



RAPPORTSERIE

Nr. 58 – Oslo 1990

FRIDTJOF MEHLUM (ED.):

Cruise report R/V "Lance"
Storfjorden, Svalbard, 19 July – 17 August 1989

**NORSK
POLARINSTITUTT**

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INTRODUCTION

The cruise was a part of Norsk Polarinstitutt's 1989 summer expedition to Svalbard. R/V "Lance" departed from Tromsø 19 July at 24 00 hrs, a few hours delayed because a winch was missing and had to be transported by car from Bodø.

Norsk Polarinstitutt has focused on the Storfjorden area as an important area for conducting environmental research and mapping. In this area there are important biological populations and nature protection areas, like Sør-Spitsbergen Nasjonalpark and Søraust-Svalbard Naturreservat. Large seabird, waterfowl and marine mammal populations are present in this part of Svalbard. These populations and areas might be influenced by the increasing level of human activity in the region. A potential threat is petroleum exploration in the northern Barents Sea and in coastal areas in eastern Svalbard. Oil pollution and physical disturbance of populations and terrestrial areas might be the results of such activities. A main purpose of this cruise was to collect background information needed to assess possible impact of anthropogenic disturbances of the marine and terrestrial ecosystems in this part of Svalbard.

The cruise comprised several different research topics, and included both marine and terrestrial activities. The research programme was mainly biological. However, projects dealing with physical oceanography and topographic surveying were also included. In addition to the staff of Norsk Polarinstitutt and contracted assistants, researchers from the following institutions participated in the cruise: Oceanographical Institute of the University of Gothenburg, Oceanological Institute of the Polish Academy of Sciences, Kalø Game Biology Station, Denmark. A total of 25 persons joined the cruise, including helicopter crew. A helicopter from A/S Lufttransport, type AS 350 B1, was stationed on board during the entire cruise.

The plan was to work in different parts of the Storfjorden area, using helicopter and zodiac rubber boats to transport terrestrial field parties and groups conducting coastal surveys of wildlife. Oceanographic transects were to be made in Storfjorden and in the waters between Storfjorden and Bjørnøya. Based on previous knowledge about sea-ice conditions we expected that the activities within Storfjorden might be restricted by the occurrence of sea-ice. However, ice conditions turned out to be favourable and most sea-ice disappeared from the area by the end of July.

After leaving Tromsø we first had a rendezvous with the Polish research vessel R/V "Oceania" in open sea to collect echo-sounder equipment for the group from Inst. of Oceanology, PAS. After a successful transfer of the equipment we proceeded to Bjørnøya and picked up two topographers, who had been working with tidal measurements in Russehamna. Then the ship headed for Kovalskifjellet on the western coast of Storfjorden. Here a camp with two ornithologists had been established two weeks earlier. A third ornithologist and a cabin were deployed upon arrival on 22 July.

Then we crossed Storfjorden and left the mammal group at Andrétangen (23 July), and the Brent Goose group at Menkeøyane. As on most crossing of the fjord oceanographic transects were made. Then we

crossed Storfjorden to Kovalskifjellet/Hambergbukta in order to conduct experiments with helicopter provocations in the large colony of seabirds which is located at Kovalskifjellet. We left the area on 26 July and crossed Storfjorden once more. The mammal and Brent Goose groups were picked up (27 July) and the topographers were left at Menkeøyane. On 28 July both the mammal and goose groups were left at Tiholmane; thereafter a new oceanographic section was made towards Sørkapp.

On 29 July we headed for Bjørnøya to pick up two ornithologists, who were joining the cruise on the pelagic seabird project and we returned to Storfjorden on 31 July. A new set of helicopter provocations were performed at Kovalskifjellet on 1 August. The helicopter was also used for picking up the two Polish researchers at Hornsund who were doing the tidal zone project and different transport missions for Norsk Polarinstitutt geologists in the Hornsund area.

Then the ship once more headed for Tusenøyane, and assisted the field parties from 2-4 August. The evening of 4 August, the scientific programme was interrupted by a rescue operation. We assisted in rescuing two researchers from "Kulturvernet for Svalbard" who had capsized with a Zodiac off the outermost islets of Tusenøyane.

On the next day we continued with marine programmes in Storfjorden and the hydroacoustic project was completed on 6 August. "Lance" headed for the Polish base in Hornsund, where the acoustic equipment was shipped. After a short visit to Hornsund during the night between 6 and 7 August, we returned to Storfjorden for a transect north to Agardh.

On 8 August, we worked in the Edgeøya area with the ship located in Diskobukta. The next day, we were in the Agardh area. Here we in addition to scientific work, we also moved two of Norsk Polarinstitutt's cabins from Agardh to Kapp Dufferin. A third cabin had been blown to pieces by strong winds during the winter and parts covered large areas. By the use of helicopter, we were able to collect all these parts.

The next day, we were operating on the western side of Barentsøya and on 11 August we continued the work on the western side of Edgeøya south to Kvalpynten. We planned to do some more work in the Tusenøyane area for the mammal and topography projects, but this had to be cancelled because of fog and low visibility. We therefore leaved the Kvalpynten area on 12 August and crossed SW to Hambergbukta in order to evacuate the ornithologists' camp at Kovalskifjellet.

On 13 August, we sailed northwards into Storfjorden, and made a short visit to Kapp Dufferin for deploying a third cabin. Later that day, the mammal group made a helicopter survey for polar bears and the tidal zone group was picked up at Kapp Lee, Edgeøya. This ended our operations in the Storfjorden area.

On the way back to Longyearbyen, we made helicopter surveys of birds at Bastianøyane in Hinlopen, and stopped in Liefdefjorden (15 August). Here we made biological surveys and evacuated a Norsk Polarinstitutt field camp at Texas Bar. The next day, 16 August, we made a short visit to Ny-Ålesund and the cruise ended in Longyearbyen on 17 August at 11 00 hrs.

In conclusion the cruise was very successful, even though fog and

strong winds in periods restricted the use of helicopter and Zodiacs. A total of 77.5 hours of helicopter time was used, which was slightly less than planned. However, such weather conditions have to be expected in this part of Svalbard during summer time.

Fridtjof Mehlum
Chief scientist

LIST OF PARTICIPANTS

Physical oceanography:

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| Per-Ingvar Sehlstedt | Dept. of Oceanography, Univ. of Gothenburg, Sweden |
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Hydroacoustics:

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| Kazimierz Groza | - " - |
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Pelagic seabirds:

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| Frode Bye | - " - |
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Seabird colony studies:

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| Georg Bangjord | - " - |
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| Egil Soglo | - " - |
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Goose studies:

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| Thomas Bregnballe | - " - |
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Marine mammals:

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| Rasmus Hansson | - " - |
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| Sverre Iversen | - " - |
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Tidal zone:

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| Josef Wiktor | - " - |
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Topographic surveying:

