

NORSK POLARINSTITUTT



ÅRBOK 1986





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The Annual Report
of the Norwegian Polar
Research Institute

NORSK POLARINSTITUTT
OSLO 1987

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Annual Report of the Norwegian Polar Research Institute

Norsk Polarinstitutt (NP) is Norway's central institute for the scientific research of Svalbard, Jan Mayen, the polar seas and the Norwegian dependencies in the Antarctic and for the mapping of the Norwegian polar land areas. Apart from its own mapping and research within the fields of geology, geophysics and biology, Norsk Polarinstitutt also acts as an advisor and coordinator for other Norwegian and foreign scientific expeditions to Svalbard.

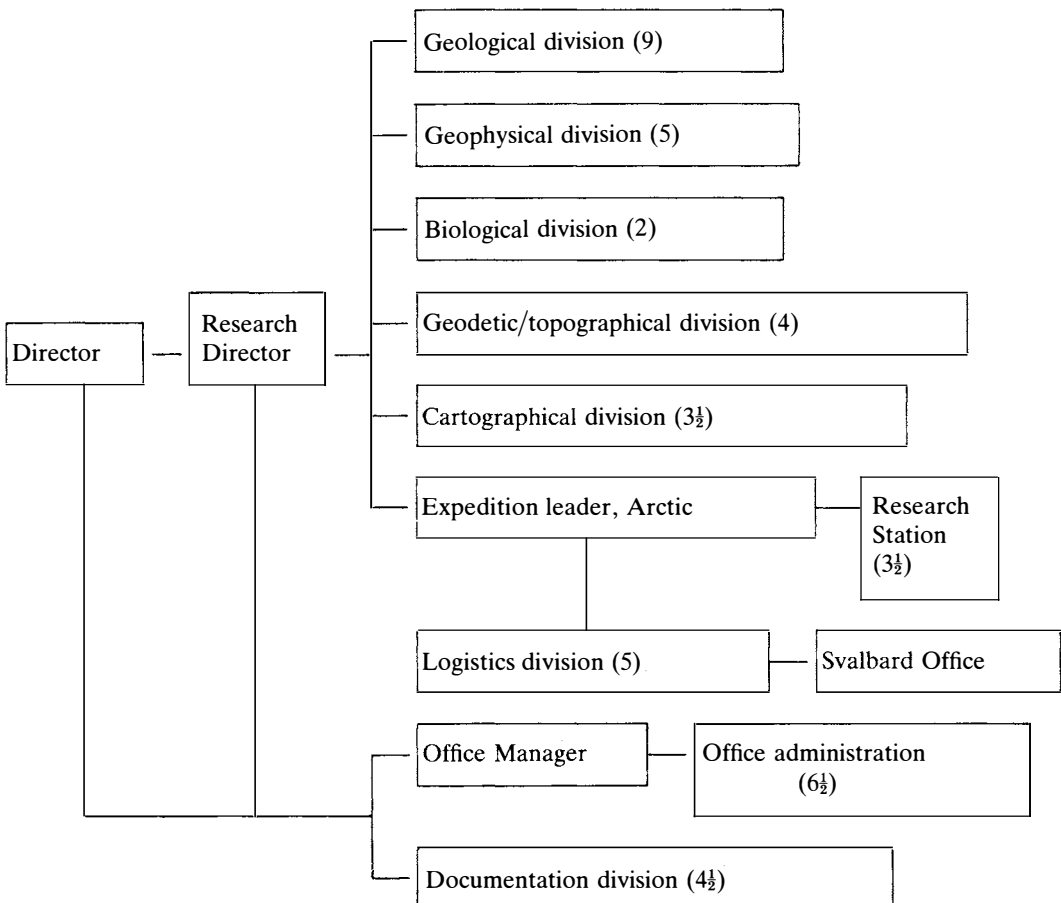
Personnel

Director: Odd Rogne
 Research director: Jan A. Holtet
 No. of permanent posts: 42½
 No. of temporary posts: 4½
 Contracted personnel: 16

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Organization (Number of permanent positions in parentheses)



The past year

Hydrocarbon explorations and exploitation in Svalbard and the Barents Sea will have significant impact on the environment. The Institute's research activities have therefore to a great extent been directed towards studies which can provide a basis for environmental impact analyses.

A project coordinator for the Institute's environmental research programme was appointed in 1985. The research related to the planned offshore exploration in the Southern Barents Sea is funded by the Ministry of Petroleum and Energy, which is also in charge of the overall management of all offshore-related projects.

The terrestrial projects in connection with the individual oil companies' activities in Svalbard are organized by the Institute in an integrated programme called MUPS (Miljøundersøkelser på Svalbard – Environmental investigations in Svalbard). In addition to the field work and data evaluation, a main endeavour in the programme is to establish a system for environmental impact analyses in Svalbard. This work builds on experience gained in similar studies in Canada. The drastic drop in oil prices in 1986 reduced the companies' planned activities considerably and had the same effect on the planned studies. Still, these activities counted for about 20% of the Institute's available resources. More detailed information is found in the "Topicalities" section of this annual report.

The field operations were at a normal level in 1986. Priority was given to sea ice investigations and oceanography in the northern Barents Sea, which is an interesting region for the oil industry and for environmental assessment studies. We have only fragmentary knowledge of the physical environment of the Barents Sea today, which means that in order to secure a reliable data base, investigations in the area will have to be continued for several years ahead.

The ordinary biological field work was kept at a high level and was coordinated with the environmental assessment studies. The geological field work was reduced to a minimum to let the geologists work on previously collected data and to accelerate the evaluation of data for map compilation.

The planning of a new Antarctic expedition in 1987/88 was started at the beginning of the year. It continued until the late autumn when it became clear that the expedition would not be funded in

1986. At the same time, the Institute was asked by the Ministry of the Environment to organize a small expedition to Peter I Øy, Antarctica, in the beginning of 1987. M/S "Aurora", belonging to a private Norwegian Antarctic expedition, was to be used for a period of 38 days, starting from New Zealand in the middle of January, 1987. The very short time available for the planning of the expedition and the shipment of its equipment to New Zealand made the last few months of the year a very hectic time for the expedition members and the administration. This was to be the first Norwegian expedition to Peter I Øy for about thirty years.

The Institute took part in the planning and initiation of several polar anniversary celebrations throughout the year. The unexpected discovery of some old glass plate photos used by Roald Amundsen as illustration to his lectures after his expedition to the South Pole, gathered much public interest. As a result the Institute summoned a meeting to discuss the conservation and registration of Norwegian polar historical photo material. To follow up the recommendations of the conference, a part time employee was engaged by the Institute, for identification work. Also, an application from the Institute resulted in financial support from the Norwegian Research Council for Science and the Humanities to employ a project leader within historical source material in 1987.

Appointments

Geologist, Dr. Philos. Anders Elverhøi was appointed professor of geology and biologist Dr. Philos. Nils Are Øritsland professor of biology at the University of Oslo. Dr. Øritsland also received the Nansen Prize for his outstanding scientific work in the Arctic. The former director of the Institute, Dr. Tore Gjelsvik, was awarded the Copernicus Medal by the Polish Academy of Sciences.

Field work

The 1986 expedition was the 73rd regular Norwegian governmental expedition to Svalbard

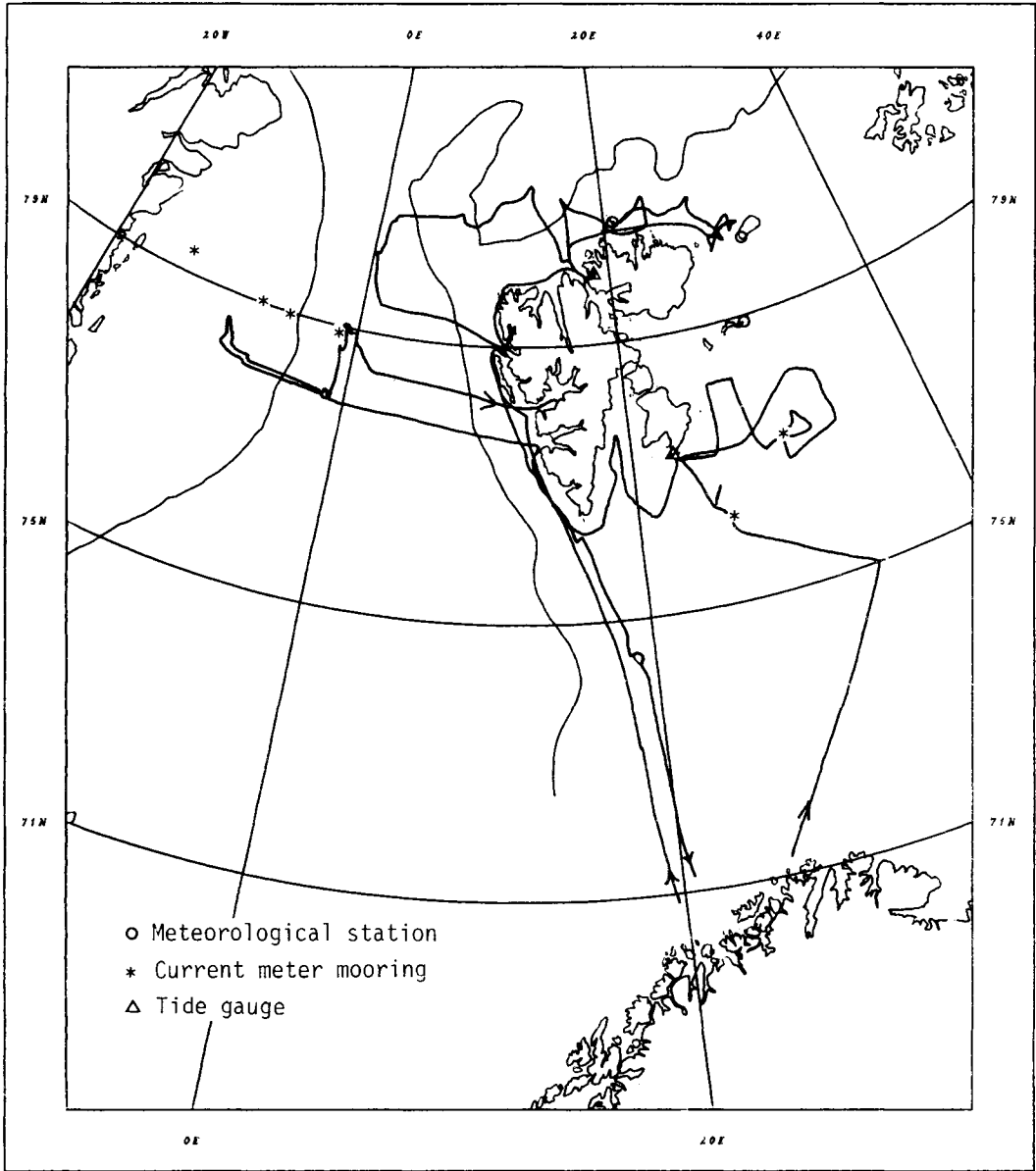


Fig. 1. Cruise tracks for the expedition vessel M/S LANCE in the summer of 1986.

and the 59th field season of the Norwegian Polar Research Institute in the Arctic. The exploratory programme included both marine cruises and terrestrial field investigations, with research projects within biology, geophysics, geology and geodesy/topography.

