

Georg Bangjord, Rune Korshavn & Victor V. Nikiforov

Fauna at Troynoy and Influence of Polar Stations on Nature Reserve

Izvestiya Tsik, Kara Sea, July 1994. Working report



**The Joint Norwegian - Russian Commission
on Environmental Cooperation
The Seabird Expert Group – Report no. 10:1994**



Norwegian Ornithological Society

Report no. 3-1994

NORWEGIAN - RUSSIAN ENVIRONMENTAL COOPERATION THE SEABIRD EXPERT GROUP

The Agreement on Environmental Cooperation between Norway and USSR was signed in 1988 and later renegotiated between Norway and Russia in 1992. The Commission - the Joint Norwegian-Russian Commission on Environmental Cooperation - is chaired by the Ministry of Environment of the two parties and has annual meetings.

Working groups on different topics have been established in order to contribute to increased collaboration on environmental problems in general, and carry out programmes and projects on different fields (i.e. air pollution, the marine environment, radioactive pollution). The seabird expert group is part of the working group for the marine environment.

The initial aim of the seabird expert group was to establish contact and collaboration between Norwegian and Russian research and management institutions. The expert group aims at contributing to the harmonisation and development of scientific methodology and data bases. Furthermore, mapping of important seabird colonies and the conditions related to seabird habitats, i.e. environmental pollutants and food resources, are important items for the group. Several projects on joint approaches have been initiated within the expert group during the last years.

Annual meetings in the seabird expert group have been arranged since 1989. The delegations from the two countries involve seabird experts from several institutions. On the Norwegian side, the Directorate for Nature Management has the coordinating role in the collaboration and chair the delegations. On the Russian side, VNII Priroda plays the corresponding role. The expert group is chaired by:

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Working report

2. revised version

NORSK ORNITOLOGISK FORENING (NOF)
KLÆBU 1994

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PREFACE

With the creation of the 42 000 km² Great Arctic Reserve in May 1993 on the north coast of the Siberian Taymyr peninsula the Russian Federation took an important step to protect its Arctic region. From the very beginning other nations such as the Netherlands and Germany together with WWF supported this development. Common coastal bird populations hosted by both Russia and these other countries during different times of the year, were the main basis of interest. This made the international cooperation work possible.

Birds are also a major element connecting Norwegian interests to the Taymyr region. Within the framework of the Norwegian-Russian Environmental Cooperation Agreement the Seabird Working Group has brought scientists of the two nations together to perform in joint projects on common seabird populations in the Barents and Kara Seas. The Ivory Gull project on Troynoy shows in an excellent way how scientific and conservation interests can be merged. The results from the 1994 Norwegian expedition to this island (belonging to the Izvestiy archipelago and the Great Arctic Reserve off the coast of Taymyr in the Kara Sea), not only contribute significantly to our knowledge about the bird populations of a rarely studied Arctic region, but also includes specific experiences which are useful for the future management of the reserve. Therefore and while seeking continuous support for the Great Arctic Reserve, WWF is pleased by the decision of the Norwegian Directorate for Nature Management to become involved in this region, as well as for financing the project.

The main initiator for this project was Bjørn Frantzen, who is presently working at the Norwegian Polar Research Institute in Svalbard. He plays an important role in the Norwegian-Russian Seabird Group and did much of the preparatory work for the project. He saw the opportunities to work with one of the worlds largest Ivory Gull colonies, when joining us in July 1993, to inaugurate the Great Arctic Reserve.

The project was undertaken by the Norwegian Ornithological Society under the lead of Georg Bangjord and Rune Korshavn. Both had the skills, experience and were motivated as is visible from this report. They cooperated in Russia with Vladimir N. Badukin, the director of the Great Arctic Reserve, and his deputy, Victor V. Nikiforov, and greatly appreciated their help there. Victor V. Nikiforov had done much of the preparatory work in Russia, and joined the expedition, as well as supplying valuable information for this report. The staff of the polar station at Troynoy and their hospitality also contributed significantly to the success of the expedition. Vidar Bakken was responsible for the professional planning of the colour ringing program and the study of the Ivory Gull. He also supported the project with different equipment, including a flap-net. In addition he has made comments to the report. Jeanine Keller and Hilde Sharp provided the English translation. Liv Åse Hellum has proofread the report, and Kjell Isaksen has contributed with valuable comments to 2. revised version.

