateria mollissima mollissima). Nature 135. London 1935.

Some notes on the Eiders of Spitsbergen.

511. RABOT, CHARLES. Spitsberg Escale Polaire. Rouen 1935.

A few species of birds are mentioned. Pagophila eburnea is described with a black bill.

512. WYNNE-EDWARDS, V. C. On the Habits and Distribution of Birds on the North Atlantic. Proc. of the Boston Soc. of Nat. Hist. Vol. 40. No. 4. Boston 1935.

In 1933 Professor Wynne-Edwards made 8 crossings of the North Atlantic from May to September, between 10° and 60° W long. In the present paper he gives an account of the birds seen on these voyages. Among them there are about 16 species of birds living in Spitsbergen, and although it is possible that these birds may have come from Greenland or America, it is quite possible that some of them may have come from Svalbard. The paper is of great interest because it shows the intensity of birds on the ocean in different months of the year.

1936

513. HARTLEY, C. H. and J. FISCHER. The marine Foods of Birds in an inland fjord-region in West-Spitsbergen. Part 2. J. Animal Ecol. 5. Cambridge 1936.

The paper deals with the ecology of 11 species of birds in Billefjorden (a branch of Isfjorden, Spitsbergen).

514. INGSTAD, HELGE. Fra Svalbard. Ny Frieslands Nordvestre Del. Norsk Geogr. Tidsskr. Bd. 4. H. 1. Oslo 1936—1937.

Almost nothing on birds, only a few remarks on the Ptarmigan.

515. SALOMONSEN, FINN. Revision of the Greenland Rock Ptarmigan. Medd. Grønland 118. København 1936.

The author gives the measurements for the wing-length of 20 males and 10 females from Spitsbergen.

516. STOTT, F. C. The marine Foods of Birds in an inland fjord-region in West-Spitsbergen. Part 1. J. Animal Ecol. 5. Cambridge 1936.

This is first part on the ecology of birds in Billefjord, Spitsbergen. Part 2 is written by Hartley and Fisher.

1937

517. ANONYMOUS. Sabines tärnmås, Xema sabini, funnen i Danmark. Fauna och Flora 32. Uppsala 1937.

The first record of Xema sabini from Denmark.

518. AUDUBON, JOHN JAMES. The Birds of America. Facsimile Edition, New York 1937.

Mentions Branta bernicla, Branta leucopsis, Crocethia alba and Plotus alle as inhabitants of Spitsbergen.

519. GELTING, PAUL. Studies on the Food of the East Greenland Ptarmigan. Medd. Grønland 116. København 1937.

An interesting paper on the food of the East Greenland Ptarmigan and other races of Lagopus mutus. Among these, the Spitsbergen form L. m. hyperboreus is also taken into account.

520. GLEN, A. R. and A. A. C. CROFT. Under the Pole Star. The Oxford University Arctic Expedition 1935—6. London 1937.

In a chapter "Birds and Animals" there are notes on 17 species of birds with many valuable dates from the spring migration from Nordaustlandet.

521. GLEN, A. R. The Oxford University Arctic Expedition 1935—36. Geogr. J. 90. London 1937.

Several notes on birds. These notes are almost identical with those in the previous book by Glen and Croft.

522. KEITH, DAVID B. Biological work of the Oxford University Expedition to North-East Land 1935—36. Nature 139. London 1937.

Remarks on about 11 species of birds. Also a discussion on non-breeding.

523. KEITH, DAVID B. The Red-throated Diver in North-East Land. Brit. Birds 31. London 1937.

A very interesting paper on the behaviour and biology of Colymbus stellatus.

524. KRASOVSKI, S. K. The Biological Basis for the Economic Exploration of Bird-Cliffs. On the Biology of the Guillemot (Uria lomvia). In Russian with an English summary. Transactions of the Arctic Institute 77. Leningrad 1937.

A paper on one of the largest bird-cliffs in the world in Novaya Zemlya.

525. LOW, G. CARMICHAEL. Grey and Red-necked Phalaropes in the Arabian Sea. Ibis. London 1937.

On October 22nd 1935 Mr. Low saw lots of Phalaropes off the coast of South Arabia. There were several flocks of Ph. lobatus and at least one of Ph. fulicarius.

526. MEINERTZHAGEN, R. Grey- and Red-necked Phalaropes in the Arabian Sea. Ibis. London 1937.

The author saw both species of phalaropes south of the Arabian coast in February 1937.

527. NIETHAMMER, GÜNTHER. Handbuch der deutschen Vogelkunde. 3 Vols. Leipzig 1937—1939.

Mentions 29 species of birds from the Svalbard area.