The main emphasis this year was on the biological and geophysical projects. In addition to

the scientific programme, the expedition was responsible for the annual maintenance of the navigation lights and beacons at Spitsbergen. Disregarding the continuous observations made at the Institute's research station in Ny-Ålesund, the field work started in February with studies of the reindeer population and ended in November with the deployment of current meters and an upward-

looking sonar under the ice in the Barents Sea. The most active field season, however, took place in the summer months July and August.

New in the expedition this year, were the externally funded projects under the programme for evaluation of environmental impacts of oil exploration and exploitation.

A total of 151 persons took part in the Institute's field programmes in the Svalbard area, of which 26 were from the Institute's staff, 39 were engaged professional personnel and field assistants, and 86 were scientists involved in cooperation projects. A number of other programmes were supported logistically and/or financially through the scholarship account (see page 36.)

A. Svalbard

1. Scientific cruises

Three scientific cruises were carried out with the expedition vessel R/V Lance in 1986, as a part of the Institute's field activities. A spring cruise in the Barents Sea was devoted to marine biology, while two cruises with emphasis on oceanography and sea-ice studies were performed in the Svalbard waters and in the Fram Strait in the summer.

The first cruise, lasting from 21 May to 10 June, was linked to the Norwegian research programme for marine arctic ecology, PRO MARE, and was one of the Institute's major contributions to this programme. PRO MARE is devoted specifically to the study of the ecosystems in the very productive ice-edge zone and in the ice-filled waters of the Barents Sea. A total of nineteen researchers participated on the cruise, representing ten different projects on flora and fauna near the ice edge, and in polynias, on seabirds, marine mammals, physical and chemical oceanography. The use of on-board helicopters provided a flexible operation in the ice-filled waters and extended the range of the sampling into the ice.

The two geophysical cruises were integral parts of the Institute's programmes on the study of the oceanography and sea-ice in the Barents Sea, the Fram Strait and the Polar Ocean. These programmes are primarily concerned with the climatological importance of the transport of water and the ice between the Polar Ocean and the

North Atlantic, and to the study of mixing processes and water mass transformations in connection with cooling, ice formation, and ice melt.

For the first time subsurface ice topography was measured in the Barents and Greenland Seas with a scanning sonar. Surface stereographic photos were also taken to get the relationship between bottom and top topography of the ice. Coded characteristics as well as thickness measurements were made on a routine basis.

Using the expedition ship as a base, incoming and outgoing solar radiation as well as the total radiation balance were measured over different types of surfaces: snow covered ice floes, melt ponds, and open water (leads).

The first geophysical cruise (17/7 – 13/8) concentrated on the Barents Sea. The basic NP programmes on physical oceanography and sea-ice were supplemented by radiation studies (NP), a substantial chemical oceanography programme in cooperation with the University of Gothenburg, and further sea-ice work together with the Mullard Space Centre, Cambridge, and SINTEF, Trondheim. A biological team from the University of Tromsø joined the cruise to continue the studies of the ice fauna which was started at the PRO MARE cruise.

Some land based activity was also included. A tide gauge at Kinnvika was recovered, and a temporary tide station established at Halvmaneøya. The automatic weather stations at Phippsøya, Kvitøya and Kong Karls Land were repaired or replaced. This work was done on behalf of the Norwegian Meteorological Institute.

The next geophysical cruise (13/8 – 22/8) jointly financed by the Institute and the University of Washington, Seattle, was primarily allocated to the recovery of moorings deployed by R/V Polarstern in 1985 in the ice covered part of the Fram Strait. This is part of a long term monitoring programme run by the Alfred-Wegener-Institut, the University of Washington, the University of Bergen, the University of Hamburg, and Norsk Polarinstitut (sea ice transport).

Due to the limited time available, only basic oceanography, sea ice and ice fauna programmes could be accommodated on an opportunity basis, in addition to the mooring work.

One of the Institute's biologists was invited by Havforskningsinstituttet, Bergen, to take part in a cruise in the Barents Sea in September, to do sea bird registrations in the open sea under the AKUP programme. He also participated on a

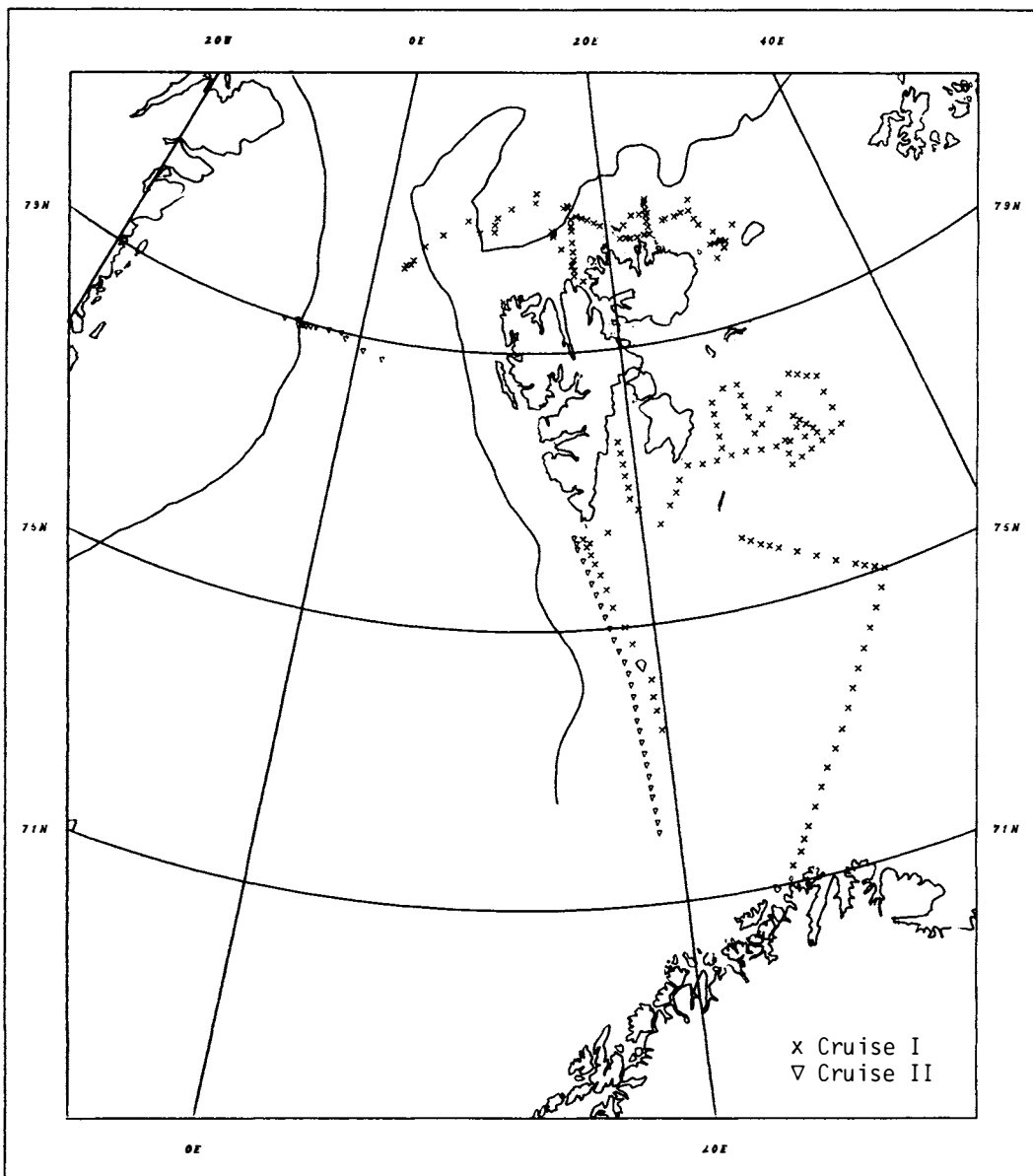


Fig. 2. CTD stations for the two geophysical cruises with M/S LANCE in the summer of 1986.

cruise with the Coast Guard vessel "Andenes" in August for the same purpose.

2. Field work on land

Geology – Three of the Institute's eight geologists carried out field work in Svalbard in the summer of 1986, collecting data for the geological map

series 1:100,000. Studies of the older folded and metamorphosed rock were continued at Prins Karls Forland. Studies of the younger sedimentary sequences were undertaken in the Nordfjorden area and eastern Nordenskiöld Land, the latter in cooperation with the Universities of Oslo and Tromsø.

Biology – The past few years' ornithological pro-

gramme in the Ny-Ålesund area was continued with, in particular, detailed studies of eider duck colonies and seabird energetics. The seabird investigations included laboratory studies at the Research Station in Ny-Ålesund, field work in Kongsfjorden, and research in cooperation with the Polish Research Station in Hornsund. Barnacle goose investigations were carried out on Forlandet and Daudmannsøyra, Spitsbergen, in cooperation with the Wildfowl Trust, England, and sea bird registration counts made on Bjørnøya under the AKUP programme. Reindeer population surveys, including tagging and loca-

lization telemetry, were conducted on Nordenskiöld Land and Brøggerhalvøya. The experimental reindeer harvesting programme was continued.

Geophysics – The long-term mass balance measurements of the Austre Brøggerbreen and Midre Lovénbreen glaciers near Ny-Ålesund were continued. Both glaciers had negative balances. The mean thinning, since the measurements started in 1966, over the whole ice surface of Austre Brøggerbreen is about 10 m, which is more than ten per cent of the total volume of the glacier.