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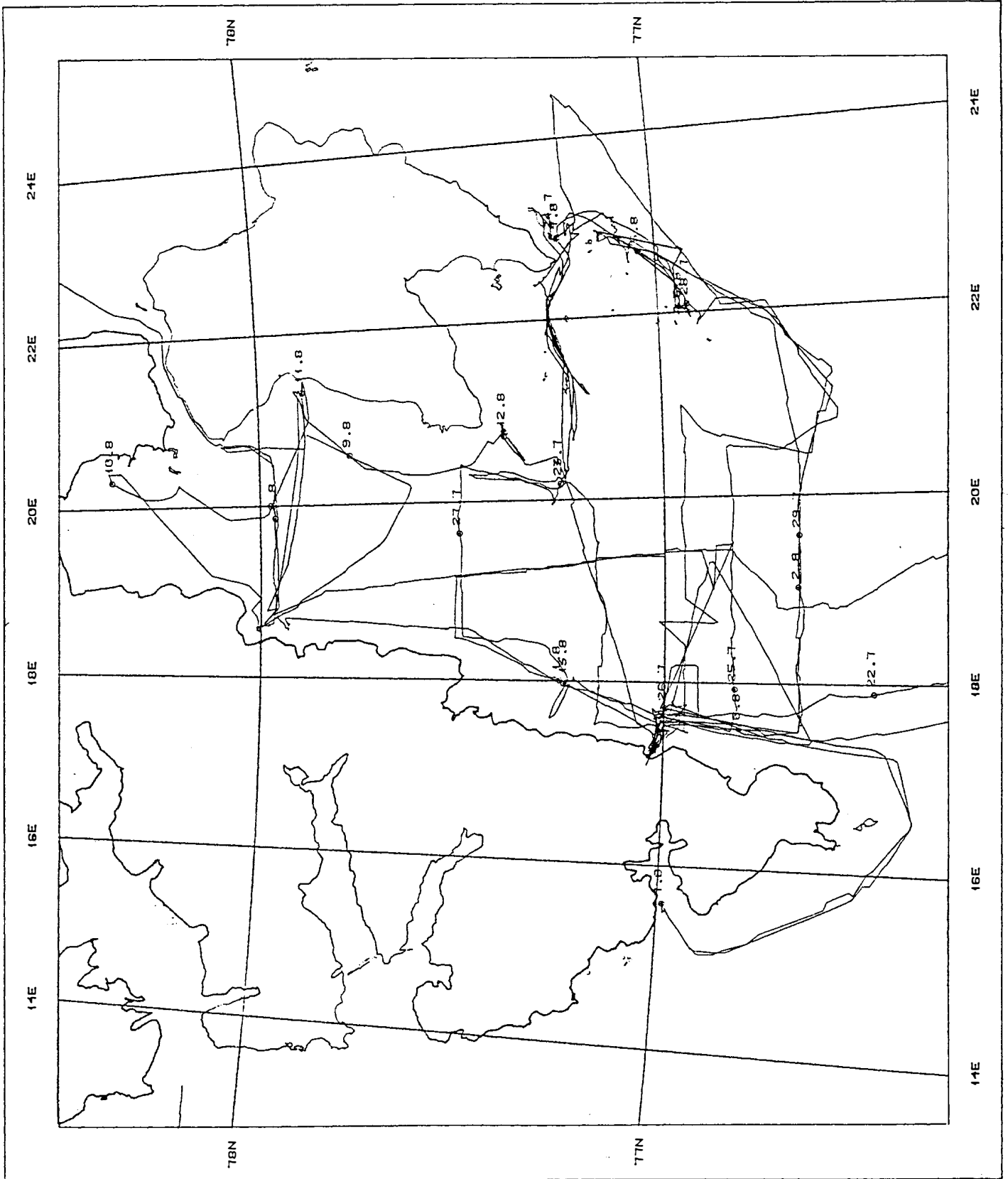
Rune Pedersen

- " -

Helicopter crew:

Jarl Andresen (pilot)
Oddvar Øvsthus (mechanics)

A/S Lufttransport
- " -



The cruise route
of R/V Lance in the
Storfjorden area
July-August 1989

DET NORSKE METEOROLOGISKE INSTITUTT

STEREOGRAFISK KONFORM PROJEKSJON M 1 : 7,5 MILL. 60° N.

Kartbl. 122

17/7-89

I S K A R T nr. 29/89, UTARBEIDET 17. JULI 1989

Iskartet er tegnet ved satellittbilder fra 13.- 17 juli 1989 og ved observasjoner fra skip.

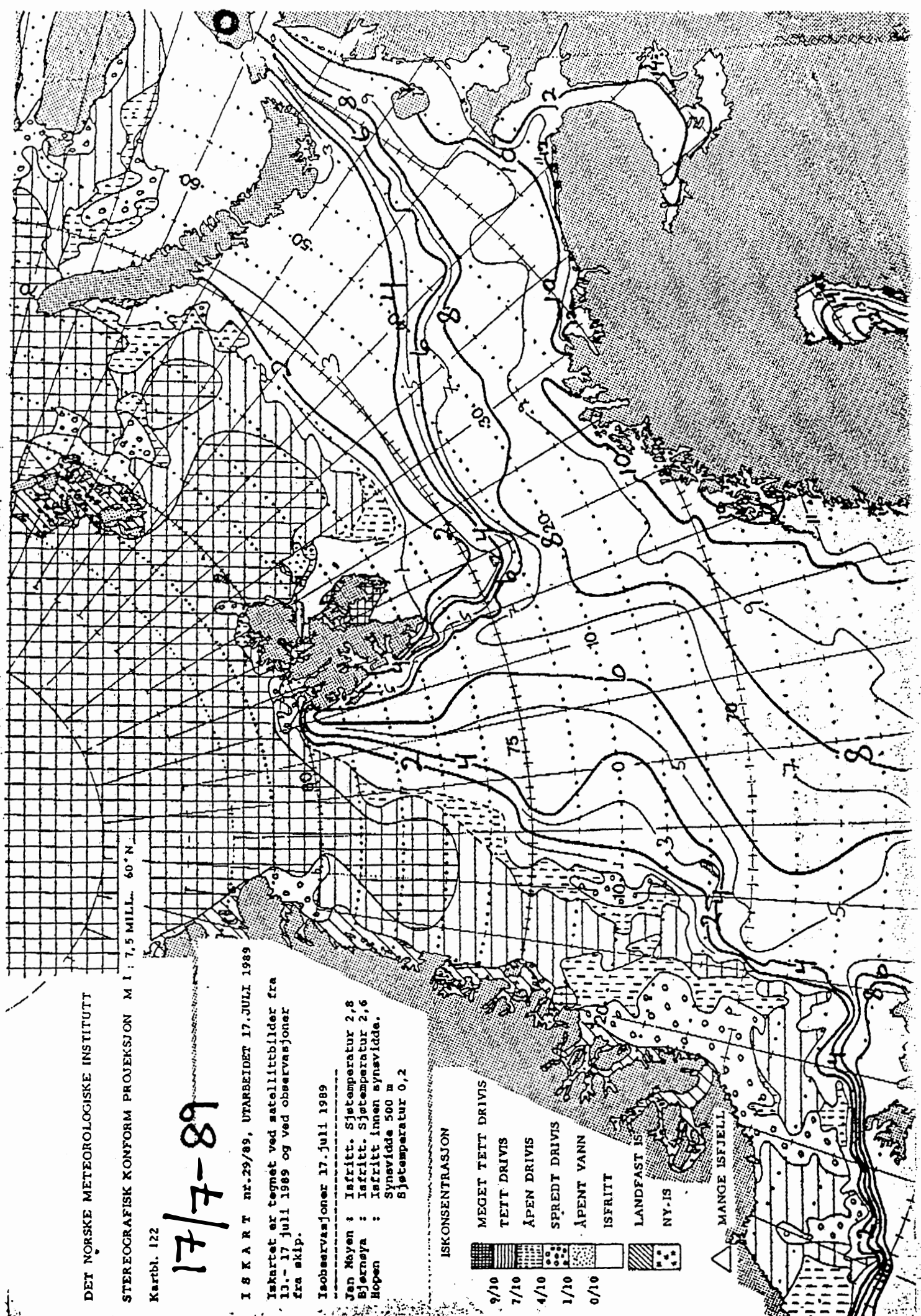
Isobservasjoner 17. juli 1989

Jan Mayen : Isfritt. Sjøtemperatur 2,8
Ejersøya : Isfritt. Sjøtemperatur 2,6
Hopen : Isfritt innen synsvidde.
Synsvidde 500 m
Sjøtemperatur 0,2