1938

528. BERTRAM, G. C. L. and DAVID LACK. Notes on the Animal Ecology of Bear Island. J. Animal Ecol. 7. Cambridge 1938.

This paper comes as an addition to several earlier publications by the same authors on the animal ecology of Bjørnøya. It includes a list of 26 species of birds from the island.

529. GODFREY, A. S. T. The Cradle of the North Wind. London 1938.

A great deal of interesting information on birds. (Migration, biology, behaviour and non-breeding.)

530. JOURDAIN, F. C. R. On the Occurrence of Larus marinus in Spitsbergen. Ibis. London 1938.

The author corrects some errors in a recent paper by Mr. Marshall in the Ibis.

531. KEITH, DAVID B. Observations on the Purple Sandpiper in North East Land. Proc. Zool. Soc. London 108 A. 1938.

A very interesting paper on the sexual behaviour and the biology of Calidris maritima.

532. MARSHALL, A. J. On the Occurrence of Larus marinus in Spitsbergen. Ibis. London 1938.

On a specimen of Larus marinus shot by the author in Billefjord, Spitsbergen in July 1937.

533. MARSHALL, A. J. Bird and Animal Activity in the Arctic. J. Animal Ecol. 7. Cambridge 1938.

A paper dealing with 7 species of birds, especially the Arctic Tern and its periods of inactivity.

534. OLROG, CLAËS CHR. Jan Mayens Fåglar. Fauna och Flora 33. Uppsala 1938.

The author gives a list of 18 species of birds seen by himself on Jan Mayen between July 15th and 18th 1936.

1939

535. BIRD, C. G. On Periodic non-breeding in the Arctic, with special reference to North-east Greenland. Bull. Brit. Ool. Assoc. 61. London 1939.

An interesting paper on non-breeding with references to some Spitsbergen birds.

536. FISHER, JAMES. Distribution of the Colour Phases of the Fulmar (Fulmarus glacialis). Nature 144. London 1939.

An interesting paper on the colour phases of the Fulmar. The author says that: "The situation east of Spitsbergen is obscure".

537. HOLMES, P. F. Some Oceanic Records and Notes on the Winter Distribution of Phalaropes. Ibis. London 1939.

Mr. Holmes has himself seen Grey Phalaropes off the West African coast in winter time and in the present paper he has also collected a lot of observations made by other ornithologists.

238. JENSEN, AD. S. Concerning a Change of Climate During Recent Decades in the Arctic and Subarctic Regions, from Greenland in the West to Eurasia in the East, and Contemporary Biological and Geophysical Changes. Det Kgl. Danske Videnskabers Selskab. Biolog. Medd. Bd. 14. No. 8. København 1939.

A great deal of information on the climatological change in Spitsbergen and the influence this has had on the fauna, especially in the sea.

539. JUNG, WILHELM. Zur Vogelkunde Nordspitzbergens (Ergebnisse der «Spitzbergen-Expedition Deutscher Studenten 1936»). Ber. Nat.-forsch. Ges. zu Freiburg. Bd. 36. Naumberg (Saale) 1939.

A very fine paper, dealing with 19 species of Spitsbergen birds, with chapters on ecology, migration etc.

540. MCNEILE, J. H. First Recorded Breeding of Teal and Pintail in Spitsbergen. Oolog. Rec. 19. London 1939.

On the first finds of the Teal and the Pintail in Kongsfjorden (Kings Bay) Spitsbergen.

541. PORTENKO, LEONIDAS. On some new Forms of Arctic Gulls. Ibis. London 1939.

Professor Portenko describes a new form of Larus hyperboreus, naming it L. h. pallidissimus. He says that it has a lighter mantle and longer wings than the nominate form from Spitsbergen.

542. RIECHE, H. Bericht über die «Deutschen Spitzbergen-Expeditionen 1937 und 1938 von Dr. H. Rieche». Petermanns geogr. Mitt. 85. Gotha 1939.

A few remarks on the ornithological results. For particulars see: Tiedemann, Journ. f. Ornith. Vol. 91. 1943. (560).

543. SALOMONSEN, FINN. Moults and Sequence of Plumages in the Rock Ptarmigan (Lagopus mutus (Montin)). Videnskapelige Medd. fra Dansk Nat. hist. For. i København. Bd. 103. København 1939—1940.

Dr. Salomonsen has had 47 skins of the Spitsbergen Ptarmigan for investigation and he says that there is no difference in moulting between this race and L. m. captus from NE Greenland.