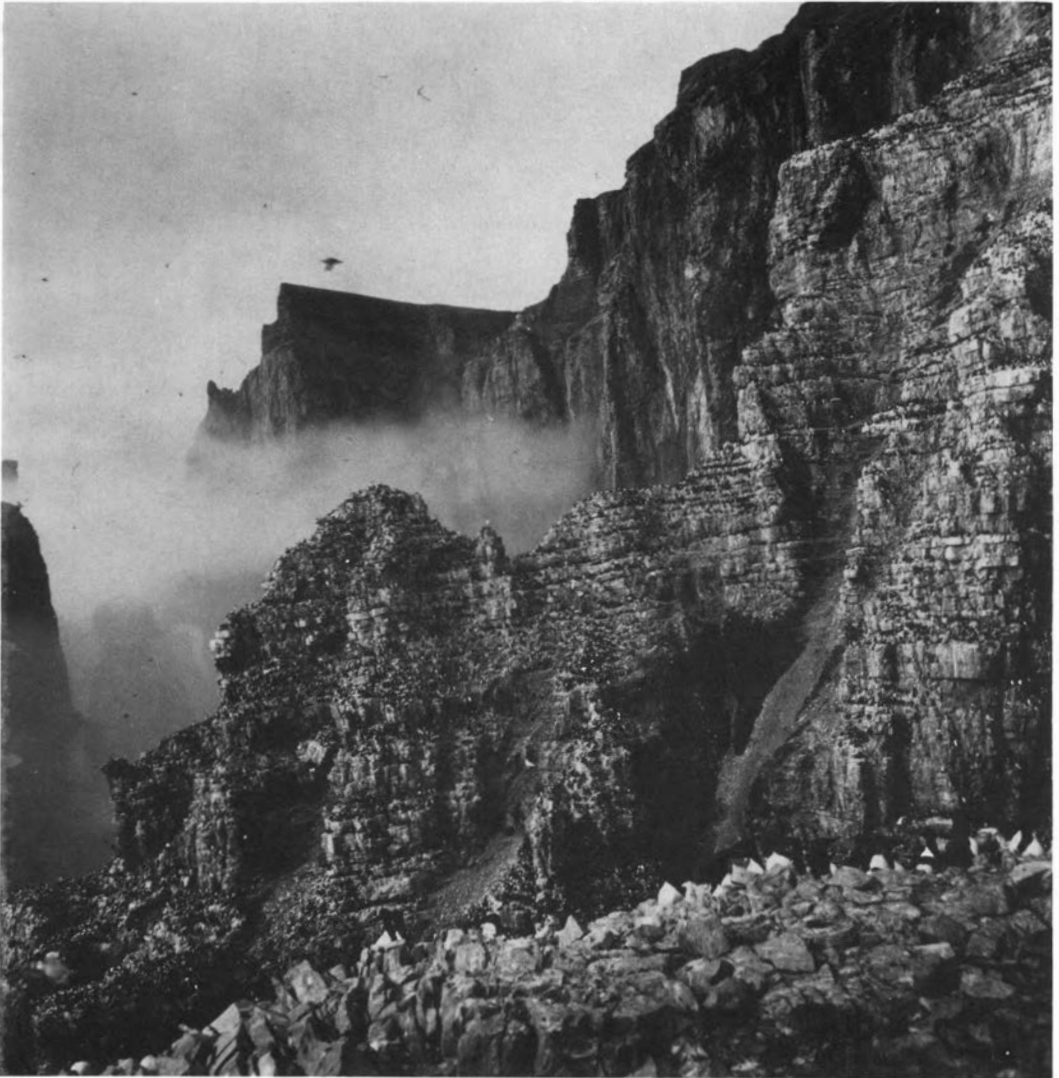


Fig. 3. The dramatic nature at the southern coast of Bjørnøya provides breeding sites for hundreds of thousands of Brünnichs guillemots (*Uria lomvia*). Photo: E. Soglo.

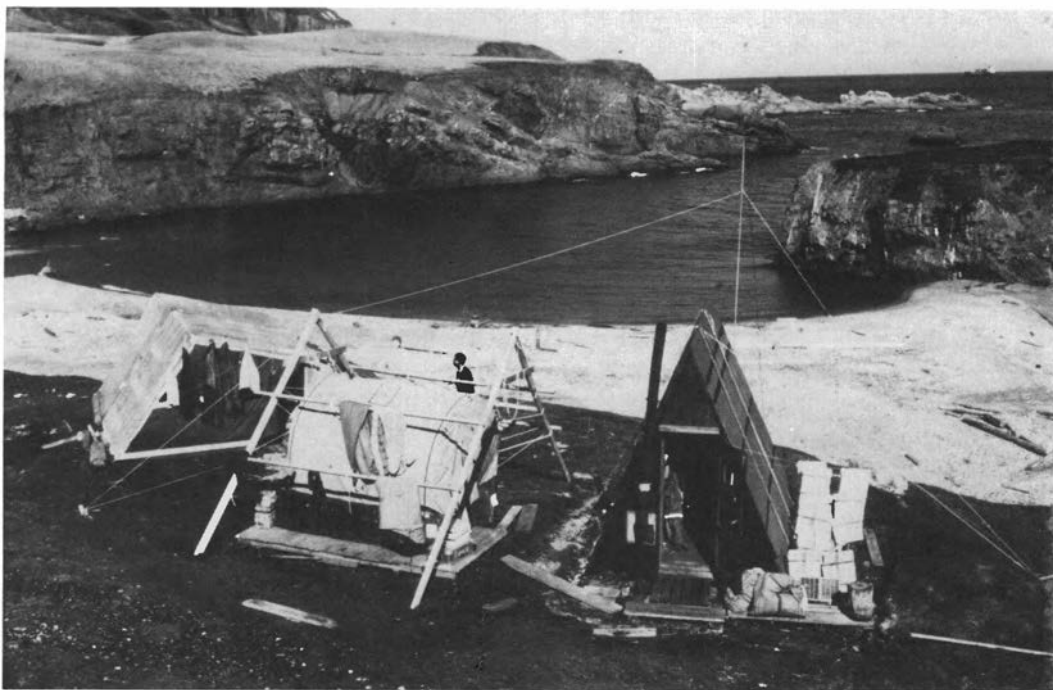


Fig. 4. The biologists' camp at Russehavna, Bjørnøya. Photo: E. Soglo.

Surge investigations were carried out on two small inland glaciers in Kjellstrømdalen and in Reindalen.

At the Research Station in Ny-Ålesund the recording of the main components of short-wave radiation continued, and the measuring instruments were calibrated during the summer season.

Geodesy/topography – The geodesist and one assistant did GPS-observations in Spitsbergen in cooperation with the Norwegian Mapping Authority. Two topographers with assistants did magnetic measurements in Spitsbergen to complete the magnetic survey programme started in 1985. Observations were also made in connection with the collection of the automatic tide gauges established in 1985 at Halvmåneøya and in Kinnvika, the latter having failed after forty days operation. The tide gauges in Longyearbyen and Ny-Ålesund received their necessary annual check.

B. Mainland Norway

Glaciology – Mass balance measurements of the Storbreen and Hardangerjøkulen glaciers in

mainland Norway were continued. This is a long-term project which for Storbreen involves the second largest series of its kind. The aim is to register any variation in volume of the glaciers and to relate these variations to climatic factors. Both Hardangerjøkulen and Storbreen had negative net balances in 1986.

Measurements of the length fluctuation of ten glaciers showed that eight had retreated. The measurements give an approximate estimation of the glaciers' mass balance averaged over a longer period.

C. Antarctica

The planning of the next regular Norwegian Antarctic expedition started early in 1986, and a scientific committee for the expedition was established jointly by the Institute and the Norwegian Research Council for Science and the Humanities. A first evaluation and selection of projects was made by the committee. It eventually became clear, however, that the expedition would not be funded in 1987.

At the same time, the Institute received the opportunity to organize an expedition to Peter I

Øy (69°S, 91°N). This small island which is one of the Norwegian claims in Antarctica, is only accessible during a few summer weeks due to heavy ice conditions. Very few visits have been made to the island, and it has never been properly mapped. M/S "Aurora", belonging to a private Norwegian Antarctic expedition, was hired for a period of 38 days, to leave from New Zealand in the middle of January, 1987. The short time available for the planning of the expedition and the shipment of its equipment to New Zealand, made the last months of the year a very hectic time for the expedition members. This was to be the first Norwegian expedition to Peter I Øy for about thirty years.

The main task of the expedition was to obtain satisfactory data to construct a topographic map of the island. This included GPS positioning, aerial photography, and establishment of a survey network. The expedition should also study krill, collect geologic and vegetation samples, and register bird and seal colonies.

Section reports

Biology

Norsk Polarinstitutt is responsible for management-oriented biological research in the Norwegian polar areas. The work of the biologists incorporates ecological mapping and population biology studies within the categories marine biology (excluding the Directorate of Fisheries' area of responsibility), ornithology, botany, and land mammals. The division has two tenured biologists. The two ornithologists contracted in 1985 continued their work for the Institute and under the Pro Mare marine ecology programme in 1986. All four biologists carried out field work in Svalbard.

Updating of the Institute's data base for fauna observations was done by a contracted zoologist. Studies of the Svalbard reindeer and the Svalbard ptarmigan were continued and behavioural ecology studies of the polar fox were initiated.

Geology

The geology division has eight geologists, six working with terrestrial geology and two with

studies of the Barents Sea. One technician is occupied with geological laboratory work. The following research fields are represented: older metamorphic and folded rocks (2), younger sedimentary sequences (3), quaternary geology (1), and marine geology (2). In addition to doing basic geologic research, the division concentrated its efforts towards the production of geological maps of Svalbard to various scales.

One geologist was engaged as research fellow for a period of three years from June 1986. One left the Institute in May, and the vacancy was not filled in 1986. Three geologists did field work in Svalbard in the summer months.

Work continued on the 1:100,000 map series of Svalbard and Sheet B10 G, Van Mijenfjorden, was published. The geological map of Svalbard and Jan Mayen to the scale of 1:1,000,000 to be included in the National Atlas of Norway published by the Geographical Survey of Norway, was printed for ordinary sale in the Institute's *Temakart* series.

Geological material collected in Svalbard, the Barents Sea, and Antarctica, was studied and results presented by members of the geological division in publications and lectures.

Geophysics

The Institute's five geophysicists are specialized in the areas meteorology (1), sea ice research (1), glaciology (2), and oceanography (1). One of the glaciologists is responsible for the planning and organization of the Institute's Antarctic research, and was occupied with preparations for the expedition to Peter I Øy during the last few months of the year. The other four geophysicists worked in and around Svalbard during the field season. The main activity of the geophysical division is long-term studies of different aspects of climatic conditions, with special emphasis on ice research.

The leader of the Geophysics Division through many years (Olav Liestøl) retired in 1986, to be replaced by Jon Ove Hagen as glaciologist. Torgny Vinje took over as leader of the division.

Meteorological observations from the automatic weather stations in Svalbard were collected on tape and prepared for climatological analysis. A discussion of the spectral composition of different phases of solar radiation was made ready for publication. Norsk Polarinstitutt, the

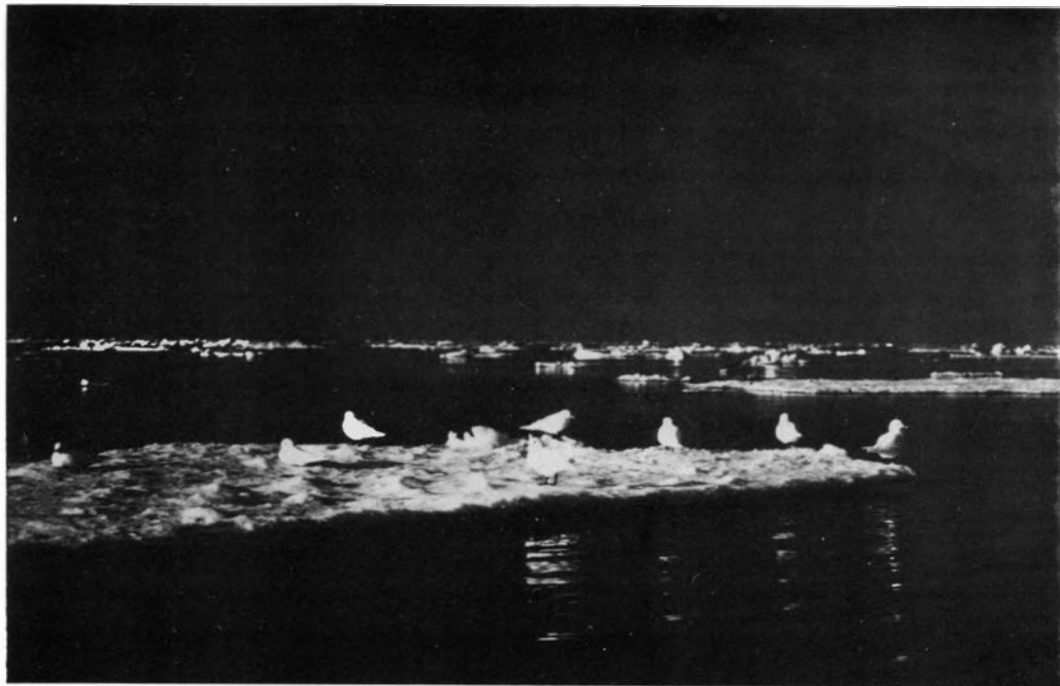


Fig. 5. Ivory gulls (Pagophila eburnea) in the drift ice south of Hopen island. Photo: E. Soglo.