ISKONSENTRASJON

| | |
|------|-------------------|
| 9/10 | MEGET TETT DRIVIS |
| 7/10 | TETT DRIVIS |
| 4/10 | ÅPEN DRIVIS |
| 1/10 | SPREDT DRIVIS |
| 0/10 | ÅPENT VANN |
| | ISFRITT |
| | LANDFAST IS |
| | NY-IS |

MANGE ISFJELL



PHYSICAL OCEANOGRAPHY GROUP

Participants

Per-Ingvar Sehlstedt (leader)
Göran Ljungek

Norsk Polarinstitutt-Dept. of Oceanography, Univ. of Gothenburg

Aim of study

The cruise is a part of a program aiming towards an understanding of the formation and the circulation of watermasses in the Storfjorden area. Of special interest to the seabird programme are the mixing processes over shallow areas (< 80-100 m).

Methods and preliminary results

During this cruise we have performed four transects across Storfjorden and three transects between Sørkapp and Tusenøyane, Storfjordbanken. One transect from Bjørnøya across Spitsbergenbanken into the Storfjorden up to N 77:30. This transect is partly repeated from just outside the sill (N 76:50) to N 77:58. In total 102 ctd stations were performed. The distance between CTD stations were about 10 NM. CTD data were collected by the use of a Neil Brown Mark 5 instrument. Profiles were usually run to about 5 metres above the bottom. The instrument will be calibrated against 34 bottlesamples that will be analysed with a Guildline Autosal salinometer.

CTD data of interest to the seabird programme will be compared to the seabird data. The water column in the southern part of Storfjorden consists of three layers:

1. A surface layer of warm and low saline water.
2. At about 70 metres there is a second layer of Atlantic Water.
3. The third layer is the bottom water under the sill depth (>115 m). This water mass is formed during the winter. The temperature is close to the freezing point. During earlier cruises to the Storfjorden we have found high salinities in the bottom water due to sinking brine draining out of the sea ice during its formation. During this cruise we did not find any high salinities (less than 34.7 ‰) in the bottom water. Whether this depends on flushing out or no formation of high salinity water at all during the winter, we do not know yet.

We thank the captain and crew of R/V "Lance" for their help during this cruise.

LIST OF STATIONS

| Transect date | Latitude north | Longitude east |
|---------------|---|---|
| A 890723 | 77:10 -"- | 20:30,20:00,19:30,19:00 18:30,18:00,17:30 |
| B 890724 | 77:14 77:08 77:05 77:00 76:55 76:47 | 23:30,24:00,24:30 24:00 23:30 23:00 22:30 22:00 |
| C 890725 | 76:50 -"- | 20:30,20:00,19:30,19:00 18:30,18:00,17:30 |
| D 890727 | 77:30 -"- | 20:30,20:00,19:30,19:00 18:30 |
| E 890729 | 76:40 -"- | 20:30,20:00,19:30,19:00 18:30,18:00,17:30 |
| F 890731 | 74:40 74:48 75:04 75:13 75:23 75:33 75:43 75:52 76:00 76:09 76:18 76:26 76:30 76:33 76:38 76:43 76:45 | 19:00 19:35 19:50 20:23 20:43 21:05 20:43 20:20 20:05 19:40 19:20 19:00 18:50 18:44 18:44 18:44 19:00 |
| G 890801 | 76:50 77:00 77:10 77:20 77:30 77:20 77:10 | 19:30 19:23 19:15 19:10 19:05 18:13 18:00 |
| H 890802 | Position, same as E | |
| I 890805 | 76:57 -"- 76:53,76:57,77:05 76:57 | 21:00,20:30,20:00,19:30 19:00 18:40 18:30,18:00,17:30 |
| J 890807 | 76:50 77:00 77:10 77:20 | 19:30 19:23 19:18 19:14 |

77:30

| | | |
|-----------------|-------|-------------------------|
| | 77:30 | 19:06 |
| | 77:40 | 19:02 |
| | 77:50 | 18:58 |
| | 77:58 | 18:45 |
| K 890808 | 77:58 | 18:43,19:10,19:30,20:00 |
| | -- | 20:30 |
| L 890812 | 77:16 | 20:30 |
| | 77:14 | 20:00 |
| | 77:12 | 19:30 |
| | 77:10 | 19:00 |
| | 77:08 | 18:30 |
| | 77:06 | 18:00 |
| | 77:04 | 17:30 |
| Hinlopenstretet | | |
| 890814 | 79:15 | 20:57 |
| | 79:23 | 20:14 |

HYDROACOUSTICS GROUP

Participants

Zygmunt Klusek (leader)
Kazimierz Groza

Institute of Oceanology
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Sopot, Poland

Introduction

The measurements of the volume backscattering strength and the volume backscattering coefficient were performed from the board of RV "Lance" in the Storfjorden area during an 80 hours time period (i.e. distance about 400 nm). In the northern part of the investigated area, there were breakdowns in continuous acoustic surveys because of floating ice presence and some cable failures.

Methods

The data were collected using a modified version of Atlas- Krupp Deso-20 echosounder - after switching off automatic volume control function and built-in precise signal amplifier, detector and low pass filter. The transducers were mounted inside of a V-fin body, which was towed at the depth of 4.5-5 m below the sea surface. The optimal speed of RV "Lance" was established in the 5 - 5.5 knots range. The maximum speed tested during our measurements was 8.3 knots. At this speed there were too many vibrations and a too high level of reverberation. The hydroacoustical measurements were carried out at two frequencies of 33 and 204 kHz simultaneously. Observations on echograms were made in the depth range from 5 to 105 m.

At the same time, the echosignals were sampled with a sampling rate of 3000 Hz in the depth range of 5 - 50 m from the transducers. The samples were squared and summed to obtain full information on mean backscattering strength profiles $S_v(z)$ for each 7 min of transect and for each ping along the transect. The envelopes of echosignals plus trigger were also recorded on a 4 track Bruel & Kjaer tape recorder.

Because of the presence of relatively high level signals from the ship EK SIMRAD echosounder in our records and unwanted echoes from the ship propeller (bubbles and cavitation), the data derived from "on line" sampling cannot be used immediately after echo surveying work. The additional signal processing on the base of analog records must be performed once more after the expedition. The proper numerical programmes are in intensive process of development.

The additional problem associated with comparison of the the echosignal levels at two frequencies, to conclude on the character of targets, can be carried out after careful signal processing.