Peter Prokosch

Coordinator Arctic Programme of WWF International

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ABSTRACT

This study is part of «The Joint Norwegian-Russian Commission on Environmental Cooperation». The aim of the work is to increase awareness of the fauna on the islands in the Kara Sea, in particular the Ivory Gull *Pagophila eburnea* including the population size and nesting biology. In addition, provide an overview of the human activities in the area, and propose management strategies for the protection of fauna and nature in these endangered areas.

The report mainly consists of fauna records undertaken on Troynoy, in the island group of Izvestiya Tsik, Kara Sea; in addition there is a short summary of the present situation in relation to the impacts of human activity on the environment in the Great Arctic Reserve.

The study undertaken on Troynoy with a general inventory of the birds, and with special emphasize on the Ivory Gull and Brent Goose. This is because of the general lack of knowledge about the Ivory Gulls' biology, its occurrence in the Russian "Red List", and because the species is important in relation to INSROP (International Northern Sea Route Programme). In total 25 bird species were recorded on the island, of which 15 were nesting birds. A minimum of 2,800 pairs of water- and wading birds made an attempt to nest on the island in 1994, distributed as follows; Red-throated Diver *Gavia stellata* (10-15), Brent Goose *Branta bernicla* (700-12.00), Eider *Somateria mollissima* (10-15), King Eider *Somateria spectabilis* (15-20), Turnstone *Arenaria interpres* (4-10), Purple Sandpiper *Calidris maritima* (50-200), Arctic Skua *Stercorarius parasiticus* (1-5), Herring Gull *Larus argentatus* (60-70), Glaucous Gull *Larus hyperboreus* (70-90), Kittiwake *Rissa tridactyla* (405-450), Ivory Gull (752-800), Arctic Tern *Sterna paradisaea* (370-450) and Black Guillemot *Cephus grylle* (20-30).

Probably more than 800 pairs of Ivory Gull attempted to nest on the island in 1994. During our stay 752 nests were inhabited. Six Ivory Gull colonies were found, four of which were inhabited in 1994. The colonies were measured, grid referenced and the number of nests counted. Two quadrats were established in two of five colonies, allowing for the possibility of further investigations in these localities. In addition biological data on nesting activity, biometry, plumage characteristics of immature birds were recorded, and in total 200 adult birds were ringed.

Between 700 and 1.200 Brent Geese probably nested on Troynoy in 1994. A minimum of 623 pairs were counted, but due to the fact that large areas of the inner part of the island not were surveyed - the actual number of nesting birds was probably much higher. Brent Geese did not nest on the island in 1992, due to late arrival of spring and snow cover remaining in the settling phase - this information was provided by the station crew on Troynoy.

Information relating to traditional hunting and trapping in connection to the polar stations was collected from the station crew on Troynoy. This information, seen in relation to the game resources was collected to aid in development of a proposal for management strategies for hunting and trapping.

Dumping and damage to the natural environment caused by motorised traffic is serious in certain areas. The specific facts which are described will hopefully lead to an increased awareness of the conditions so that they will be taken seriously in the future.

1. INTRODUCTION

Today the preservation of nature and biological diversity are central issues related to nature conservation all around the world. Active work is being undertaken today, world wide through a large number of agreements and international conventions.

An example heading in the right direction toward co-operation is the Great Arctic Reserve. To be able to manage nature and its biodiversity, a knowledge of the fauna's habitat requirements is a central element. It is not enough to have well defined laws and agreements. Laws have to be implemented and active research and management is necessary to understand and manage nature in the best possible way.

Taymyr is a very special and important area, it is the eastern limit for a number of species from the western palearctic region, and likewise the western limit for many species in the north-asiatic region. This means that these areas are very important in relation to research for both Europe and Asia. In this never-ending large Taymyr peninsula containing some of nature's treasures there are still many unanswered questions and unidentified species.

During June and July 1992 E. Syroechkovski Jr. was the leader of a group of six specialists (four ornithologists, one botanist and one physical geographer) who undertook research on Troynoy Island. Data from this expedition is under preparation and is therefore not included in this paper. We have chosen to present this work in a report form. There is no intention to cover up the total knowledge gained concerning the nature and fauna of Troynoy.