Fig. 6. Bird cliff with guillemots at Kapp Kolthoff, Bjørnøya. Photo: E. Soglo.

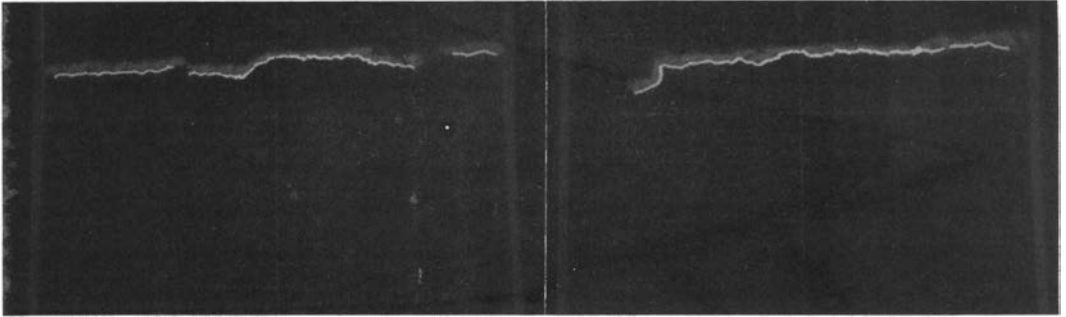


Fig. 7. Samples of bottom profiles of ice floes as obtained by the Mesotech 971 scanning sonar.

Norwegian Meteorological Institute, and the Polar Science Center, Seattle, continued cooperative investigations of the interaction of ice drift, wind and ocean currents in the Transpolar Ice Drift Stream, the Fram Strait, and the Greenland Sea. Three ice-drift stations were deployed near the North Pole.

Sea-ice investigations based on satellite imagery, automatic ice drift buoys, and measurements conducted from ships were continued. The sea ice programmes have increased in number under an OED project for analysis of the consequences of a possible oil spill in ice infested waters.

A comprehensive data base containing all sea ice as well as surface temperature observations

made during the last twenty years, is now under development. The work is performed under a contract with ESSO Norge A/S.

The processing of iceberg data from Antarctica, collected through an international programme led by the Institute, was continued. Information has now been collected on more than 70,000 icebergs. An automatic weather station was built to be established at Peter I Øy, Antarctica.

Geodesy/topography

Norsk Polarinstitutt is responsible for the land mapping of the Norwegian polar areas and for

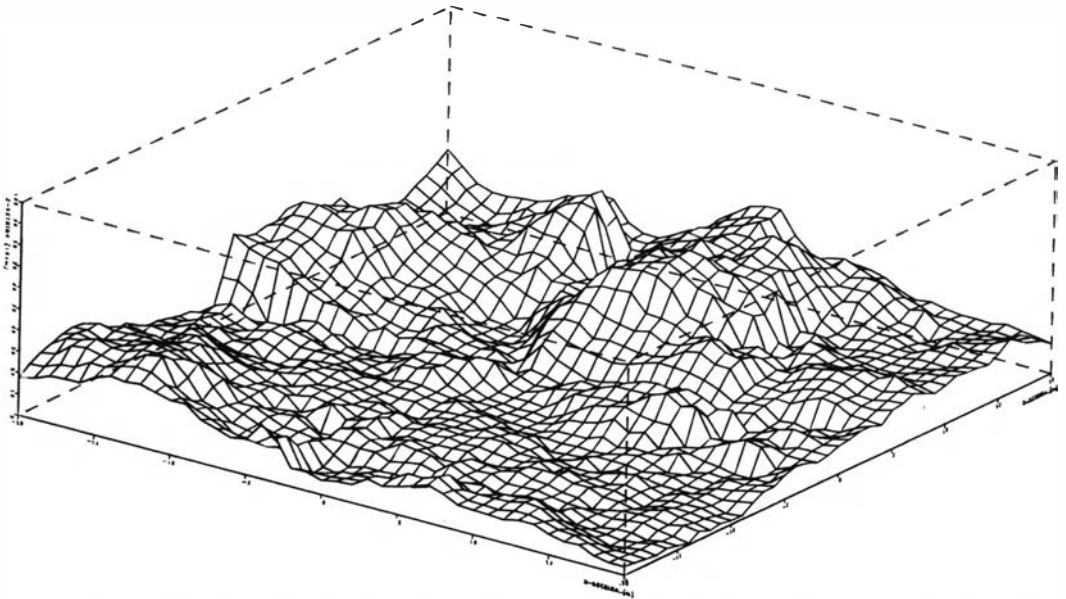


Fig. 8. Three-dimensional sketches of the bottom side of ice floes are made based on the scanning sonar results. This ice flow has been turned upside-down, to make it easier to see how much oil it will collect.

producing map series of these areas. Three topographers and a geodesist are employed in this work.

Together with the Norwegian Mapping Authority, the division started calculation of the doppler observations made on the NARE 1984/85 expedition. Triangulations made on the same expedition were partly calculated. A programme for the magnetism observations was prepared, and the list of light-house positions in Svalbard completed. One topographer and one geodesist were occupied during the last few months of the year with preparations for the mapping expedition to Peter I Øy, Antarctica, to leave Norway early in 1987.

The division edited two maps in the 1:500,000 and four in the 1:100,000 series in 1986. The following Svalbard maps were constructed: E6 Wilhelmøya, E12 Tusenøyane, E13 Håøya, F5 Vibebukta, F6 Bråsvellbreen, G3 Leighbreen, G4 Isispynnten, and G5 Isdomen. Two maps of areas in mainland Norway were constructed: Storbreen 1:10,000 (glacier map) and Herynken 1:2500 Lofoten. One map of Bouvetøya, Antarctica, to the scale of 1:20,000, was published.

Cartography

The cartographical division's main responsibilities are the technical preparation and production of all the Institute's topographical and thematic maps, and the administration of the final preparation for the map printing work which is done outside the Institute. Three cartographers and one illustrator are occupied with this as well as with illustrating work for the Institute's publications.

In addition to the publication of the maps listed under "Publications", the division has been concerned this year with the preparation or revision of fifteen topographic maps of Svalbard, thirteen in the main 1:100,000 series and two in the 1:500,000 series, and two geological maps of Svalbard and the western Barents Sea (of which C10G Braganzavågen is in the main series). The division is also undertaking work transferring the place-name card file to a computer data base.

Place-name Committee

The Place-name Committee works with the

assignment of geographical place names in the Norwegian polar areas. It approved eighty-five new names in 1986, mostly in connection with the main map series of Svalbard.

Computer section

The use of computers in research, administration, and publishing is continuously increasing, leading to new investment in a number of new computer facilities. There is also an increase of personal computers, used both to record data in the field, and as ordinary word processors in the office. This trend will probably continue in the years to come.

The coordination of the computer equipment used in the field and that used in the main office is important to make data processing more efficient. For example, the navigation of M/S Lance is now transferred as digital data and plotted in the cruise report.

Information/documentation

An information officer, a publications editor, a librarian, a translator, and a part-time assistant try to cover the multitude of documentation tasks resulting from the Institute's responsibility for the scientific research in the Norwegian polar areas. The continued interest in polar matters has been noticeable for all aspects of the division's work.

The Institute receives many requests for general information concerning the polar areas. The general day-to-day inquiries by letter or telephone are taken care of by the information officer, while individual Institute staff members contribute with scientific and popular lectures, articles and interviews for newspapers and magazines as well as material to and participation in radio and television programmes. The information officer, having worked on the committee of the special exhibition concerning Norwegian polar explorers for the World Fair EXPO-86, was present at the opening in Vancouver in May (see under Topicalities, page 23).

The first issue of an about 10-page newsletter in Norwegian, "Polarinform", was prepared in October and distributed to more than two hundred addresses in Scandinavia. The bulletin will focus on news from Norwegian polar areas, and

will appear four times a year. It seems to be of interest for the press as well as in circles with a special polar interest. Several statements to the press were released and a press conference arranged in connection with the opening of a special celebration of the 75-year anniversary of Roald Amundsen's expedition to the South Pole. The former and present directors of the Institute and its Antarctic leader contributed actively to the gala performance, which included a small exhibition jointly set up by the Information officer and the newspaper *Aftenposten*.

Several refereed series are published by the Institute, describing results of scientific and other activities in Norwegian polar regions. Manuscripts are received from scientists of Norwegian and foreign institutions, as well as from the Institute's own staff. Publications in 1986 are listed on page 25. NP exchanges its publications with those of other scientific institutions and libraries in 26 countries spread over five continents.

The library has a good selection of old and new material on polar subjects and is open to the public in office hours. In the course of the year 183 new titles were registered. The reprint collection now comprises approximately 6600 items. 488 loans were registered, including 75 to persons outside the Institute and 28 to other libraries.

The translator is mainly occupied with the translation from Russian to English of scientific literature of interest to the Institute's staff. A list of the translations carried out this year is to be found on page 28.

The information officer was granted one year's leave of absence as of 1 April 1986. An internal rearrangement was initiated, leaving room for one editorial assistant to be engaged on a temporary basis.

Logistics

1986 was a very busy year for the Logistics Department. After the furnishing of and installations in new localities at Fossum, half an hours drive from the Institute premises at Fornebu, were finalized, the moving of equipment took up most of the first four months of the year. The work involved with preparations for the summer expedition was less trying than usual, due to the more advantageous working conditions of the new premises.

The division has five permanent posts and a

number of occasional part-time helpers, but the personnel situation was still unstable in 1986 owing to illness and leave. Through the use of a rota system, the division always has an on-the-spot representative in charge of the equipment at the research station in Ny-Ålesund.

Navigation beacons

Norsk Polarinstitutt has, since 1933, had the practical responsibility for establishing and maintaining a network of navigation lights and beacons (including 42 signalling beacons) for ships and aircraft on Spitsbergen. Personnel from the logistics division are responsible for their annual inspection and service. Two navigational lights for aircraft were moved and a new light tried to be set up at Kapp Borthen. Due to unfavourable weather this could not be done, and the work has been delayed until the summer of 1987. General service of other lights and beacons was carried out.

Norsk Polarinstitutt's Svalbard office, Longyearbyen

The Institute has had a base for its Svalbard expeditions in Longyearbyen since 1977. The logistics division is responsible for the service function of this office, both for the Institute's own people and for other visiting scientists. The office is manned during the main field season on land which in 1986 stretched from June to September.