Preliminary results

From the echograms we can conclude :

Krill presence is observed in the upper layer from 8 - 9 m to 50 m, mostly down to 35 m. The most dense aggregations can be found to the east and to the west from the central bank of Storfjorden, for example on the Lat 76:57 transect between Long. 19:47 - 18:56 and Long. 18:40 -18:11. Fish presence was not observed during the transect from Bjørnøya to the northeast across Spitsbergenbanken.

In our project we want to determine space and depth (in 10 m thickness layers) distribution of backscattering coefficient in the region, as a measure of biomass presence, densities of swarm - their time and space variations and internal structures of swarms.

Acknowledgements

The authors are deeply indebted to Dr. Fridtjof Mehlum for the idea of collaboration and for encouragement during the cruise. We are also obliged to the crew of RV "Lance" for providing help in practical work and other forms of assistance during measurements.

PELAGIC SEABIRD GROUP

Participants

Fridtjof Mehlum (leader)
Vidar Bakken
Frode Bye

Norsk Polarinstitutt

Aim of study

The main aspect of the pelagic seabird programme was to locate feeding areas of breeding seabirds (mainly Brünnich's Guillemots *Uria lomvia*, and follow the swimming migration of this species after the young have jumped from their nesting cliffs. We would try to explain the observed distribution of birds at sea by special oceanographic features and the occurrence of food organisms. There are several large seabird colonies located at both sides of Storfjorden, but highest priorities were given to the two large colonies at Kovalskifjellet and Stellingfjellet on the Spitsbergen side.

Methods

Standard transect observation methods were applied. A strip of 300 m to one side of the moving ship was censused. All observations were directly entered into a hand held computer (Husky), and later transferred to a personal computer and stored on disk.

Results

Ship transects were made at different distances of the breeding colonies as well as cross sections across Storfjorden. One transect was made all the way south to Bjørnøya returning to Storfjorden by passing over the slope of Spitsbergenbanken.

In Storfjorden, many seabirds, mainly Brünnich's Guillemot and Little Auk, were seen foraging in ice-covered areas. When the sea-ice disappeared from the area, most birds from the colonies at Kovalskifjellet and Stellingfjellet flying between feeding areas and the colonies were observed south and southeast of the colonies.

Additional transects were made through Hinlopenstretet and on the northern and northwestern side of Svalbard.

Other activities

The group also made a census of monitoring plots in the Kittiwake colony at Diskobukta, Edgeøya. Additionally, different types of bird surveys were performed in collaboration with the Brent Goose Study Group. Moulting eiders and geese were censused in the following areas:

Andretangen - Kvalpynten
Kvalpynten - Kapp Lee

Sundneset - Mistakodden
Inglefieldbreen - Dunérbukta
Bastianøyane (Hinlopen)
Liefdefjorden - Woodfjorden

SEABIRD INVESTIGATIONS AT KOVALSKIFJELLET

Olof Olsson (leader)
Georg Bangjord
Egil Soglo

Norsk Polarinstitutt

Aim of project

In the period 12 July - 13 August seabird investigations were made at Kovalskifjellet on the eastern coast of Spitsbergen. The main objects to study were the disturbance effect of helicopter noise near the the breeding colony of Brünnich's Guillemot Uria lomvia, and to study the food and breeding ecology of this species. Another task was to establish monitoring for the species. In addition, a new total count of seabirds in the colony was to be done.

Helicopter provocations

15 helicopter provocations were made in the Kovalskifjellet colony. 14 of them were made by a three bladed Aerospatiale Ecureuil helicopter, stationed on board R/V Lance. One provocation was made by a two bladed Bell 212 helicopter from the Governor.

The provocations were made at different distances and directions in relation to the colony. The speeds and altitudes of the helicopter were also variable. Depending on whether the birds had egg/chick or not, there were great differences in behaviour during the provocations. Birds with egg/chick remained on the ledges even when the provocations were very strong. Non-breeders, on the other hand, left the cliffs early at only small provocations. The provocations were registered with two photo cameras and one video camera.

Food ecology

During the period 22 food samples were collected from adult Brunnich's Guillemots (who carry food, mostly fish to the chicks). In addition, we also observed 161 occasions when adults fed their chicks and when we were able to recognize the fish species. Arctic cod (Boreogadus saida) constituted 86 % of the number of fishes given to the chicks. The diversity of the fish species was higher in the second half of the feeding period.

The feces of the adult birds had, in about half of the registrations, a reddish color, which indicates that they, in addition to fish, also ate crustaceans.

During the whole period we observed a massive feeding migration in southeast direction from the colony.

About 400 birds were painted yellow with picric acid to make it possible to recognize them in the feeding areas and during the feeding migration from R/V Lance. Two of these were spotted from the ship south of the colony.

Breeding ecology

When we arrived at the study area on 12 July, 5-10 % of the eggs were hatched. These registrations indicate that the egg laying started in the beginning of June.

We observed the first chicks jumping from the ledges on 26 July. The first and last day with massive jumping were 4 and 10 August, respectively. When we left the colony on 12 August, there were also some thousands of chicks left on the ledges.

It was possible to count all the chicks in the air when leaving the breeding ledges in the Kovalskifjellet colony. During five days, we registered the jumping activity every 15 minutes in the periods without mist and when chicks were jumping. From these registrations we have estimated the number of young leaving the Kovalskifjellet colony before 12 August to be at least 45 000. The diurnal peak of jumping activity was between 7 pm. and 11 pm. The main mortality factors for the young after leaving the breeding ledges were predation from Arctic fox and Glaucous gull.

Population estimates

We estimated the number of individuals sitting on the ledges in the Kovalskifjellet and Stellingfjellet colonies to 90 000 and 450 000, respectively. These figures are much higher than earlier estimates. It is probably not due to an increase in the population, but rather that we have used better methods and spent more time counting the birds than earlier. Anyway, the figures are still very rough, especially in Stellingfjellet.

Study plots

In the Kovalskifjellet colony we have made nine study plots for future population monitoring. The study plots include about 5 % of the birds in the colony.

Ringing, biometry, and blood samples

A total of 400 adult and 600 juvenile Brünnich's Guillemots were ringed. We also have taken biometric measurements on 42 adults and 35 pulli individuals. Blood samples for DNA-analysis were taken from 21 adults.

LIGHT-BELLIED BRENT GOOSE STUDY GROUP

Participants

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 Denmark

Background

In the summer of 1987 J. Madsen and T. Bregnballe in collaboration with the Norwegian Polar Research Institute studied the breeding ecology of the Light-bellied Brent Goose (Branta bernicla hrota) on Tiholmane in the Tusenøyane group with the overall aim to reveal factors contributing to the regulation of this small goose population counting 3000-5000 individuals, which winters in Denmark.

Aim of project

The aim of the project carried out in the summer of 1989 was a follow-up of the 1987 studies comprising:

- Survey and estimates of breeding success of geese and eiders in the Tusenøyane area.
- Catching and ringing of Brent and Barnacle Geese.
- Behaviourial and ecological studies of geese, primarily Brent Geese.
- Counts of other nesting birds.

Itinerary

The group participated in the Svalbard Expedition 1989 from 19 July (Tromsø) to 17 August (Longyearbyen).

Helicopter surveys of geese and eiders in the whole Tusenøyane area were carried out on 22 and 23 July 1989.