During the inauguration of the Great Arctic Reserve, a larger international delegation visited Troynoy for 3 hours on the 5th of July 1993. Among them were Dr. Peter Prokosch from WWF (World Wide Fund for Nature) who was involved in the establishment of the new reserve, and Bjørn Frantzen as the delegate from Norway. They came up with the idea of an additional ornithological study of the area to form the basis for the 1994 expedition to Troynoy. This would concentrate in particular on the Ivory Gull *Pagophila eburnea* but also include other faunal elements and their management.

Our visit to Troynoy forms the background for this report. The participants were: Victor V. Nikiforov (Russia), Rune Korshavn and Georg Bangjord (Norway).

It is a hope that both now and in the future Norway will contribute to fruitful collaboration both within the fields of research and management in this outstanding nature area.

2. METHODS AND MATERIAL

We arrived at the Troynoy Polar Station by helicopter at 04:30 on the 3rd of July 1994 and left the island at 20:45 on the 17th of July 1994. The polar station became our base during the stay, and we undertook daytrips all over the island.

The main work concentrated on the Ivory Gull colonies. The catching, measuring and colour ringing of 200 Ivory Gulls took a great deal of time. The weather conditions were unfavourable for general bird surveys on most days. Fog and strong winds were the most negative factors during our research (refer Table 1). Line-surveys along the coastline were undertaken around the whole island (refer Figure 4) and the results are noted down by zone (refer Table 2). No research was undertaken in the inner and central parts of the island, except for parts of the Flat Land on the eastern side.

The survey method led to very accurate observations for the numbers of nesting pairs of Red-throated Divers, gulls and Arctic Terns. Due to a more or less continual fresh northerly wind, there was very little vocal-activity from the waders and it was therefore easy to accidentally overlook these birds. The foggy daily conditions made observations difficult at times. Binoculars (10x40) and a telescope (20x-45x) were used for the survey. Our stay was too short to investigate the coastline several times. It was especially difficult to travel through the terrain during the first part of the expedition as the tundra had just thawed, and this caused us to sink into the top layer of the soil.



Expedition participants and the station crew on Troynoy. From the left standing V. V. Nikiforov and N. Petrenko. Sitting from the left G. Bangjord, R. Korshavn and A. Babko.

3. STUDY AREA

3.1 LOCATION

Troynoy is situated in the Kara Sea, which is located at the boundary of the Arctic Ocean between Novaya Zemlya and the coast of Siberia. The eastern part of the sea contains several large and small islands. Most of these are situated along the coast of Taymyr and create a belt of islands from south-west to north-east. The total number of islands are shown in Figure 7, covering an area over 1500 km². The south-west part contains a group of islands called Ostrova Izvestiy Tsik. The largest and the most eastern island is called Troynoy. The Kara Sea is generally covered by ice throughout the year, but often has open areas from August to September. Troynoy is situated N75°58' E 82°39'. Its shape is oblong, and the direction of the island is west-east. The island is 26 km long and the average width is 4.3 km. The total size of the island is approximately 61 km² (6 km² brack- and freshwater) (Figure 1). The highest point is 42 metres above sea level. The coastline has an irregular form with two dominant bays. Round Bay stretches from the north to the western side of the island, while Polarnic Bay is on the eastern side, approaching from the south and stretching almost across the island. The bays separate the island into three main parts, the western, middle and the eastern part.



The polar station on Troynoy as seen from the east.