Norsk Polarinstitutt's Research Station, Ny-Ålesund

The Research Station in Ny-Ålesund was established in 1968 and is one of the most northerly land stations in the world. It serves as an observatory, a laboratory, and a field base and is available all year round for Norwegian scientists and others working with arctic problems in cooperation with Norwegian scientific institutions. The station's function of observatory provides the most important part of the activity there, with a considerable recording of mainly geophysical data.

The permanent scientific registration programmes of the Research Station in Ny-Ålesund,



Fig. 9. Interior from the logistics department's new premises at Fossum.



Fig. 10. The Institute's Svalbard office is located in this building at the airport in Longyearbyen.

was in operation throughout 1986. The following phenomena are recorded continually or observed during longer periods of the year.

Components of the radiation energy budget	- Norsk Polarinstittutt
Tide measurement	- Norsk Polarinstittutt
Mass balance of glaciers	- Norsk Polarinstittutt
Atmospheric pollution	- Norsk Institutt for Luftforskning
Meteorological conditions	- Det norske meteorologiske institutt
Seismic disturbances	- University of Bergen
The Earth's magnetic field	- Universities of Tromsø and Oslo
Ionospheric activity, including aurora	- Universities of Tromsø and Oslo

During the course of 1986, 67 visiting scientists stayed at the station for a total of 1380 visitor days. Not included in this number are more randomly visiting researchers, stopping over in Ny-Ålesund on their way to field work elsewhere in Svalbard.

Visits are unfortunately not evenly spread throughout the year; more than 60% of all visits to Ny-Ålesund take place in the period 15 June to 15 August. During the remaining ten months of the year, there is ample room for visitors, particularly in October-November. July is the busiest month, partly due to the many courses being arranged in Ny-Ålesund at that time of the year. 69.7% of all visits are concerned with biological projects, 22.25% with geophysics, and 6.6% with geological work.

Last year's research fellow, working with the ecology and population dynamics of the Svalbard Ptarmigan, left the Institute in 1986. He was replaced by a biologist working on the behavioural ecology of the Arctic Fox in Svalbard, dividing his time between the Research Station and the biology division at the main office of Norsk Polarinstittutt.

Scientific Projects in 1986

Biology:

Ecological polar bear studies	Thor Larsen
Fauna data base	Fridtjof Mehlum
Seabird studies in the Svalbard area (including the <i>Pro Mare</i> project: Seabird ecology in the Arctic)	Geir W. Gabrielsen
Seabird studies in the Barents Sea (impact studies in connection with petroleum activity)	Vidar Bakken
Reindeer studies in Svalbard	Nils A. Øritsland
Environmental studies in Svalbard in connection with petroleum activity	Nils A. Øritsland
	Pål Prestrud
Rabies and population dynamics of the arctic fox in Svalbard	Pål Prestrud
Behaviour and social biology of the arctic fox in Svalbard	Karl Frafjord

Geology

Regional geological investigations in Svalbard	Audun Hjelle
	Yoshihide Ohta
	Otto Salvigsen
	Thore S. Winsnes
	Hilde Keilen
Correlation of older complexes	Audun Hjelle
	Yoshihide Ohta
	Thore S. Winsnes
Dating of older metamorphic rocks	Yoshihide Ohta
Glaciation and deglaciation of Svalbard	Otto Salvigsen
Investigation of unconsolidated sea floor in the Barents Sea	Anders Elverhøi
	Anders Solheim
Studies of upper bedrock geology (subcrop) in the Barents Sea	Anders Elverhøi
	Anders Solheim



Fig. 11. The Institute's Research Station in Ny-Ålesund has a well equipped instrument rack.

Study of the Devonian sequences of Svalbard

Regional investigations in Dronning Maud Land, Antarctica

Sea-floor investigations in Antarctica

Tore Gjelsvik
Hilde Keilen
Yoshihide Ohta
Anders Elverhøi
Anders Solheim
Hilde Keilen

Geophysics

Mass balance studies of the glaciers Storbreen and Hardangerjøkulen

Mass balance studies of glaciers in Svalbard

Length measurements of glaciers in Norway

Surge investigations in Svalbard

Climatological description of the Svalbard area

Radiation measurements in Ny-Ålesund

Arctic Ocean Buoy Programme

Sea ice studies in areas around Svalbard

Absorption and drift of oil spill in the Barents Sea ice fields

Oceanography of sea areas around Svalbard

Oceanographic conditions and mixing processes in the Arctic Seas and water mass exchanges between the North Atlantic and the Polar Ocean

Studies of tabular icebergs in Antarctica

Olav Liestøl/
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Topicalities

Environmental impact analyses

Many oil companies evidenced a new interest in searching for hydrocarbons in Svalbard in 1985. At the same time the Ministry of Oil and Energy signalled their plans to open up the Barents Sea northwards to Bjørnøya for petroleum activity in 1990. This made the need for environmental impact studies in the Norwegian Arctic of more immediate importance.

The Ministry of Oil and Energy started a programme for Environmental Impact Analyses in the Barents Sea in 1985/86. Norsk Polarinstitutt took part in 1986 with two projects. One involves a survey of sea bird colonies on Bjørnøya and the southern part of Spitsbergen and Edgeøya, and of the distribution of sea birds in open water. The other will focus upon the sea ice distribution and the underside shape of the ice cover in the Barents Sea. A literature study on the problem of "oil in the Barents Sea" will also be made under this project. Both projects will continue in 1987.

As the responsible authority for impact analyses in Svalbard, the Ministry of the Environment will direct all oil companies planning to take up petroleum activities in the Svalbard area, to make environmental investigations before such activity is started. Norsk Polarinstitutt has been given the task of coordinating these investigations, and has worked out a programme called "Environmental studies in Svalbard" (MUPS). In 1986, British Petroleum, Statoil, the Arctic Development Corporation, and SNSK/Hydro paid for studies on Svalbard reindeer, polar bears, ringed seals, and on vegetation in connection with their seismic investigations in Svalbard. In cooperation with several oil companies, the Institute is working out an "analysis system for the environment and industrial development in Svalbard". A verbal version of the system which is patterned after the Canadian BEMP programme (Beaufort Sea Environment Monitoring Project) will be completed in 1987.



Fig. 12. Seismic shooting in connection with oil activities in Svalbard. Photo: R. Hansson.



Fig. 13. Tracks in the ground made in connection with industrial activities remain visible for many years in Svalbard.

Marine geology

Norsk Polarinstitutt's responsibilities include research and mapping of the sea floor and shallow geology of Norwegian polar offshore regions. The work is presently concentrated to the Barents Sea, north of 74°N, and on the Weddell Sea shelf and upper slope. Data background is mainly high frequency acoustic records and shallow cores, but some studies also cover sediments in the water column and in sea ice. In addition to the two permanent staff members, the group for marine geology consisted in 1986 of one full-time assistant, two part-time assistants on externally funded projects (Statoil and NAVF), and five graduate students from the universities of Oslo and Bergen.

The group's main interest is in the Quaternary sediments and glacial history of the Barents Sea and Weddell Sea continental shelves, and long-term projects within these scopes have been continued. The entire shallow seismic data base (28,000 kilometres sparker lines) combined with surface samples are used to map structures, age, and lithology of the upper bedrock (subcrop) geology of the northern Barents Sea. The same seismic data have also been used to map indications of shallow gas in the northern Barents Sea (completed). Modern glacial marine sedimentary environments are studied in an extensive data set from surging glaciers on Nordaustlandet. Material from sea ice cores are studied for a quantitative and qualitative analysis of sediment transport with sea ice through the Fram Strait.

No marine geological field activity was carried out in 1986, but one of the group's geologists took part in terrestrial field work on Spitsbergen in an upper bedrock geology programme.

International cooperation

Norsk Polarinstitutt is Norway's central institution for research in Norwegian polar areas. Scientists from other countries will usually contact the Institute for scientific and practical information before

starting their work in Norwegian polar regions. They are often also looking for cooperative partners. Polar science is represented at all the Norwegian universities as well as at some other scientific institutions. Researchers from the Institute as well as from other Norwegian institutions are therefore often involved in cooperative projects on polar science.

Norsk Polarinstitutt's research station in Ny-Ålesund is also open for foreigners cooperating with Norwegian scientists. In 1986 the Institute participated in such projects within the fields of biology, geology, and certain aspects of geophysics with scientists from France, Poland, Sweden, the Federal Republic of Germany, the United States, Japan, and the United Kingdom.

Bilateral cooperation

The Institute is involved in international cooperation either in direct scientific project work or as coordinator and initiator.

The following possibilities were explored in 1986:

France: – A letter of intent between the Institute and CNRS (Centre National de la Recherche Scientifique) was signed several years ago. Four cooperative projects were agreed upon in 1985 within the fields of glaciology, geology, upper atmosphere physics, and remote sensing. The director visited most of the French institutions and laboratories dealing with or interested in Arctic research, on a one-week visit to France in the autumn of 1986.

Poland: – An agreement between Norsk Polarinstitutt and the Institute of Geophysics, Polish Academy of Sciences, was signed in May 1985 on ecological, environmental, and geodynamic studies at the Polish Station in Hornsund. Interested scientists from both countries may contact these institutions for further information.

Norsk Polarinstitutt has had cooperative projects with Polish scientists in the Hornsund area under this agreement as well as others elsewhere in Svalbard.

United Kingdom – The Institute has cooperated with British scientists in Svalbard for many years. When the United Kingdom in 1986 established a “Polar Sciences Committee” under its Natural Environment Research Council, the director of Norsk Polarinstitutt as the only foreigner, was asked and accepted to join. The committee will advise on and sort out cooperative needs between the two countries.

The Federal Republic of Germany – The Institute has a general agreement with the Alfred Wegener Institut für Polar und Meeresforschung for practical and logistic cooperation. Individual scientific projects will be agreed upon in each case. The former director of Norsk Polarinstitutt, Dr. Tore Gjelsvik, has been a member of the board of Alfred Wegeners Institut from its very start.

USSR: – Discussions on polar research cooperation between Norway and the USSR were started in 1985. A delegation from the USSR visited Oslo early in 1986 to continue the talks. Several projects have been discussed in meetings between scientists from both countries. Of special interest are projects of mutual value, such as the estimation of populations of animals, the study of the sea ice and the oceanography of the Barents Sea, etc. An agreement was supposed to be signed at the end of the year, but this had to be postponed until the first half of 1987 for practical reasons.

A “SCAR” for the Arctic

At the XIX SCAR-meeting (Scientific Committee on Antarctic Research), the President, Dr. J. Zumberger, USA, invited representatives of those nations present which had scientific projects in the

Arctic, to an informal meeting to discuss possibilities for international cooperation within Arctic research.

Several suggestions came up of how to establish an organization or committee for this purpose, among them "A SCAR for the Arctic". The idea has been launched before, but without success so far. This time, however, realizing that the Arctic is politically very different from Antarctica, it was agreed that representatives from the circumpolar Arctic nations should first discuss and possibly agree on terms of reference for such an organization before any further steps be taken. Such a meeting between representatives from the Arctic nations will be arranged by Norsk Polarinstitut early in 1987.

Nordic consultations

A close contact between polar scientists and polar institutions in the Nordic countries has existed for many years, facilitated by the similarity of language, cultural background, and geographical location. Many special Nordic conferences have been held through the years.

Informal meetings between ministerial representatives from the Nordic countries started in 1986. The director of Norsk Polarinstitut joined the Norwegian delegation as advisor.