Landbased surveys and estimates of breeding success of geese as well as counts of other nesting birds were performed as follows:

- | | |
|----------------------|--------------------------|
| 24 to 27 July: | Menkeøyane |
| 28 July to 3 August: | Tiholmane, Schareholmane |
| 4 August: | Kong Ludvigøyane |
| 4 August: | Meinickeøyane |

Supplementary observations of geese and eiders were made by other

participants on the Lance cruise on the following islands:

26 July and 4 August: Bølcheøya

3 August: Håøya

4 August: Utsira

Between 8 and 15 August helicopter surveys of geese, eiders and other birds were conducted along the coasts of Edgeøya, Barentsøya, in parts of Hinlopen, and in Liefdefjorden and Woodfjorden. During the same period, landbased observations were made in Rosenbergdalen and on Grunnlinjesletta on Edgeøya as well as on some islands in the area.

Preliminary results

The helicopter surveys showed an almost complete lack of goose families with goslings, and this impression was confirmed by the landbased surveys. Most birds and the only families of Brent Geese were observed on Menkeøyane - in all 10-11 families with a total of 26 goslings - corresponding quite well to the few nests found scattered on these islands.

On Tiholmane and Schareholmane where Brent Geese nested on every island in 1987, no nests or families were found in 1989 and only a single family of Barnacle Geese with two goslings was registered. A similar situation was found on Kong Ludvigøyane and Bølcheøya. On the other hand, Arctic Fox was either observed present or foxtracks were seen on most of these groups of islands and the presence of fox is believed to be the main cause of the failure in breeding attempts of geese here.

The survey of the greater Meinickeøya differed from the others. A dense colony of both Brent and Barnacle Geese was found but no birds were seen on or around the islands. A fox was seen and several predated goose-eggs were spread on the island, which indicates that the fox had arrived after nest initiation, and effectively expelled the geese.

As described it turned out that 1989 has been a bad breeding year for Brent Geese as well as for Barnacle Geese. In addition, the geese had started moulting 1-2 weeks earlier than normal. Due to these circumstances the possibilities of catching the geese were limited and only one catch of 10 adults and 7 goslings of Brent Geese succeeded. For the same reasons, the conditions for behavioural and ecological studies of post-hatching and moulting geese were poor.

Nevertheless, the studies in 1989 have added valuable information to the 1987 picture of the harsh life of the Brent Geese: a goose population living on the margin.

Acknowledgements

The group wishes to thank the Norwegian Polar Research Institute and especially the cruise leader, Fridtjof Mehlum, for the invitation to participate in the Svalbard Expedition 1989. We also greatly acknowledge the kind hospitality and help of the crew of RV "Lance" during the cruise.

MARINE MAMMAL GROUP

Participants

Øystein Wiig (leader)
 Ian Gjertz
 Rasmus Hansson
 Sverre Iversen

Aim of study

The group was to perform three main projects:

1. Walrus

The walruses in the Tjuvfjorden-Tusenøyane area were to be surveyed from helicopter and from land. Two walruses should be instrumented with satellite transmitters. Old hunting sites of walruses were to be registered.

2. Polar bear

One polar bear was to be instrumented with satellite transmitter. Bears instrumented earlier this year were to be recaptured for control of condition.

3. Track surveys

Tracks from vehicles were to be surveyed and photographed at Edgeøya, Barentsøya and in Agardhdalen.

PRELIMINARY RESULTS

1. Walrus

Seven helicopter surveys were performed in the Tjuvfjorden-Tusenøyane area. The maximum number of walruses counted during any one survey was 150-200.

The group spent two periods on land. During the first period two walruses were drugged and captured. One of these was instrumented with transmitters, the other died. The behaviour of the animals was studied during the period.

During the second period walruses were counted on land and their activity pattern was studied for a week. Nearly 200 walruses were counted in the area during any one day. One pup of the year was seen. One walrus was instrumented with satellite transmitter.

All islands in the Tusenøyane area were surveyed from helicopter and/

or from land for signs of walrus hunting. Most of the western coasts of Edgeøya and Barentsøya were surveyed for such activity.

Ten samples of walrus faeces were collected.

2. Polar bears

One polar bear was instrumented with satellite transmitter in the Tusenøyane area. The bear soon after took off the collar and the transmitter had to be picked up from a helicopter. The transmitter was soon after put on another bear farther north in Storfjorden.

None of the bears instrumented with a transmitter during the spring was located. One bear with transmitter was seen by another person during the time we were in the area. About 70 polar bears were observed during the cruise.

3. Track surveys

The areas searched from helicopter for tracks were the western and southern parts of Edgeøya, the western part of Barentsøya, and Agardhdalen.

Tracks connected to oil activity were observed in the western parts of Edgeøya. No tracks were found on Barentsøya or at Agardh. The tracks were photographed by Ektachrome and IR films.

MISCELLANEOUS

Several pods of whales were observed during the cruise.

One dirty letter was received.

TIDAL ZONE GROUP

Participants

Marek Zajaczkowski (leader)
Josef Wiktor

Institute of Oceanology, Polish Academy of Sciences,
Sopot, Poland,
and Norsk Polarinstitutt

Aim of study

In the present programme ecological mapping of the tidal zone on Tusenøyane and the western coasts of Edgeøya and Barentsøya was carried out.

Methods

The following parameters have been observed:

- air temperature
- water temperature and salinity
- coast type
- width of tidal zone
- exposition
- slope
- sediment type
- algae deposits
- driftwood and litter occurrence
- human activity

The following samples have been taken:

- phytoplankton
- quantity of tidal zone assemblages
- qualitative samples of Amphipoda
- meiofaunal assemblages

Additionally, weather conditions have been noted.

In the areas mentioned above 28 stations were under observation. These stations were established in typical coast zones and with availability for landing by boat. Three of them were located on Tusenøyane, two on Halvmåneøya, sixteen on Edgeøya, and eight on Barentsøya.

Biological samples will be analysed at the Institute of Oceanology after termination of field works.

TOPOGRAPHIC SURVEYING

PARTICIPANTS

Bjørn Lytskjold (BL), topographer
 Brit Åse Luktvaslimo (BÅL), topographer
 Bjørn Barstad, BÅL's assistant
 Rune Pedersen, BL's assistant

Norsk Polarinstitutt

TOPOGRAPHIC INSTRUMENTS

2 Wild T2 theodolites

TIDE RECORDING INSTRUMENTS

3 Aand

eraa water level
 recorders 1 Wild Di3000 distance meter 1 Wild reflector with 11 prisms
 1 Wild reflector with 3 prisms
 2 Wild reflectors with 1 prism
 1 Zeiss Ni2 Arctic level

BACKGROUND

In 1985-86 a new Zero order network was established in Svalbard. Approximately 80 stations were measured with GPS - Global Positioning System - in a project by Statens Kartverk and Norsk Polarinstitutt. GPS uses the NAVSTAR satellites, the most flexible and accurate positioning system available.

Triangulation points measured by GPS are now connected to the existing network, though in the inaccessible areas southeast in Svalbard some of these connections are still missing. The biological cruise with the research vessel LANCE gave us the opportunity to visit some of these stations.