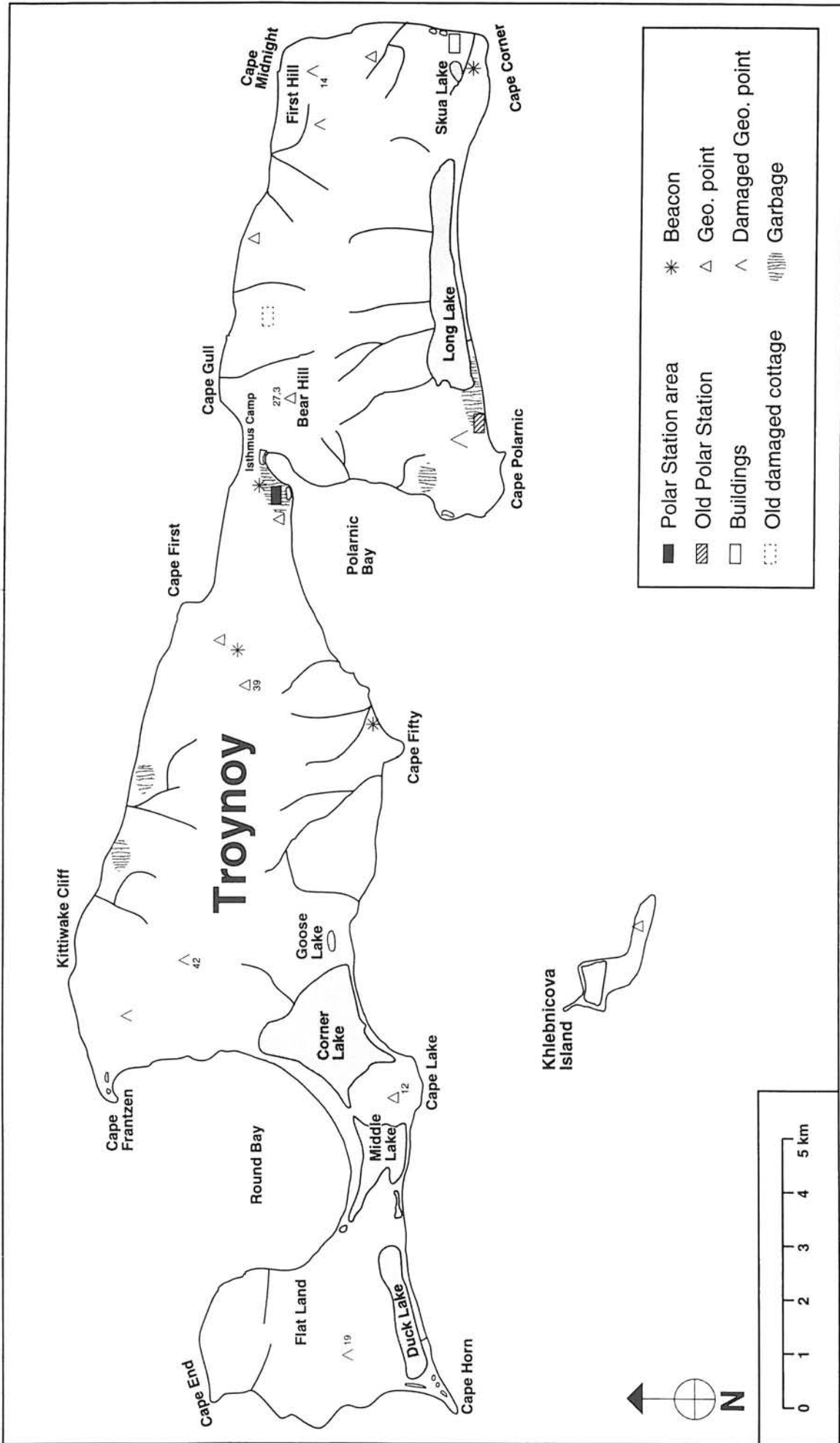


Figure 1. Map of Troynoy.

3.2 CLIMATE

All the climatic data was collected at the weather-station at Troynoy. The climate can be defined as a high arctic climate. *Temperature*: During our visit the temperature varied between -2.3°C and 7.3°C (Figure 2 and Table 1). The average temperature for June, July, August and September during the period 1988 to 1993 was 0.26, 0.29, -0.6 and -2.5 respectively, this means a tetra term (average temperature in the growth period) of -0.6°C . The coldest month is February and the warmest is July (refer Figure 3). *Wind*: The predominate wind direction during the warmest summer months is northerly. During the period from the 1st to the 16th of July 1994, the average wind force was 6 m/s, precipitation was 0.53 mm and it was mainly cloudy. It is not unusual with snow falls for short periods during the summer.

Ice-conditions: The ice conditions on the ocean were visible from the polar station, during the field-study. The first lead was observed on the northern side, on the 7th of July. Large leads were observed on the northern side on the 8th of July. Ice covered the area again on the 10th of July and stayed throughout the period. Ice remained on the southern side during the whole period, except for a lead which appeared beyond Polarnic Bay on the 11th of July. The lead was gone the next day.