1940

544. BIRD, C. G. and E. G. BIRD. Some Remarks on non-Breeding in the Arctic, especially North-east Greenland. Ibis. London 1940.

The paper is of interest for comparison with the conditions in Spitsbergen.

545. DEVOLD, HALLVARD. Polarliv. Oslo 1940.

Remarks on some of the more common birds in the area. Important is the first record of a starling from Spitsbergen.

546. DURANGO, S. Roskarlen. Arenaria interpres L., som häckfågel i tärnkolonier. Fauna och Flora 35. Uppsala 1940.

The author shows that the Turnstone on the Swedish island Fårön mainly nests in tern-colonies.

547. OUSTALET, M. E. Liste des oiseaux recueillis dans lecours de la dernière Campagne scientifique de S. A. S. Le Prince Albert Ier de Monaco. Results. Camp. sci. Monaco Vol. 103. Monaco 1940.

A list on 15 species of birds which were collected, but most of them without date and locality.

548. SELIGMAN, O. R. and J. M. WILLCOX. Some Observations on the Birds of Jan Mayen. Ibis. London 1940.

Interesting for comparison with the Spitsbergen avifauna.

549. BIRD, C. G. and E. G. BIRD. The Birds of North-east Greenland. Ibis. London 1941.

550. SOUTHERN, H. N. and E. C. R. REEVE. Quantitative Studies in the Geographical Variation of Birds. The Common Guillemot (Uria aalge Pont.). Proc. Zool. Soc. 111 A. London 1942.

1942

551. HOLMSTRÖM, C. T. and collaborators. Våra fåglar i Norden. Stockholm 1942—1947. A Norwegian edition by Professor F. Økland.

Mentions 39 species of birds from the Svalbard area.

552. JOHNSEN, SIGURD. Remarks on the Svalbard Ptarmigan (Lagopus mutus hyperboreus Sundev.) Bergens Mus. Årb. 1941. Naturv. R. Bergen 1942.

On the moult of the Spitsbergen Ptarmigan.

553. STANFORD, J. K. Grey Phalaropes off the West Coast of Africa. Ibis. London 1942.

On a flock of Phalaropus fulicarius seen in February, 120 miles W of the South African coast.

554. The Place-Names of Svalbard. Skrifter om Svalbard og Ishavet No. 80. Oslo 1942.

This publication contains almost all the official place-names of Svalbard. It includes names which are now partly forgotten and partly out of use, but they remain important, especially when one has to work with old maps, papers and books.

1943

555. Bagg, A. M. Snow-Buntings burrowing into snowdrifts. Auk 60. Cambridge, Mass. 1943.

In very cold weather, with the temperature below —35° F., Plectrophenax nivalis inhabited burrows which they had excavated into the soft snow under the lee-side of shallow drifts in the open field. (Cited from the Ibis Vol. 86. London 1944.)

556. Lowe, Willoughby, P. Grey Phalaropes off the West Coast of Africa. Ibis 85. London 1943.

Mr. Lowe states he has seen thousands of Grey Phalaropes on migration in the regions of Madeira, Canary and Cape Verde Islands and through the Gulf of Guinea southwards to the Cape of Good Hope.

557. Løppenthin, Bernt. Systematic and Biologic notes on the Long-Tailed Skua, Stercorarius longicaudus Vieill. With a Danish Summary. Medd. Grønland 131. København 1943.

Some earlier records from Spitsbergen are published.

558. Southern, H. N. The Two Phases of Stercorarius parasiticus (Linnæus). Ibis 85. London 1943.

In a list on the distribution of the phases, there are recorded in all only 13 dark birds from Spitsbergen and the Svalbard area.

559. Sund, Oscar. Skårungen. Oslo 1943.

Mentions 12 birds from Spitsbergen. Unimportant.

560. Tiedemann, Max. Ornithologische Beobachtungen aus dem Hornsund-Gebiet auf West-Spitzbergen. Ergebnisse der Deutschen Spitzbergen-Expedition von Dr. Herbert Rieche 1937 und 1938. J. Orn 91. Berlin 1943.

In Hornsund the expedition found 17 species of birds. Account is given of only 9 of these species, and among these especially of the Ivory Gull and the Arctic Skua.

1944

561. Ruthe, Kurt. Ethologie und Biologie der Schmarotzerraubmöve auf Grund ornithologischer Beobachtungen aus dem Hornsund-Gebiet auf West-Spitzbergen. Polarforschung 2. Goslar 1947.

Mainly a summary from Mr. Tiedemann's paper in Journ. f. Ornith. Bd. 91. 1943, especially on the biology of Stercorarius parasiticus.