PLANNED WORK

- 1 Connect GPS points to the existing triangulation network in these areas:
 - * TUSENØYANE
 - * KVALPYNTEN
 - * AGARDHBUKTA
 - * FREEMANSSUNDET
 - * HINLOPENSTRETET, southern part
- 2 Define and determine the baseline points (grunnlinjepunkt) in all visited areas. These points give the territorial border around the islands. If possible the work should be carried out by field measurements, secondary by photogrammetric methods.
- 3 Strengthen the existing triangulation network in all visited areas by establishing new points through trilateration/triangulation.
- 4 Establish a tide gauge on Bjørnøya that will run for one year.
- 5 Carry out the annual work on the tide station in Ny-Ålesund.

6 Build a new tide station in Longyearbyen.

7 Assist other groups if positioning was needed.

WORK EXECUTED

CONNECTIONS OF GPS POINTS

TUSENØYANE

Our plan was to connect the GPS points on Halvmåneøya and Håøya. Some was done in 1985, but bad weather spoiled most of the work.

This time we started from Halvmåneøya GPS point. From July 27 to August 2 a network of triangulation points was established towards Vindholmen, with new stations on the following islands:

- Halvmåneøya, southernmost point (BL)
- Andsteggen (BÅL)
- Havella (BL/BÅL)
- Store Brækmoholmen (BL)
- Søre Meinickeøya (BÅL)
- Bølscheøya (BL)
- Utsira (BL)

The map on the next page shows the triangulation points on Tusenøyane.

In 1985 the Håøya GPS point was connected via Lurøya and Havsteinen up to Vindholmen. Unfortunately we did not manage to connect our measurements to Vindholmen, due to strong wind. This means that a vital part is still missing in the Tusenøyane network.

We did not obtain high quality measurements at the Utsira station. The island is so low and isolated that it is difficult to obtain good visual sights to surrounding triangulation points. Additional measurements are needed.

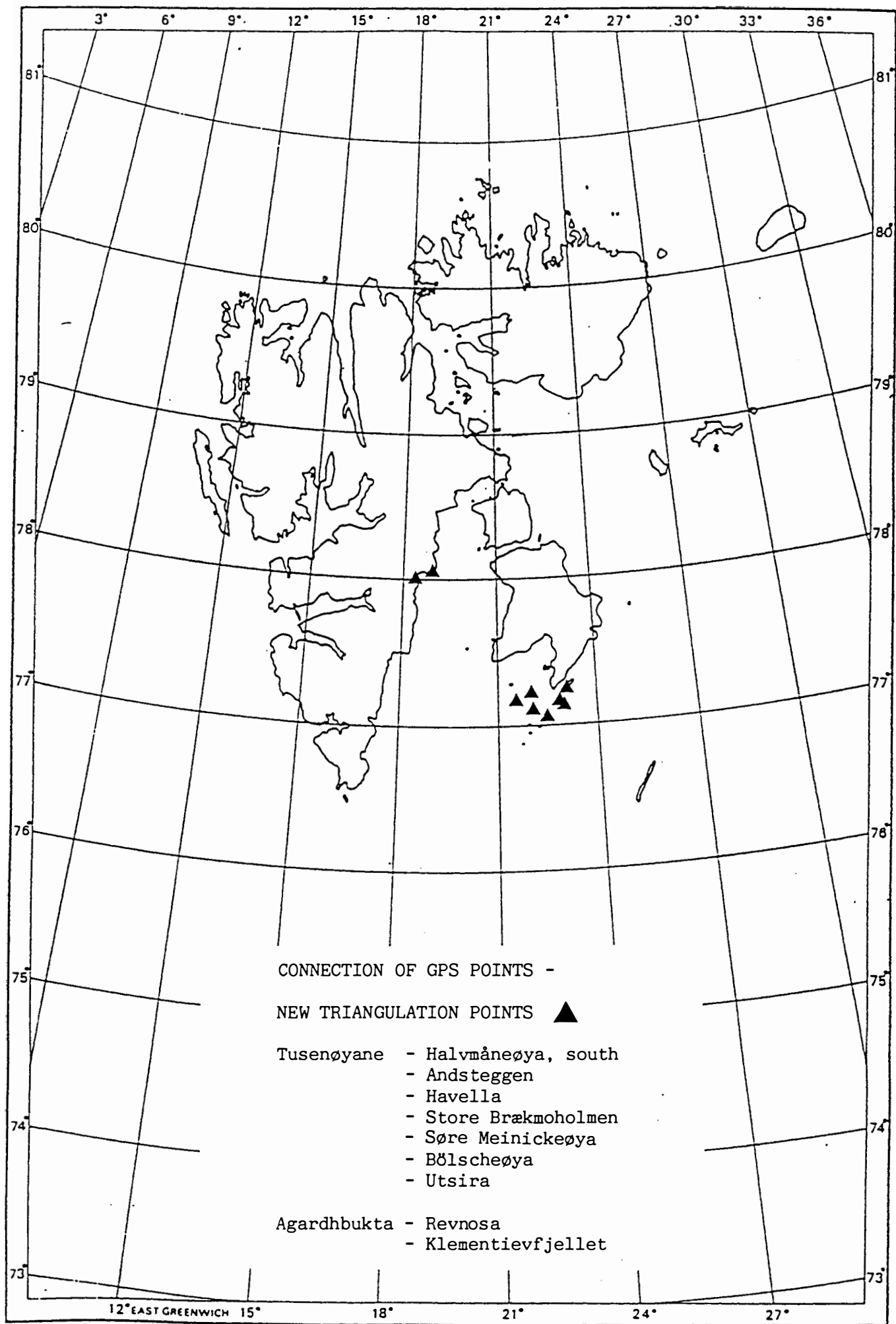
Near the end of the cruise, August 12, LANCE was lying just south of Kvalpynten. We had thumbs up for flying south to connect the Store Brækmoholmen and Vindholmen points - but the fog did not cooperate...

In general, the work on Tusenøyane is difficult since the islands are far apart. 12-13 km is a typical distance and then seldom exceed 25m in elevation. The high humidity limits the use of electronic distance meter (EDM). Unpredictable fog is the main obstacle.

KVALPYNTEN

The GPS point at Habenichtbukta was measured in 1985 in thick fog. It was not connected to the existing triangulation network; the nearest points are on Årdalsnuten and Siegfjelllet.

During the night of July 22-23, one party (BL) visited Årdalsnuten that was supposed to have one old Russian cairn and one of newer date. Totally 5 cairns were found. The top is extremely flat; from the cairns there were no direct sight down to the GPS point. BÅL tried to establish a supporting triangulation point between Siegfjelllet and



CONNECTION OF GPS POINTS -

NEW TRIANGULATION POINTS ▲

- Tusenøyane - Halvmåneøya, south
- Andsteggen
- Havella
- Store Brækmoholmen
- Søre Meinickeøya
- Bølscheøya
- Utsira

- Agardhbukta - Revnosa
- Klementievfjellet

12° EAST GREENWICH 15° 18° 21° 24° 27°

Årdalsnuten SE of Kvalpyntfonna - on Grindane. This proved to be situated too far south and too low to be connected directly with Årdalsnuten.

No measurements were done in the area, as the complicated situation on Årdalsnuten demands a local traverse net. The supporting point has to be further north.

At the end of the expedition, LANCE was in position near Kvalpynten for two days, August 11-12. The fog constantly kept its damp grip over the mountains.