Snow conditions: The whole island was generally free of snow on our arrival on the 3rd of July. The river bed, steep slopes and other steep areas were still covered by some drifting snow throughout the period of our stay. The ice layer was thick on all the larger waterbodies, but at the edges there were holes. Smaller waterbodies and ponds were generally ice-free.

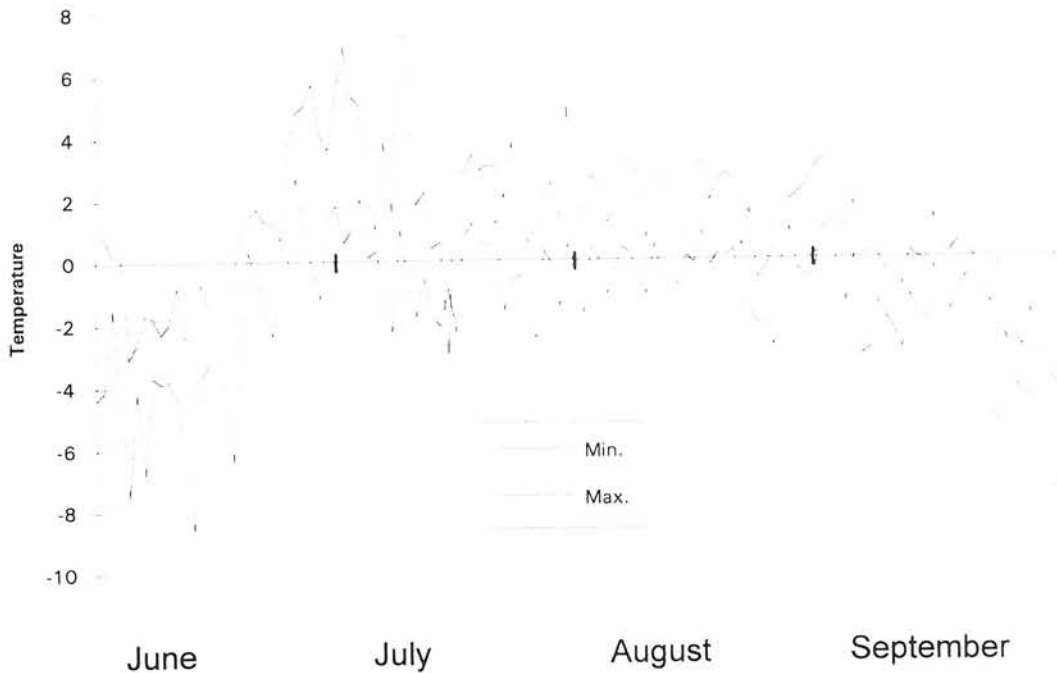


Figure 2. Temperatures measured at the polar station, Troynoy

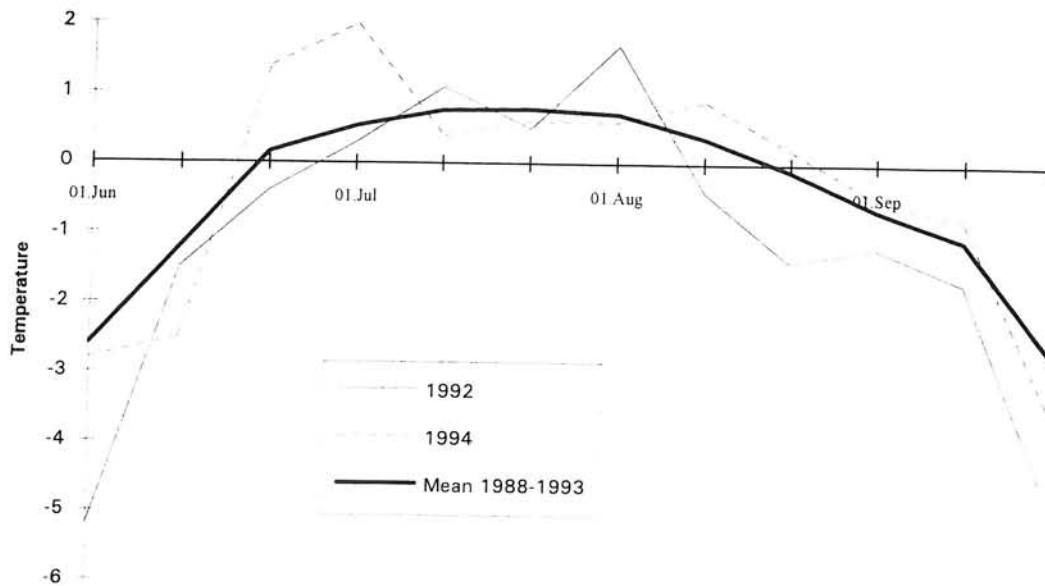


Figure 3. The average temperature for ten day periods from June to September in the period 1988 – 1993. The variations from 1992 and 1994 are included.

Table 1. Weather conditions in July 1994, recorded between the 3rd and the 17th of July.

Date	Temp. mid. °C	Temp. max. °C	Temp. min. °C	Precipitation (mm – water)	Wind (m/s)	Wind direction	Cloud cover*
01.July	3.2	5.3	1.8	4.2	5.5	N-W	10
02.July	3.7	6.9	0.6	0	5		6.2
03.July	3.1	5.3	1	0	3.75	S	6.1
04.July	3.6	5	2	0.3	4.62	S-SE	10
05.July	0.7	2	0.1	0.9	9	NE	10
06.July	0.6	1	0.3	1.9	14.3	NE	10
07.July	0.8	3.8	-1	0	7.1	NW-SW	6.2
08.July	-0.4	1.6	-2.3	0	3.1	SW-SE	8.5
09.July	3.8	7.3	1	0.4	8.6	E	9.3
10.July	1.5	7.2	-0.6	0.1	5.7	NW	10
11.July	0.2	1.8	-1.8	0.3	4.25	N	10
12.July	0.6	2.2	-0.6	0.4	8.25	N-NW	6.9
13.July	-0.9	0.4	-1.8	0	4	NW-N	8.4
14.July	-0.9	0.6	-2.1	0	5	N-NE	9.8
15.July	-2	-3	-0.9	0	3.5	N-NE	9.8
16.July	0.4	2.8	-2.3	0	3.5	N-NW	9.3
Average	1.1	3.1	-0.4	0.5	5.9	N	8.8

* 10 = total cloud cover. 1 = Cloudless/Clear

3.3 TOPOGRAPHY AND GEOLOGY

Troynoy is a flat island. The landscape consists of gentle rounded forms, and the island is generally covered with tundra. The surface is mainly sandy in the slope parts. The landscape is largely formed by ice. At a few places on the island there are small scree slopes which interrupt the landscape. The island has no obvious tops, or