A proposal for more formalized Nordic cooperation in polar research was put forward by a group of politicians. The proposal was circulated for comments to the countries involved in 1986, and is likely to be discussed in the Council in 1987.

"Great Norwegian Explorers" exhibition

In addition to its national contribution to the World Fair, EXPO 86, Norway was invited to present a special exhibition concerning its famous explorers through the ages. Under the leadership of Norway's Foreign Office and the Export Council, the exhibition crystallized as a presentation of the Viking discovery of North America, the sea voyages of Thor Heyerdahl, and a polar section focusing especially on Fridtjof Nansen, Otto Sverdrup, and Roald Amundsen. It was raised under the title of "Great Norwegian Explorers".

The information officer of Norsk Polarinstitut was asked to set up the polar section of the exhibition. In addition to original photographs and objects, it included a scale model of Nansen's ship "FRAM" in the ice, and a full-size model of Roald Amundsen with his dog-sledge on his expedition to the South Pole. Commissioned paintings by the Norwegian artist Karl Erik Harr were copied and enlarged to form the background scenery.

The World Fair was on from May to October in Vancouver, Canada. After its closure, the "Great Norwegian Explorers" exhibition was moved to New York for further exhibiting.

Data bases for the Norwegian polar areas

The following data bases have been established within different fields of research, with various stages of progress since 1985 (name of responsible person in parentheses):

Fauna data base (Fridtjof Mehlum)

Bathymetric data base for the Barents Sea (Anders Solheim)

Bibliographic data base (Reidunn Lund)

Data base for icebergs in the Southern Ocean (Olav Orheim)

Data base for geological samples from the Arctic region (Hilde B. Keilen)

Geology data base (Audun Hjelle)

Place-name data base (Bjørn Arnesen)
Sea-ice observations, Arctic (Torgny Vinje)
Sea-ice distribution between Greenland and Novaja Zemlja (Torgny Vinje)
'Ice drift Experiment' (ICEX) buoy data (Torgny Vinje)
Historical sea-ice observations (Torgny Vinje)
Tabular iceberg drifts, Antarctica (Torgny Vinje)
Radiation data (Vidar Hisdal/Torgny Vinje)
Meteorological observations, Antarctica (Vidar Hisdal)

Data base for glaciers in Svalbard (Jon Ove Hagen) – All kinds of accessible data on glaciers in Svalbard collected for a Glacier Atlas of Svalbard have now been stored in this new data base. All glaciers are registered by name, geographical locality, area, depth and volume (where registered), and morphological data on surge.

Published in 1986

Several series are published by the Institute. The journal *Polar Research* contains original scientific papers in English and appears in two-three issues per year. The *Skrifter* series is for monographs in English, French or German, while *Meddelelser* is a series for articles of a more popular character. *Polarhåndbok* has so far appeared in two issues, on the flora and geography of Svalbard. *Årbok* has been published annually since 1960. The *Temakart* series (Thematic maps) was started in 1985, one new issue appearing in 1986.

Norsk Polarinstitutt's publications and translations may be ordered from bookstores or directly from the Institute.

Publications

Polar Research

This journal, started in 1982, is now well established. It is exchanged with the scientific literature of about 250 institutions around the world. Two issues appeared in 1986:

Volume 4 n.s., No. 1

- Mann, D. H., Sletten, R. S. & Ugolini, F.C.: Soil development at Kongsfjorden, Spitsbergen
Armstrong, Howard A., Nakrem, H. A. & Ohta, Yoshihide: Ordovician conodonts from the Bulltinden Formation, Motalafjella, central-western Spitsbergen
Dowdeswell, Julian A.: Remote sensing of ice cap outlet glacier fluctuations on Nordaustlandet, Svalbard
Haftorn, Svein: A quantitative analysis of the behaviour of the Chinstrap penguin *Pygoscelis antarctica* and Macaroni penguin *Eudyptes Chrysolophus* on Bouvetøya during late incubation and early nestling periods
Engblom, Eva, Lingdell, Per-Erik, Marvanová, Ludmila & Müller-Haeckel, Agnes: Foam spora in running waters of southern Greenland
Gjertz, Ian & Lydersen, Christian: The ringed seal (*Phoca hispida*) spring diet in northwestern Spitsbergen, Svalbard
Lydersen, Christian & Gjertz, Ian: Studies of the ringed seal (*Phoca hispida* Schreber 1775) in its breeding habitat in Kongsfjorden, Svalbard
Gjertz, Ian & Lydersen, Christian: Polar bear predation on ringed seals in the fast-ice of Hornsund, Svalbard
Skye, Erik: Observations on the vegetation and vascular plants of Hopen
Wołowicz, Maciej & Szaniawska, Anna: Calorific value, lipid content and radioactivity of common species from Hornsund, southwest Spitsbergen
Szaniawska, Anna & Wołowicz, Maciej: Changes in the energy content of common species from Hornsund, southwest Spitsbergen

Research Notes:

- Solheim, Anders: Submarine evidence of glacier surges
Liestøl, Olav: Glaciological investigations in the balance year 1983-84

NOK 80.-

- Manum, S. B. & Throndsen, T.: Age of Tertiary formation on Spitsbergen
Rudels, B.: The θ -S relations in the northern seas: implications for the deep circulation
Rudels, B.: The outflow of polar water through the Arctic Archipelago and the oceanographic conditions in Baffin Bay
Steen, J. B. & Gabrielsen, G. W.: Thermogenesis in newly hatched Eider (*Somateria mollissima*) and Long-tailed Duck (*Clangula hyemalis*) ducklings and Barnacle Goose (*Branta leucopsis*) goslings
Klekowski, R. Z. & Opaliński, K. W.: Matter and energy flow in Spitsbergen ornithogenic tundra
Strømme, J. A., Ngari, J. W. & Zachariassen, K. E.: Physiological adaptations in Coleoptera in Spitsbergen
Engelskjøn, T.: Botany of two Antarctic mountain ranges: Gjelsvikfjella and Mühlig-Hofmannfjella, Dronning Maud Land. I. General ecology and development of the Antarctic cold desert cryptogam formation
Sømme, L.: New records of terrestrial arthropods from Dronning Maud Land, Antarctica

Research Note:

Sømme, L.: Terrestrial arthropods of Bouvetøya

Errata

NOK 80.-

Norsk Polarinstitutt Skrifter

No. 184 – Larsen, Thor: Population biology of the polar bear (*Ursus maritimus*) in the Svalbard area.

This paper is included in the author's Dr. Philos thesis, delivered at the University of Oslo in May 1985. It is based on various aspects of the population of polar bears in Svalbard between 1966 and 1983: composition, migration, distribution, discreteness, range, size and trends, and biological parameters. Data from 1966-70, before implementation of total protection of the polar bear in 1973, and 1976-83 are compared.

NOK 50.-

No. 185 – Botany of Bouvetøya, South Atlantic Ocean, I. Cryptogamic taxonomy and phytogeography.

This volume is the first comprehensive contribution of the Norwegian Antarctic Research Expeditions on the flora of the isolated, maritime Antarctic island Bouvetøya. The island became a nature sanctuary by ruling of Norwegian authorities in 1971. The publication contains articles by B. Graham Bell & Hans H. Blom, Per Magnus Jørgensen, Dag Olav Øvstedal, Trond Schumacher, Dag Klaveness & Jan Ruesness, and Torstein Engelskjøn, the latter having collected the articles and acted as co-editor.

NOK 70.-

No. 186 – Vinje, T. & Finnekåsa, Ø.: The ice transport through the Fram Strait.

This 37-page paper discusses the characteristic features of the ice transport through the Fram Strait, based on surface observations, satellite information, and 52 ice drift tracks.

NOK 50.-

No. 187 – Glaciological research on Riiser-Larsenisen and nearby ice-shelves in Antarctica.

Most of the results from glaciological studies conducted on Norwegian Antarctic expeditions in 1968/69, 1976/77, and 1978/79 are reported in three articles which discuss ice thicknesses, flow rates and other flow phenomena, accumulation rates and the mass balance of the ice shelf, snow temperatures, and results of various isotopic studies.

NOK 60.-

Årbok 1985

In addition to being the annual report of the Norwegian Polar Research Institute, this yearbook contains an article on the still active volcano at Jan Mayen. It is distributed free of charge.

Norsk Polarinstitutt Temakart

Introduced in 1985, this series saw one new publication in 1986:

No. 2 – A. Hjelle, Ø. Lauritzen, O. Salvigsen & T. S. Winsnes: Geological map Svalbard 1: 100,000. Sheet B10G Van Mijenfjorden.

NOK 100.-

Research in Svalbard 1986

This is a yearly bulletin which gives information on the scientific work planned to take place in Svalbard during the coming season. It is based on data collected by Norsk Polarinstitutt and is distributed to all contributors before the beginning of the season each year.

Norsk Polarinstitutt Report Series

The following seven papers appeared in the Report Series in 1985, which is published for limited distribution. The reports are not for sale, except for No. 31 which may be ordered from the Institute at a price of Kr. 35.-. The others may be obtained directly from the authors.

No. 27 – Prestrud, Pål: Åpning av Barentshavet Syd for petroleumsvirksomhet. Forslag til konsekvensanalyser i de arktiske områder.

No. 28 – Vinje, Torgny & Finnekåsa, Øyvind: Norwegian ice drift experiment buoy drift data 1976-79.

No. 29 – Mehlum, Fridtjof: Rapport fra Norsk Polarinstitutts Pro Mare tokt med "Lance", Barentshavet 21/5-10/6, 1986.

No. 30 – Engelskjøn, Torstein: Zonality of climate and plant distribution in some Arctic and Antarctic regions.

No. 31 – Hartmann, Aagot: Barentshavets geologi og Svalbards kvartærgeologi – en bibliografi.

NOK 35.-

No. 32 – Rudels, Bert: Estimating the exchanges through the Fram Strait by classical methods: hydrography TS-analysis and minimizing techniques.

No. 33 – Rudels, Bert: Cruises with R/V Lance to the Barents Sea and the Fram Strait summer 1986.

Polarinform

This is a new information bulletin giving short notes on general news topics from the polar areas, which will be issued four times a year. It appeared for the first time in November 1986 and will be distributed free of charge to those interested.

Maps and charts

Bouvetøya 1: 20,000

Translations of literature carried out at Norsk Polarinstitut in 1986:

Biology

Mišin, I. P. 1954: Contamination of Reindeer of the island of Sachalin by the nose gadfly depending upon the development of vibrissae. *Zoologičeskij Žurnal*, XXXIII, 1: 162-165. 1 figure, 3 tables. – Translated (4 pp.), June 1986.

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Geophysics

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- Markussen, N. H. & Øritsland, N. A. 1986: Metabolic depression and heat balance in starving Wistar rats. *Comp. Biochem. Physiol.* 84A(4), 771-776.
- Cuyler, L. C. & Øritsland, N. A. 1986: Seasonal variations and responses to normal activity of the deep body temperature in the Svalbard reindeer. *Rangifer, Spec. issue, No. 1*, 81-85.
- Rogne, O. & Barr, S. 1986: Norske polarmuseer – historisk materiale for norske polarekspedisjoner og -områder. *Framhuset 1936-1986, Jubileumsskrift*, 64-68.
- Rudels, B. 1986: An attempt to estimate the deep water production from molecular effects. *ICES Hydrography Committee CM 1986/C:35*. 15 pp.