AGARDHBUKTA

With the BÅL party on the Revnosa GPS point and BL on Klementievfjellet, the connection was carried out August 9. Weather conditions were very tricky, the fog was continuously covering surrounding cairns in a very frustrating pattern.

The cairn on Klementievfjellet was restored, a new one was erected on Revnosa.

FREEMANSSUNDET

During the two days LANCE was in position west of Freemansundet, August 10-11, thick fog constantly drifted from east the out of the sound, and covered the Brimulen and Zeiløyane GPS points. All GPS measure plans still are plans only...

HINLOPENSTRETET - SOUTHERN PART

LANCE was heading north through Hinlopenstretet August 13-14. We had two areas of main interest:

- 1 Kiepertøya GPS point should be connection with the triangulation point on Wilhelmøya via Bastianøyane.
- 2 Eremitten GPS point should be connected to surrounding points.

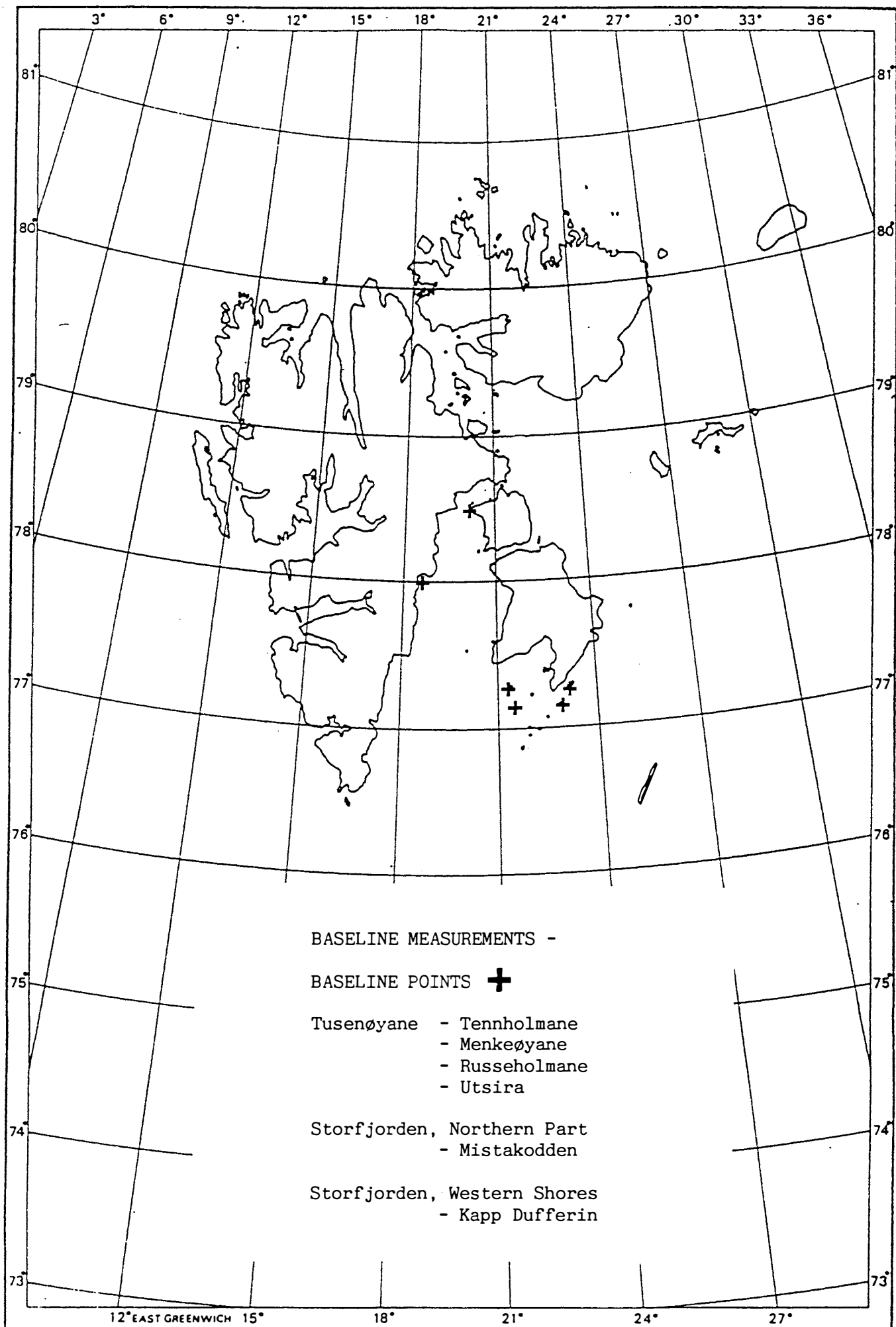
No measurements were done in Hinlopenstretet due to strong wind and bad visibility.

BASELINE POINTS

GENERAL

The baseline (grunnlinjen) gives the territorial border around the Svalbard archipelago, defined by baseline points (grunnlinjepunkt, abbr.: GLP). The baseline points are the most seaward dry land at low tide of characteristic points of the coastline, chosen according to international criteria.

The map on the next page shows GLP determined during the expedition.



TUSENØYANE

During our stay on Havella in Menkeøyane, July 28 - August 2, we determined and measured two baseline points with conventional surveying techniques:

- 1 Menkeøyane GLP, connected to triangulation points on Havella and Andsteggen.
- 2 Tennholmane GLP, connected to triangulation points on Halvmåneøya.

August 4 party BÅL determined Russeholmane GLP, a tiny skerry. To connect this to the nearby triangulation point the topographer aimed the theodolite with the EDM mounted towards a helicopter holding a reflector over the skerry.

Party BL determined Utsira GLP. This baseline point was located and marked on air photographs only.

STORFJORDEN - NORTHERN PART

Waiting for good "GPS weather" near Brimulen August 10, we determined Mistakodden GLP. BÅL's party was stationed on the headland that defines the point, BL worked from the cairn on Framslengja. The work was partly interrupted by fog. Both Kvalrossøya and Dolerittneset baseline points were within flying distance August 10, but then there was something called fog...

STORFJORDEN - WESTERN SHORES

Working at Kapp Dufferin SW in Agardhbukta August 13, searching for the baseline point, we discovered a cluster of skerries not marked on the topographic map. The positions of these were measured from BÅL's party on Rurikfjellet. The EDM reflector was put out by using a rubber boat.

The easternmost skerry represents Kapp Dufferin GLP, and was measured from Rurikfjellet and a supporting point on Kapp Dufferin.

STORFJORDEN - EASTERN SHORES

We hoped to determine the baseline points in the Kvalpynten area combined with GPS measurements. No measurements at all were carried out because of the fog.

STRENGTHENING THE EXISTING TRIANGULATION NETWORK

GENERAL

When LANCE visited areas where no GPS or baseline point measurements were required we worked to improve and strengthen the existing triangulation network. For this part of Svalbard in general, the existing net is very sparse; the areas we visited were of no exception.

The improvements are made by establishing new triangulation points between already existing ones. Suitable mountain peaks are picked out

to serve this purpose, special care is taken to obtain good relative position. Each station is marked with a brass/aluminium bolt and a stone cairn. The stations are tied together by triangulation and trilateration. Efficient work requires frequent use of helicopter.