562. SALOMONSEN, FINN. The Atlantic Alcidae. Göteborgs Kungl. Vetenskaps- och Vitterhets-Samhälles Handlingar. F. 6. Ser. B. Bd. 3. No. 5. Göteborg 1944.

Dr. Salomonsen states that the following Alcidae are found in the Svalbard area: Alca t. torda, Plotus a. alle, Uria aalge hyperborea, Uria lomvia, Cepphus grylle mandtii, Fratercula arctica naumanni and Fratercula a. arctica.

563. SALOMONSEN, FINN. Spetsbergsgrisslan (Uria lomvia lomvia (L.)) i Stockholm skärgård. Fauna och Flora 39. Uppsala 1944.

On some specimens of the Spitsbergen Guillemot found in Sweden in the winter-time.

564. SOUTHERN, H. N. Dimorphism in Stercorarius pomarinus (Temminck). Ibis 86. London 1944.

In all the material cited by the author there is only one dark specimen from Spitsbergen, reported by Mr. Longstaff.

1945

565. DEMENTIEW, G. P. and N. N. GORTCHAKOVSKAYA. On the Biology of the Norwegian Gyrfalcon. Ibis 87. London 1945.

It is shown that rodents, chiefly lemmings, form an important part of the Gyrfalcon's diet.

566. TEMPERLEY, GEORGE W. On the Arctic Redpoll. Brit. Birds 39. London 1946.

Two birds of this species were seen in Northumberland on November 10th, 1945.

1947

567. DEGE, WILHELM. Das Nordostland von Spitzbergen. Polarforschung 17. Goslar 1947.

The author states that he saw 17 species of birds on Nordaustlandet. There are notes on only a very few of them.

568. HAVERSCHMIDT, FR. Glaucous Gull off Madeira. Ibis 89. London 1947.

On a Glaucous Gull seen near Madeira in January 1946.

569. KAY, G. T. The Young Guillemot's Flight to Sea. Brit. Birds 40. London 1947.

From a visit to the Shetlands where the author saw young Guillemots leave their nesting-place and go to sea.

570. KEIGHLEY, J. and R. M. LOCKLEY. Fledgling-Periods of the Razorbill, Guillemot and Kittiwake. Brit. Birds 40. London 1947.

Biological notes on the Razorbill, Guillemot and Kittiwake, on their enemies and how long the young birds stay in the nests.

571. LØVENSKIOLD, H. L. Håndbok over Norges Fugler. Oslo 1947—1949.

From the Svalbard area 42 species of birds are mentioned.

572. ONSLOW, G. HUGHES. Arctic Redpoll in Ayrshire. Brit. Birds 40. London 1947.

On January 1st and February 2nd, a single Carduelis hornemanni was seen at Barr, Ayrshire.

573. ORVIN, ANDERS K. Bibliography of literature about the Geology, Physical Geography, Useful Minerals, and Mining of Svalbard. Norges Svalbard- og Ishavs-undersøkelser, Skrifter No. 89. Oslo 1947.

In the bibliography many books and papers on Geology are named, in which notes on birds are printed.

574. SÆTERSDAL, G. and T. SÆTERSDAL. A list of Ornithological Material collected in Spitsbergen the Summer 1947.

This is a copy of a list in the journal of the Zoological department of the University in Bergen. It contains 24 species of birds collected by the brothers Sætersdal in 1947.

1948

575. AHLMANN, HANS W:SON. The Present Climatic Fluctuation. Geogr. J. 112. London 1948.

No notes on birds, although there are some references to biology.

576. FØYN, B. & J. HUUS. Norges Dyreliv. Bd. 2. Fugler. Oslo 1948.

In Vol. 2, about 35 species of birds from the Svalbard area are mentioned. Some of these notes are misleading. Thus in 1948, Rhodostethia rosea had never been found breeding in Spitsbergen.

577. INGSTAD, HELGE. Landet med de kalde Kyster. Oslo 1948.

An interesting book on Spitsbergen. Some of the birds of the Svalbard area are mentioned, but there is nothing of importance on ornithology to be found.

578. LAGERKRANZ, JOHN. Några Botaniska Iagttagelser sammanställda under trenne sommarresor til Västspetsbergen inom Svalbards Polararkipelag. Del 1. Stockholm 1948.

There is only one remark of importance on the flora of bird-cliffs.

579. SALOMONSEN, FINN. The Distribution of Birds and the Recent Climatic Change in the North Atlantic Area. Dansk Orn. Foren. Tidsskrift 42. København 1948.