Meetings, courses and teaching

Institute staff attended meetings and short courses in Norway, Finland, France, the United States, Canada, the Federal Republic of Germany, Poland, Spain, the Soviet Union, Denmark, Australia, Iceland, and Sweden.

The following have held regular lectures and tuition at the University of Oslo:

Liestøl, Olav: Glaciology

Øritsland, Nils Are: Biology

Elverhøi, Anders: Geology

and at the University of Bergen:

Orheim, Olav: Glaciology

Elverhøi, Anders: Geology

Lectures and conference contributions

Eiken, Trond: XVIII International Congress of Surveyors, Toronto, Canada. 1-11 June.

– Det 10. Nordiske Geodetmøtet, Helsinki, Finland. 29 September - 3 October.

Elverhøi, Anders: *Norsk Polarinstituttets geofysiske/geologiske virksomhet*. Oljedirektoratets årlige informasjonsmøte, 10-11 February.

– *Shallow geology and geophysics of the Northern and Central Barents Sea*. Institutt for geologi, 26 May.

Frafjord, Karl: *Fjellrevforskning i Norge; historikk og dagens prosjekter*. Rovdyrseminar Økoforsk, Trondheim, 4 November.

Gabrielsen, G. W.: *Sjøfugløkologi*. Pro Mare meeting in Bergen and Svalbardkurset, February and July.

– *Seabird energetic*. Department of Arctic Biology, University of Tromsø. March.

– *The Pro Mare project*. Polish Polar Club, Arctic Symposium, Gdansk, Poland. April.

– *Bruk av data teknologi i biologisk forskning*. Mycron conference, Geilo. April.

– *Effekt av menneskelige forstyrrelser på fugler og pattedyr*. Svalbardkurset. July.

– *Passiv frykt en mulig årsak til plutselig uventet spebarnsdød*. Conference on the sudden infant death syndrome, Soria Moria, Oslo. September.

Holtet, Jan A.: *Miljøkonsekvenser av oljeutvinning i nordområdene*. Norsk Journalisthøgskole. May.

– *Norsk Polarinstitutt – forskning og annen virksomhet*. Svalbardkurset 1986. July.

– *Forskning i Ny-Ålesund*. NIF/SINTEF Studieseminar Nord-86. July 1986.

– *Norsk Polarinstituttets Svalbard-forskning*. NAVF/UNIT's Svalbard-seminar, November.

Ohta, Y.: *Geology of Gjelsvikfjella and western Mühlig-Hofmannfjella*. University of Bergen, 29-31 January.

– *Present stage of NP's geological research in Svalbard*. Workshop on Svalbard research, Omaha, Nebraska, USA, 6-9 March.

– *Polyphase Caledonian orogeny in Svalbard and their correlation to Ellesmere Island*. University of Georgia, USA, 10-15 March.

– *Two-fold Caledonian history of Svalbard*. 14th International Polartagung, Alfred Wegeners Institut für Polarforschung, 6-10 April.

– *Caledonian tectonics in the Arctic and Norwegian activities in the Arctic and the Antarctic*. University of Hamburg, 11-16 April.

– *Two orogenic phases in the Svalbard Caledonian*. 17th Nordic Geology Meeting, Helsinki, Finland, 12-15 May.

– *Caledonids in Svalbard*. University of Paris, 23-25 May.

– *Caledonian tectonics in the Arctic*. University of Rennes, France, September.

- *Ordovician-Silurian restoration of Svalbard and Ellesmere Island*. 4th Annual Meeting of Tectonic and Structural Geology Study Group, 28 November.
- Orheim, Olav: *Norge i Antarktis*. Svenska Vetenskapsakademi, 16 January.
- *Norway in Antarctica: Science and policy*. Fulbright Alumni Association of Norway, 19 March.
- *Glaciological research on NARE 1984/85*. 2nd International Workshop of the “Filchner Ronne Ice Shelf Programme”, 4 June.
- *Logistic experiences using K/V Andenes in the Antarctic*. SCAR Working Group for Logistics, 19 June.
- 1. *Evolution of under-water sides of ice shelves and icebergs*,
2. *Snow and ice studies by Thematic Mapper and Multispectral Scanner Landsat images*. 3. *Icebergs in the Southern Ocean*. Symposium on Remote Sensing in Glaciology, Cambridge, 8-12 September.
- *Norsk forskning i Antarktis – før og nå*. Gala performance in connection with 75th anniversary of Roald Amundsens travel to the South Pole, 17 December.
- Rogne, Odd: *A survey of Norwegian polar research*. The XIIIth Polish Polar Symposium, Gdansk, Poland, 23 March.
- *Amundsen-Ellsworth-Nobile Transpolar Flight. Background and historical survey and Amundsen-Ellsworth-Nobile Transpolar Flight. Polar explorations as initiator of polar research*. 60th Anniversary of Amundsen-Ellsworth-Nobile Transpolar Flight commemorated in Vadsø, 6 May.
- Rudels, Bert: *Estimating the exchanges through the Fram Strait by classical methods*. Workshop on the exchange processes in the Fram Strait, Hamburg, 24-28 February.
- *Blandningsprosesser, hydrografi och massetransporter i havet*. Nordisk havisforsker møte, Strømmen, 17-19 March.
- *Polar oceanografi*. University of Oslo, March.
- *An attempt to estimate the deep water production from molecular effects*. ICES Statuary Meeting, Copenhagen, 9-11 October.
- *The formation of polar surface water and the exchanges through the Fram Strait*. Work Shop on the Fram Strait, Seattle, USA, 18-20 November.
- Salvigsen, Otto: *The geological history of Svalbard in the Pleistocene and Holocene*. University of Tallin, Estonia.
- Solheim, A. & Elverhøi, A.: *Norske marin-geologiske studier i Weddellhavet, Antarktis, med hovedvekt på sokkelens glasiiale historie*. 17th Nordic Geology Meeting, Helsinki, 12-15 May.
- Solheim, A.: *The Norwegian Polar Research Institute's activities in the Arctic and Bedrock geology, sediment cover and sea floor morphology of the Barents Sea shelf*. Marine geology of the Arctic shelves and slopes: dynamics and processes, Woods Hole Oceanographic Institution, 2-4 December.
- Vinje, Torgny: *Isdrift og isdannelse i Polhavet og Barentshavet*. Marine geologic course at University of Oslo, 5-6 March.
- *Om istransporten gjennom Framstredet and Om isdynamikk og istransport*. Syvende nordiske havisforsker møte, Oslo, 17-19 March.

Institute staff

In 1986 the Institute had 42½ permanent and 4½ temporary positions, a total of 47. A number of persons were contracted on specified projects for shorter or longer periods of time.

Administration:

Director	Odd Rogne
Research Director	Jan A. Holtet

Office administration:

Office Manager	Reidar Lund (until 30.9) Otto Gerhard Vaagen
Accounts	Björg Grimsrud
Telephonist/Receptionist	Aud Christiansen (part time) Nora Lisen Bugge (part time)
Director's Office	Mary Caspersen (part time) Gro Pedersen (part time) (until 31.3) Marit Wiik (part time)
Secretarial Correspondence archive	Hildur Skaalmo (part time) (from 1.4) Jorunn Myklebust Ingeborg Christiansen
Expedition Leader, Arctic, and leader of Logistics division and Research Station, Ny-Ålesund:	Thor Siggerud

Computer services:

Leader	Øivind Finnekåsa Torstein Berge
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Documentation division:

Leader, information officer	Susan Barr (on leave from 31.3) Annemor Brekke (from 1.4)
Publications editor	Annemor Brekke
Editorial assistant	Knut Egil Arnesen (from 11.8)
Russian translator	Peter Hagevold
Librarian	Reidunn Lund
Documentation assistant	Inge Marie Mølmen (part time)

Cartographical division:

Leader	Bjørn Arnesen Reidar Mandt Arild Myhrvold Espen Kopperud (part time)
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Logistics division:

Kåre M. Bratlien
Jan Mikalsen
Odvar Lund (on leave from 1.5)
Egil Soglo (until 5.4)
Torstein Midtgård (temporary until 30.4)
Eilif Frantzen (from 9.5)
Georg Johnsrud (temporary from 7.7)

Research Station, Ny-Ålesund (temporary posts):

Station leader, shared with KBKC

Engineer
Engineer
Engineer
Research fellow
Research fellow

Jomar Barlaup (from 1.4)
Nils U. Hagen (until 31.1)
Harald Ottesen (from 6.8.)
Magne Bentzen (until 16.6)
John Søgaaard
Sigmund Unander (until 28.2)
Karl Frafjord (from 9.6.)

Scientific Divisions

Biology:

Leader

Ornithology

Nils Are Øritsland
Thor Larsen (on leave)
Fridtjof Mehlum (temporary)

Geophysics:

Leader, Glaciologist

Sea Ice
Meteorologist
Antarctic, Glaciologist
Oceanographer
Glaciologist

Olav Liestøl (until 28.2)
Torgny Vinje (from 1.3)
Torgny Vinje
Vidar Hisdal
Olav Orheim
Bert Rudels
Jon Ove Hagen (from 1.8)

Geology

Leader

Marine geology

Technician

Thore S. Winsnes
Audun Hjelle
Ørnulf Lauritzen (on leave until 20.5)
Yoshihide Ohta
Otto Salvigsen
Hilde B. Keilen (temporary)
Anders Elverhøi
Anders Solheim
Jon Erik Møller

Geodesy/Topography:

Leader, topographer
Geodesist
Topographer
Topographer

Sigurd Helle
Trond Eiken
Bjørn Lytskjold
Knut Svendsen

Post retirement positions:

Geology
Pilot Description

Tore Gjelsvik
Kaare Z. Lundquist (until 30.9)

Contracted for projects:

Geir Wing Gabrielsen, research assistant (financed by NAVF for the Seabird Ecology project in the Arctic)

Pål Prestrud, biologist (environmental impact studies)

Christian Lydersen, biologist (pinnipeds)

Vidar Bakken, biologist (environmental impact studies – seabirds) from 1.6.

Per Magne Jensen, biologist (environmental impact studies)

Per Espen Fjeld, biologist (environmental impact studies)

Rasmus Hansson, biologist (environmental impact studies)

Egil Soglo, technician (environmental impact studies – seabirds) from 1.5.

Ånund Sigurd Johnsen, meteorologist (environmental impact studies – sea ice) from 13.8.