major hills. The two highest points on the island, which are 42 and 37 metres respectively, are generally invisible due to the tundra. There is a continual fall from the middle of the island out towards the coast on both sides, and the land often ends with low cliffs and a narrow sand strip.

Every summer large quantities of melt water accumulate. This water gather and forms small streams which cut into the landscape. Due to the gentle topography of the island these streams are situated more or less at right angles to the middle of the island towards the sea. Close to the coast the water cuts deep into the landscape and then reaches the sea in generally larger river beds - in several places large deltas have been created.

Except for three areas (Cape Horn to Cape Lake, and the inner part of Round Bay and between Cape First and Cape Gull), there are generally steep slopes (small cliffs). These cliffs vary in height from approximately one metre up to the highest which is the Kittiwake Cliff, at between 10-20 metres. Kittiwake Cliff is much higher than the average cliff-height which is between 2 to 5 metres. The coastline is only a narrow strip consisting of pebbles and gravel, it stretches around the whole island. The gravel has in some places accumulated into large mounds.

The island has 4 large lakes, and approximately 17 smaller lakes. What is remarkable is that they are more or less situated along the southern coastline. Three of the larger lakes are situated on the western side and only have a narrow gravel mound separating them from the sea. The water level is approximately the same as the sea-level. Duck Lake and Long Lake have an opening in the beach-mound facing the coast, so excess water flows into the sea. Due to the insignificant difference in height between the sea and the lakes, we assume that the water is mainly brackish.