Only birds from Greenland, Iceland, the Faeroes and Denmark are taken into account. There is nothing to be found from the Scandinavian Peninsula or Spitsbergen.

580. WILLIAMSON, KENNETH. Ivory Gulls off Bear Island. Ibis 90. London 1948.

On an unusual abundance of Ivory Gulls in the seas around Bjørnøya in mid-June 1947.

1949

581. DALGETY, C. T. The Knot. Brit. Birds 42. London 1949.

Some pictures of the Knot on the nest, photographed by Mr. Dalgety in Spitsbergen.

582. WILLIAMSON, KENNETH. The Distraction Behaviour of the Arctic Skua. Ibis 91. London 1949.

An interesting paper on the behaviour of the Arctic Skua as observed by the author in the Faeroe Islands from 1941 to 1945.

583. WITHERBY, H. F. and Collaborators. The Handbook of British Birds. 5 Vols. 6th Edition. London 1949.

Mentions 77 species and races of birds from the Svalbard area.

1950

584. BLAIR, H. M. S. "Rodent-Run" Distraction-Behaviour in Birds. Ibis 92. London 1950.

On the "Rodent-Run" in Calidris maritima and in some other birds.

585. DUFFEY, ERIC and N. CREASEY. The "Rodent-Run" Distraction Behaviour of certain Waders. Part 1. — Field-Observations on the Purple Sandpiper. Ibis 92. London 1950.

On the "Rodent-Run" of Calidris maritima as observed on Bjørnøya in the summer of 1948. Also on other species in which the "Rodent-Run" occurs.

586. DUFFEY, ERIC and DAVID E. SERGEANT. Field Notes on the Birds of Bear Island. Ibis 92. London 1950.

Field notes on 28 species of birds from Bjørnøya. A very important paper.

587. LØVENSKIOLD, H. L. Den geografiske variasjon hos Fjæreplytten (Calidris maritima (Brünn.)). Dansk Orn. Foren. Tidsskr. 44. København 1950. (English summary.)

588. SALOMONSEN, FINN. Grønlands Fugle. København 1950.

16 species of birds are mentioned as occurring in Spitsbergen.

589. SALOMONSEN, FINN. (Rediscovery of Fulmarus glacialis minor (Kjærbølling)). Dansk Orn. Tidsskr. 44. København 1950.

Measurements of the bill of this rediscovered race of the Fulmar are given. The birds from the Baffin Island colonies are often of the sooty coloured variety. These birds are seldom or rarely found in NE Greenland or in Spitsbergen.

590. WILLIAMSON, KENNETH. The Distraction Behaviour of the Faeroe Snipe. Ibis 92. London 1950.

The nature of the display is interpreted, also in regard to Calidris maritima and other species which perform the "Rodent-Run".

591. WILLIAMSON, KENNETH. The "Rodent-Run" Distraction Behaviour of certain Waders. Part 2. — Interpretation of the "Rodent-Run" Display. Ibis 92. London 1950.

On the nature and origin of the distraction display.

1951

592. AUSTIN, O. L. Age record for the Arctic Tern. Bird Banding Vol. 22. Boston 1951.

A ringed Sterna macrura recovered after 23 years. (Cited from The Polar Record Vol. 6. No. 46. p. 843. Cambridge 1953).

593. CABANES, BERNHARD. Alpinisme polaire; l'Expedition Maillard au Spitsberg. Paris 1951.

Almost nothing on birds, one or two notes on the Ptarmigan.

594. DEGE, WILHELM. Im Vorfeld des Nordpols. Freiburg im Breisgau 1951.

A few notes on about 12 species of birds.

595. DUFFEY, ERIC. Sooty Shearwater in Barents Sea. Brit. Birds 44. London 1951.

First record of Puffinus griseus 25 miles W of Bjørnøya.

596. HARTOG, J. M. and W. M. L. WOOD. Oxford and Cambridge Explore. Brief general account of the Oxford expedition to Nordaustlandet and the Cambridge Expedition to Spitsbergen 1949. Geogr. Mag. Vol. 23. No. 9. London 1951.

A single note on birds. A colony of Sterna macrura was found on Isispynten on the SE part of Nordaustlandet.

597. LONGSTAFF, TOM. This My Voyage. Sec. Ed. London 1951.

Notes on 17 species of birds from Spitsbergen.

598. SERGEANT, D. E. Ecological Relationships of the Guillemots Uria aalge and Uria lomvia. Proc. of the 10th Intern. Ornithol. Congress. Uppsala June 1950. Uppsala 1951.

References to the breeding of the two species on Bjørnøya and of Uria lomvia on Spitsbergen.