Rigmor W. Hiorth, part-time secretary (environmental impact studies)

Kari Vik, part-time secretary (environmental impact studies)

Knut Hovrud, logistics department

Martin Skotte, logistics department

Alf Arne Vullstad, marine geology

Frank Larsson, marine geology

Pål Haremo, marine geology

The following left the Institute in 1986:

Ørnulf Lauritzen, geologist (20.5)

Jørn E. Fortun, logistics division (20.11)

Gro Pedersen, Director's office (31.3)

Olav Liestøl, glaciologist (retired 28.2)

Magne Bentzen, engineer (16.6)

Reidar Lund, Office manager (retired 30.9)

Sigmund Unander, research fellow (28.2)

On leave:

Thor Larsen, biologist

Susan Barr, Information officer (from 1.4)

Odvar Lund, logistics division (from 1.5)

Jørn Fortun (until 1.11)

Accounts for 1986

<i>Chap.1412. Debit items</i>	<i>Budgeted</i>	<i>Expenditure</i>
01. Salaries, wages, etc.	11,042,000.-	11,222,000.-
11. Goods and services	10,106,000.-	10,316,000.-
21. Special expenses	3,321,000.-	3,321,000.-
Project expenses (see Chap.4412.01 and 03)	5,520,000.-	4,297,000.-
45. Large new purchases	1,204,000.-	844,000.-
70. Scholarships*	2,270,000.-	2,270,000.-
	33,442,000.-	32,262,000.-
 <i>Chap. 18. Beacons and radio beacons in Svalbard</i>	 1,291,000.-	 1,283,000.-
<i>Chap.4412. Credit items</i>	<i>Budgeted</i>	<i>Received</i>
01. Sale income	200,000.-	252,000.-
03. Income from various services	5,520,000.-	4,047,000.-
04. Reimbursement from Svalbard budget	1,850,000.-	1,850,000.-
	7,470,000.-	6,349,000.-
 <i>Chap.5309.29 Other income</i>		
14 Other income	0	5,167.-

* An extraordinary NOK 1,900,000 was granted by the Ministry of the Environment over the Institute's scholarship item to the private Antarctic Expedition 90° South as payment for the use of M/V Aurora on the Institute's expedition to Peter I Øy.

Grants and financial assistance for research projects

Norsk Polarinstitutt gives financial support to polar research at the Norwegian universities and research institutions in the form of fellowships and project grants. Fellowships are granted to individuals, mainly students, to support and stimulate new scientific projects in Svalbard. More extensive management-orientated projects will be supported under the Programme for Biological Research and Investigations in the Arctic.

Fellowships

Bech, Claus: Temperature regulation in chicks of the Arctic Tern (*S. Paradisaea*).

Breistein, June Britt: Revegetation processes.

Brækkan, Ragnar: Heat transfer and thermal properties of soils in the Arctic.

Frafjord, Karl: Sociobiology of the Arctic Fox.

Gulden, Gro: Arctic mycology (mainly: fam. Tricholomataceae).

Hagen, Jon Ove: Glacier surge investigations.

Henriksen, Kjell: Application of spectrometric equipment on solar radiation (multi-disciplinary).

Hobæk, Anders: Mapping of genetic variability in *Daphnia* populations in ponds and lakes.

Hodin, Lars: Digitalized mapping of Svalbard lichens and studies around their ecological distributive factors.

Jacobsen, Bjørn: Large scale studies around Auroral dynamics.

Johansen, Stein: Airspora and long-distance dispersal of pollen and spores.

Johnson, Ellen Espolin: Outer factors influencing morphology, phenology and heat resistance of plants.

Lybekk, Bjørn: Energy transfers from solar wind into the dayside ionosphere.

Mangerud, Jan: Geological investigations concerning sea-level changes. Holocene glacier variations, vegetation history and paleomagnetism.

Martinsen, Thomas: Friction between ice and water.

Myhre, Astrid: Physiology of plants adapted to short growth season at low temperatures.

Pierce, Elin Pilar: Reproductive energetics of the purple sandpiper (*Calidris maritima*) in Spitsbergen.

Ryg, Morten: Flow of energy and nutrients through a ringed seal population.

Sandholt, Per Even: Mapping of the temporal and optical relationships between Geomagnetic pulsations and dayside Auroral dynamics.

Schreiner, Berit Borch-Johnsen: Physiological studies of the turnover of iron contents in Svalbard reindeer.

Schreiner, Berit Borch-Johnsen: Physiological studies of the heat production in eiders, and content of copper and iron in the liver of grown up eiders.

Steen, Johan B.: Metabolism in eider ducklings upon cold strees.

Sørbel, Leif: Detailed studies and mapping of rock glaciers.

Tolgensbakk, Jon: Detailed geomorphological mapping and studies of quaternary geology emphasizing patterned ground.

Project grants

Elvebakk, Arve, University of Tromsø: Vegetation mapping, conventionally and by Remote sensing.

Mehlum, Fridtjof: Seabird ecology in the Svalbard area.

Prestrud, Pål: Studies of the polar fox in Svalbard with emphasis on factors influencing the outgrowth and dispersal of rabies.

Sendstad, Erling: Studies of natural revegetation processes in disturbed areas.

Sollid, Johan Ludvig, University of Oslo: Continued mapping of the coastal zones in Svalbard.

Sollid, Johan Ludvig, University of Oslo: General mapping of Quaternary geology and geomorphology with erosional studies emphasizing effect of reindeer-grazing.

Sveum, Per: Oil spill studies in Ny-Ålesund.

Unander, Sigmund: Studies of the regulation of the breeding population of Rock ptarmigan in high arctic ecosystems.

Øritsland, Nils Are: Reindeer studies in Svalbard.

THE REINDEER IN THE NY-ÅLESUND AREA

The small population of Svalbard reindeer on Brøggerhalvøya at Ny-Ålesund represents an interesting ecological experiment involving a unique subspecies of the widely distributed reindeer.

Reindeer are found throughout the northern part of the Holoarctic region. The Svalbard reindeer is a subspecies genetically closer to the Canadian high arctic Peary caribou than the continental reindeer on mainland Scandinavia, Siberia and America. Around 1920 the Svalbard reindeer was considered to be close to extinction, possibly due to unregulated hunting. In 1925 the subspecies was protected by law. The total population in 1925 has been estimated at about 1000 which has grown to a present level of 10 – 12,000 individuals.

In 1978, fifteen animals were moved from the Longyearbyen and Reindalen area to Brøggerhalvøya, where twelve individuals formed the basis for the present population of 110 animals. The population has grown at a steady 26% per year, in spite of occasional severe winters causing nearly fifty per cent die-offs in populations in other parts of west Spitsbergen. This growth is close to the maximum expected for any reindeer population in the world and has clarified some academic questions, not to be discussed here, concerning the regulation of Svalbard reindeer populations.

We may consider a related question, however. If the Svalbard reindeer have such a high and normal capacity for population growth, why have they in the period since 1925 not reoccupied all available grazing land? This is particularly interesting since we observe reindeer tracks everywhere in Svalbard,



Fig. 14. Svalbard Reindeer at Ny-Ålesund.

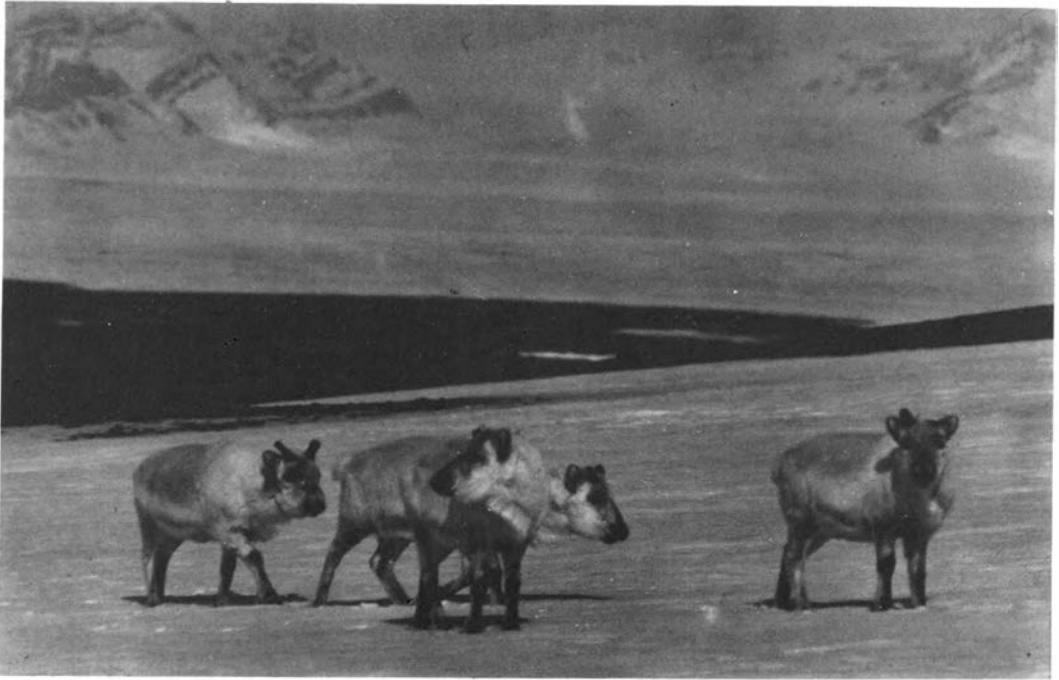


Fig. 15. Reindeer in winter coat in the early spring. Photo: L. Ø. Knutsen.

even across glaciers. Analyses aimed at resolving why the Brøggerhalvøya population did not grow even faster than 26% per year, provide some answer to the wider question about reoccupation of grazing land.

It appears from the analyses that if the random chance for death every winter, and the chance for male calves being born instead of females, are taken into account, a “seed group” of about eight animals is necessary to start a viable new population. In contrast to many other reindeer, the Svalbard subspecies does not form herds, but stay typically in small groups of two to four. This behaviour serves to protecting the grazing range from being trampled and worn. At the same time, however, it may be part of the reason for the slow reoccupation of “empty” areas. According to the analyses, two to four reindeer are rarely able to form a proper new population, even if they have a normal healthy life history of reproduction and death. Nevertheless, on Brøggerhalvøya twelve animals started a now apparently solid population.

The question arises – what is going to happen in the future? We know that soon death by starvation will commence and some animals will emigrate from the peninsula. The objective of the experiment is to collect data elucidating some mechanisms involved in the population changes in terms of nutritional health, reproduction and vegetation responses to grazing.

The Brøggerhalvøya experiment has demonstrated that Svalbard reindeer on good grazing range may become pregnant already when they are one-and-a-half years old. The reindeer on Brøggerhalvøya are considerably heavier than those living in other parts of Svalbard, and tooth wear, which is part of the starvation problem, is nearly negligible. Curiously enough, and in contrast to observations in the Longyearbyen area, the Brøggerhalvøya animals appear to walk a lot in the winter season. We get the impression of well fed animals taking trips at their leisure, looking for quality food in the midst of the starvation period.

Considerable changes in the plant cover on some winter grazing spots are already visible, however. Three plots of original vegetation were fenced off and protected from grazing before the reindeer were introduced to the peninsula in 1978. Particularly at one of the “enclosures” most of the light yellow lichens have been removed by the reindeer leaving a more grazing resistant cover of green

moss and some grasses. In other places the reindeer have removed all vegetation exposing bare soil that may be eroded by winds. Botanists are worried about the reindeer destroying their work opportunities. The total vegetated area on Brøggerhalvøya covers 40-50 square kilometres, and from the Adventdalen area we have learnt that the ecological carrying capacity may be 3-5 animals per square kilometre. Thus Brøggerhalvøya may perhaps provide seed for somewhere between 120 and 250 reindeer. With the present development, the population will grow to this ceiling within three years. Both the population and the grazing range will exhibit some very interesting changes which we hope to be able to document quantitatively.