During the LANCE cruise, we improved the net in two areas which we name:

- * MARKHAMBREEN NETWORK
- * GULDALEN NETWORK

MARKHAMBREEN NETWORK

LANCE was in position at Hambergbukta several times during the cruise. We used the visits between July 22 - 26 to work in an area limited by the coastal mountains from Kamtoppane up to Belcherfjellet. Inland, the area includes the Ostrogradskifjellet and Stolryggen massives.

Party BÅL was equipped with theodolite and EDM.
Party BL was equipped with theodolite and EDM reflectors.

Existing triangulation points visited:

- * N Kamtoppane (BÅL/BL)
- * Belcherfjellet GPS point (BL)

New triangulation points established:

- * Isingfjellet (BÅL)
- * Grimfjellet (BL)
- * NW Ostrogradskifjellet (BÅL)
- * Stolovajafjellet (BL)
- * Kovalskifjellet (BÅL)
- * Stellingfjellet (BL)
- * "Matrosen" (BÅL/BL)
- * NW Stolryggen (BL)

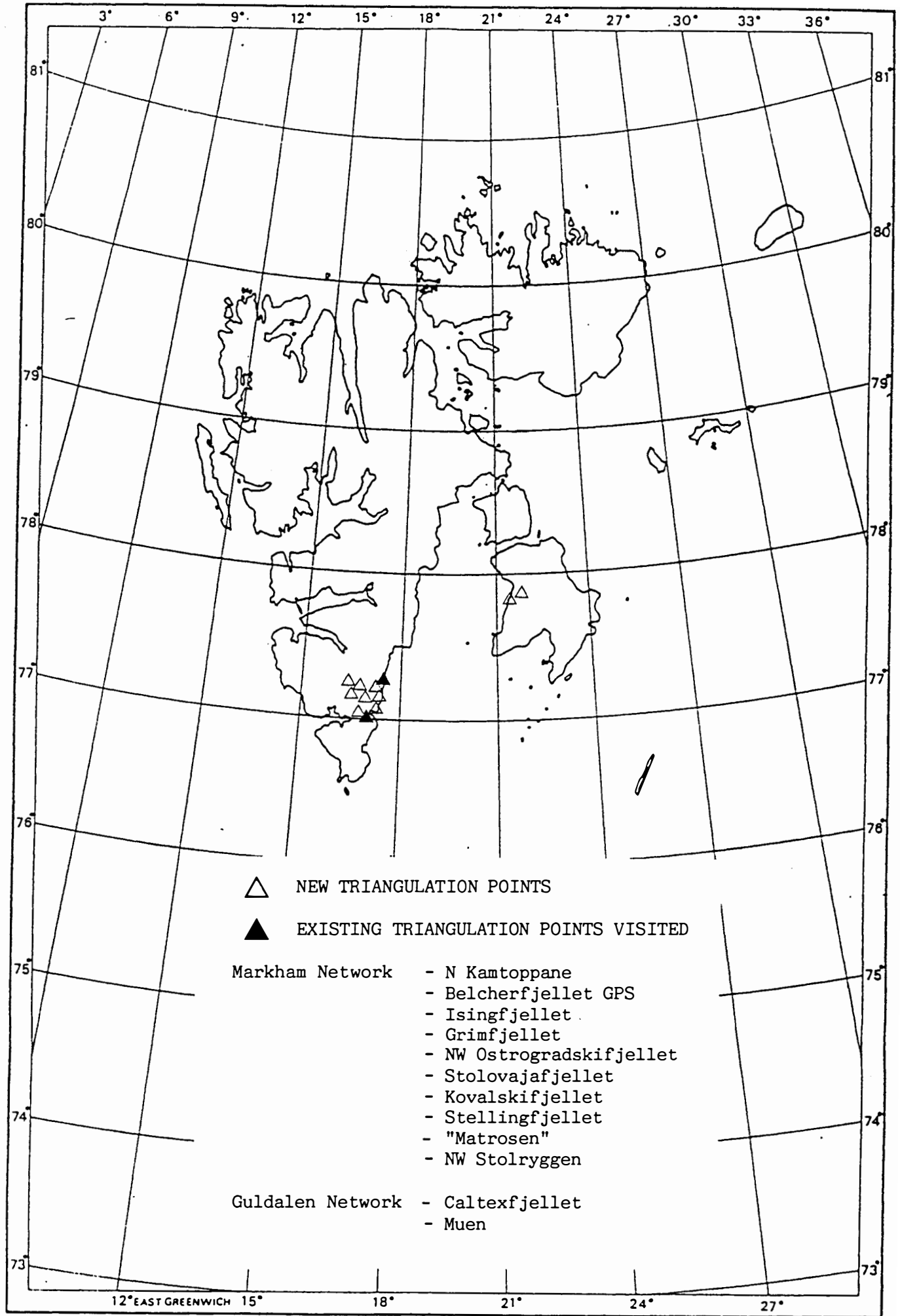
GULDALEN NETWORK

While LANCE was anchored in Diskobukta August 11, both the Habenichtbukta and Brimulen GPS stations were impossible to reach because of the fog. We used the stay to establish two triangulation points:

- * Caltexfjellet (BL)
- * Muen (BÅL)

EDM reflectors were put up on Karstenfjellet and Burmeisterfjellet.

The map on the next page shows the Markham and Guldalen networks.



△ NEW TRIANGULATION POINTS

▲ EXISTING TRIANGULATION POINTS VISITED

- Markham Network
- N Kamtoppane
 - Belcherfjellet GPS
 - Isingfjellet
 - Grimfjellet
 - NW Ostrogradskifjellet
 - Stolovajafjellet
 - Kovalskifjellet
 - Stellingfjellet
 - "Matrosen"
 - NW Stolryggen

- Guldalen Network
- Caltexfjellet
 - Muen

12° EAST GREENWICH 15° 18° 21° 24° 27°

ADDITIONAL MEASUREMENTS

Three new huts were put up near Kapp Dufferin. They were measured from Rurikfjellet (BÅL) and a new point on Kapp Dufferin (BL).

TIDAL MEASUREMENTS

Strictly, the work on the different tide stations was done just before and immediately after the biological cruise with LANCE. To give a complete picture of our work this summer, I chose to enclose this report as well.

BJØRNØYA

BL/BÅL joined LANCE from Bodø to arrive on Bjørnøya July 10. An Aanderaa tide gauge was put out in Sørhamna - see the map below - mounted on a steel platform, depth 12 m. The party then was landed in Russehamna by helicopter. In the nearby Lognvika, readings on a tide staff were carried out through the following 3 days and nights. The tide staff was levelled into a new reference brass bolt. The bolt was not connected to the existing triangulation network.

NY-ÅLESUND

BÅL's party left LANCE August 16 in Ny-Ålesund to carry out the annual work on the tide station there. The present water level recorder was replaced by a new one, as the timer seemed to be defect.

LONGYEARBYEN

BL's party left LANCE August 18 in Longyearbyen to build a new tide station there. The station built in 1983 has been out of work since 1988, as sediments have blocked the inlet. The new station is now situated under the quay (Gamlekaia). The Aanderaa tide gauge was placed in a 5.5m long steel tube mounted on one of the quay poles. The tide gauge works at approximately 4m depth. To control the stability of the station precise levelling was carried out between control bolts fixed both to the quay and into a concrete foundation near by.