1952

599 a. CONGREVE, W. M. From my Spitsbergen Diary. Oolog. Rec. 26. London 1952.

599. b. 27. London 1953.

A very interesting paper on the Spitsbergen birds.

600. DUFFEY, ERIC. Field Studies on the Fulmar, Fulmarus glacialis. Ibis. 93. London 1951.

On the early developed spitting reflex of the Fulmar chicks.

601. FISHER, JAMES. A History of the Fulmar FULMARUS and its Population Problems. Ibis 94. London 1952.

Some references to the size of the population of Fulmarus glacialis on Bjørnøya and in Spitsbergen.

602. FISHER, JAMES. The Fulmar. London 1952.

An interesting book on the Fulmar. A special chapter on the Fulmars of Spitsbergen.

603 a. HAGEN, YNGVAR. Rovfuglene og Viltpleien. Oslo 1952.

On the birds of prey in Norway and their relation to game-preservation.

603 b. MARSHALL, A. J. Non-Breeding among Arctic Birds. Ibis 94. London 1952.

On the non-breeding of the birds of Jan Mayen.

604. ØKLAND, FRIDTJOF. Fuglene i Norden. Oslo 1952—1953, See also C. T. Holmström: Våra Fåglar i Norden. (551).

31 birds from the Svalbard area are mentioned. There are, however, some mistakes as to the breeding and distribution of some species. Nyctea scandiaca has never actually been found breeding. Pluvialis apricarius does not breed there. Larus canus has never been found in Spitsbergen. The note on Fratercula arctica seen by Mr. Sverdrup on 88°11′ N. lat. is nonsense.

605. WILLIAMSON, KENNETH. The Spitting Reaction of Nestling Fulmars. Ibit 94. London 1952.

On the ejecting of oil by nestling Fulmars.

606. WYNNE-EDWARDS, V. C. Geographical Variation in the Bill of the Fulmar (Fulmarus glacialis). The Scottish Naturalist Vol. 64. No. 2. Aberdeen 1952.

The common European Fulmar has the longest bill, a little shorter are the bills of the Spitsbergen birds and shortest of all are the bills of the refound F. g. minor from West-Greenland and the Baffin Island. Measurements for the bill of a number of Spitsbergen birds are given.

1953

607. ANONYMOUS. Blackbirds in Spitsbergen. Aftenposten (Newspaper) Oslo December 4th, 1953.

On small flocks of Turdus merula seen in Longyearbyen and Ny-Ålesund, Spitsbergen, in the last days of November 1953.

608. BERSET, ODD. Hilmar Nøis. Bergen 1953.

On the life of the trapper Hilmar Nøis in Spitsbergen. Notes on about 16 species of birds. The number of Ptarmigan caught in different years seems to be exaggerated.

609. COTT, HUGH B. The Exploitation of Wild Birds for their Eggs. Ibis 95. London 1953.

P. 425. "Species mainly used as egg-birds in various centres are as follows: Spitsbergen — Anser fabalis, Branta bernicla, Somateria mollissima, Sterna paradisea, Uria lomvia."

610. LOCKLEY, R. M. Puffins. London 1953.

Several interesting notes on Fratercula arctica naumanni in Spitsbergen.

611. SCOTT, PETER and JAMES FISHER. A Thousand Geese. London 1953.

In an appendix: The Pinkfoot in Spitsbergen.

1954

612. CULLEN, J. M. The Diurnal Rhythm of Birds in the Arctic Summer. Ibis 96. London 1954.

613. DEGE, WILHELM. Wettertrupp Haudegen. Wiesbaden 1954.

Notes on 13 species of Spitsbergen birds.

614. JOHANSEN, HANS. Die Vogelfauna Westsibiriens. J. Orn. 95. Berlin 1954.

On p. 334 about Oenanthe oenanthe.

615. LØVENSKIOLD, H. L. Studies on the Avifauna of Spitsbergen. Norsk Polarinstitutts Skrifter No. 103. Oslo 1954.

Field notes and observations on 42 species of birds seen by the author in the summers of 1948, 1949, 1950 and 1952.

616. LØVENSKIOLD, H. L. Spitsbergensommer. Nordisk Tidsskrift. Ny Ser. Årg. 30. Stockholm 1954.

Biological notes on several Spitsbergen birds.

617. SCOTLAND, C. and G. LARMOUR. Report to Norsk Polarinstitutt, Oslo, from the ornithological work in Spitsbergen during the summer of 1954.

618. WILLIAMS, G. R. Population Fluctuations in some Northern Hemisphere Game Birds. (Tetraonidae). J. Animal Ecol. 23. Cambridge 1954.

A great deal of valuable information on the Spitsbergen Ptarmigan.

1955

619 a. FOSSHEIM jr., EIVIND. Hubro tar rødrev. Fauna, Årg. 8. Drammen 1955.

About an Eagle Owl killing a fox.

619 b. GOODHART, JAMES, RUSSELL WEBBE and THOMAS WRIGHT. Goose-Ringing in West-Spitsbergen 1954. The Wildfowl Trust. Seventh Annual Report 1953—54. London 1955.

On the ringing of Anser f. brachyrhynchus, Branta leucopsis and Branta b. hrota in Spitsbergen during the summer of 1954. Also a list of recaptured birds.

620. OXAAS, ARTHUR. Svalbard var min verden. Oslo 1955.

Some notes on birds, the most interesting on geese and Ptarmigan.

621. RAPP, ANDERS. En sommarmånad på Spetsbergen. Ymer 75. Stockholm 1955.

First record of breeding Oenanthe oenanthe from Spitsbergen. Also a record of Hirundo rustica from Sassen.

1956

622 a. HESSELBERG and BIRKELAND. The Continuation of the Climate in Norway 1940—50. Det Norske Vid. Selsk. — Geofysiske Publikasjoner Vol. 15. Bergen 1944—56.

622 b. HOLGERSEN, HOLGER. Bird-Banding in Norway 1955. Sterna 2. Stavanger. 1956.

On the recapture of ringed Spitsbergen geese.

623. PENNIE, I. D. and D. G. ANDREW. Bird Notes from Spitsbergen, Summer 1955. Sterna 2. Stavanger 1956.

An interesting account of a great number of Spitsbergen birds.

624. PENNYCUICK, C. J. Observations on a Colony of Brünnich's Guillemot, Uria lomvia in Spitsbergen. Ibis 98. London 1956.

A valuable account of the behaviour of Uria lomvia during the breeding season.

1957

625 a. BATESON, P. P. and EDVARD K. BARTH. Notes on the Geographical Variation of the Ringed Plover. Nytt Magasin for Zoologi Vol. 5. Oslo 1957.

625 b. HOLGERSEN, HOLGER. Bird-Banding in Norway 1956. Sterna 2. Stavanger 1957.

On the recapture of ringed Spitsbergen geese.

626. STRIJBOS, JAN P. Svalbard. Amsterdam 1957.

The book is written in Dutch. It has an excellent account of a great number of Spitsbergen birds, with very fine photographs.

1958

627. EHRSTRÖM, CHRISTMAN. Fåglar på Nordostlandet, Spetsbergen. Fauna och Flora 53. Uppsala och Stockholm 1958.

Birds observed on Nordaustlandet during the summer of 1957.

628. FERENS, BRONISLAW. Badania Ornithologiczne na Spitsbergenie. Ornithological Investigations on Spitsbergen. (With a summary in English). Przeglad Geofizny, Rocz III/2. Warszawa 1958.

Investigations on 18 common species from the Hornsund district.

629 a. GUDMUNDSSON, FINNUR. On the Iceland Ptarmigan.
From a paper read at the XI International Ornithological Congress in Helsinki, 1958.

629 b. JOHANSEN, HANS. Revision und Entstehung der Arktischen Vogelarten I & II. Acta Arctica. København 1956—58.

Deals with a number of birds which also are found in Spitsbergen, their immigration to these islands and their origin.

630 a. LUNDGREN, SVANTE. Bjørnøya. Stockholm 1958.

Notes on 14 birds from the island.

630 b. SALOMONSEN, FINN. The Present Status of the Brent Goose (Branta bernicla (L.)) in Western Europe. The International Wildfowl Research Bureau. Printed in Copenhagen 1958.

A very interesting paper, dealing mainly with the decrease in the different populations of the Brent.

1959

631. BLURTON JONES, N. G. and ROBERT GILLMOR. Some Observations on Wild Geese in Spitsbergen. Reprint from the Wildfowl Trust, 1959.

Very interesting notes on the breeding biology of Pink-footed Geese and also notes on Brents and Barnacles.

DIARIES

632 a. ORVIN, ANDERS. Diaries, Spitsbergen 1917, 1921 and 1936.

632 b. HORN, GUNNAR. Diaries: Bjørnøya 1924, Spitsbergen 1926 and Frans Josef Land 1930. Kept in Norsk Polarinstitutt, Oslo.

633. LØVENSKIOLD, H. L. Diaries: Vestspitsbergen 1954 and 1956. Bjørnøya 1958.

TRAPPERS' DIARIES

These diaries belong to the library of Norsk Polarinstitutt. They are either bought from the trappers or they have been lent to the institute where a typewritten copy has been made.

634. ANDERSEN, NORMANN. Prins Karls Forland 1936 and 1937/38.

635. BENGTSEN, KARL. Agardhbukta 1909/10.

636. BJØRNNES, GEORG. Wijdefjorden 1921/22. 1924/25. 1927/28.
Dunérbukta, Storfjorden 1928/29.
Edgeøya 1929/30.
Wijdefjorden 1931/32. 1933/34. 1935/36. 1939/40.

637. BJØRVIK, PAUL. Virgohamna, Danskøya 1906/07.

638. HANSEN, E. Grønfjorden 1913/14.

639. JOHANSEN, ALFRED. Sørgattet 1930/31. 1932/33. 1933/34.
Magdalenefjorden 1931/32.

640. KRÆMER, WALDEMAR. Fair Haven 1936/37. Sallyhavn 1937/38.

641. MEYER OLSEN. Nordaustlandet, (south of Lågøya) 1923/24.

642 a. NØIS, HILMAR. Sassen 1926/27. 1936/37. 1937/38. 1938/39.

642 b. OLSEN, MIKAEL. Bellsund 1917/18.

643. OXAAS, ARTHUR. Flathuken, Raudfjorden 1924/25. 1925/26.
Kapp Wiik, Isfjorden 1937/38. 1938/39. 1939/40.
Sørgattet 1920/21.
Verlegenhuken 1921/22.

644 a. SVENDSEN, ALFRED. Verlegenhuken 1926/27. 1927/28.
Lomfjorden, Hinlopen. 1928/29.
Edgeøya 1929/30.

644 b. SØRENSEN, SVERRE. Hopen 1934/35.

644 c. THUE, KLAUS N. Isfjorden 1895/96.

645. TRØHAUG, BØRRE. Sørgattet 1929/30.
Hopen 1934/35.

646. ÅM, PEDER. Kongsfjorden 1929/30. 1930/31. 1931/32. 1932/33. 1935/36. 1936/37

LETTERS WITH NOTES ON THE SPITSBERGEN BIRDS

647. LØNØ, ODD. Bird-observations during a wintering on Edgeøya 1954/55. Letter to Dr. Løvenskiold 1955.

648. STRIJBOS, JAN P. Letter to Dr. Løvenskiold with information on some birds in Kongsfjorden during the summer of 1956. Mr. Strijbos is a Dutch ornithologist who has visited Spitsbergen several times and who has written books and papers on the bird-life there.

649. ASKHEIM, TH. Letter 1957 to Dr. Løvenskiold with information on the birds of Hopen. Mr. Askheim was topographer to Norsk Polarinstitutt. He worked on the island Hopen during the summer of 1956.

650. BATESON, PAUL PATRICK. Letter 1957 to Dr. Løvenskiold with report on the birds in Raudfjorden and NW Spitsbergen during the summer of 1957.

Mr. Bateson was an assistant on one of the expeditions of Norsk Polarinstitutt. His letter contains a great deal of valuable information.

651. BATESON, PAUL PATRICK. Letter 1959 to Dr. Løvenskiold with information on the breeding of Pagophila eburnea on Nordaustlandet during the summer of 1958.

652. BLURTON JONES, N. Letter 1959 to Dr. Løvenskiold with diary notes on birds seen in Spitsbergen during the summer of 1957.

Mr. Blurton Jones was a member of the Reading University Zoological Expedition to Spitsbergen in 1957. His letter contains many valuable notes on birds.

653. LIESTØL, OLAV. Letter 1959 to Dr. Løvenskiold with bird-notes from Van Keulenfjorden in 1952, 1954, 1956 and 1958. Especially on Plotus alle, Oenanthe oenanthe and Xema sabini.

Mr. Liestøl is glaciologist to Norsk Polarinstitutt.

654. SAMUELSEN, KNUT. Letter 1959 to Dr. Løvenskiold with information on the breeding of Rhodostethia rosea at Kapp Linné in Isfjorden during the summer of 1955.

Mr. Samuelsen was radio-operator at the radio-station of Kapp Linné in 1955.

655. WINSNES, T. Letter 1959 to Dr. Løvenskiold with extracts of notes on birds from his Spitsbergen diaries 1952—57.

Mr. Winsnes is geologist to Norsk Polarinstitutt. He has a fair knowledge of birds and has many valuable observations among his notes.

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MAPS

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Jordan Hill		1:100,000	1937	....	
JAN MAYEN					
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