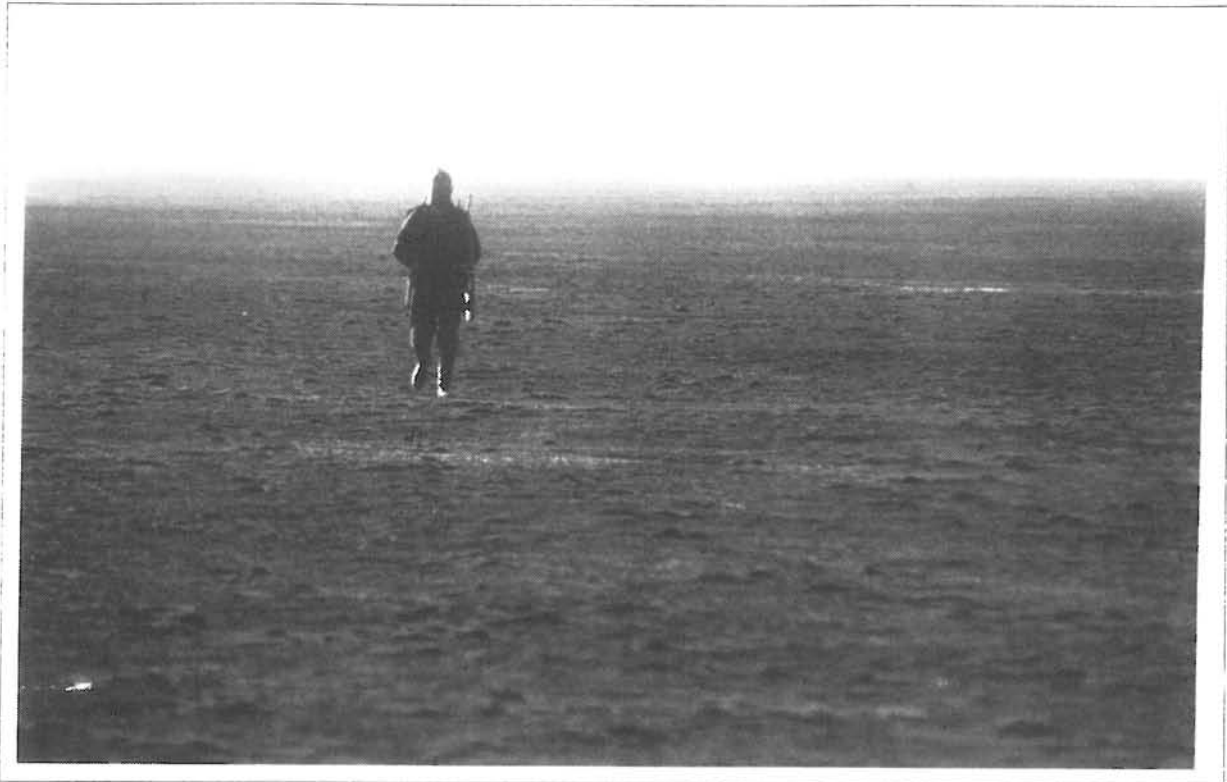
The formation of these lakes is probably a directly result of the frequent ice-drift from east to west. The ice breaks loose stones and gravel from the cliffs which it pushes in front of itself along the coastline. This is the way the gravel-mounds are created and which dams the freshwater. This is very evident when one compares the coast on the eastern and western side. The whole of Cape Horn consists solely of deposited stones and gravel, in contrast to the eastern side which has only a narrow strip of gravel. There is also reason to believe that Cape Horn "continuously" changes form. At those parts of the coastline where there are no cliffs, but where the tundra flattens out and gradually changes to sand and gravel large quantities of driftwood accumulate. There were four places in particular where driftwood accumulated: along the beach in Round Bay, Isthmus Camp, the section between Cape Horn to the eastern side of Corner Lake and around Long Lake.



Wetland areas in the north-western part of the Middle Lake.



Large quantities of driftwood lies on the beaches all around the island, as shown here at Round Bay.



The plateau on the eastern part of Troynoy, the Flatland.



A pond on the beach on the western side of Polarnic Bay.

3.4 VEGETATION

A botanical survey was undertaken by the scientific expedition led by E. Syroechkovski Jr. to Troynoy during June-July 1992. Several of the findings from this expedition are "in press" and we presume that the botanical survey will be mentioned in one of these publications.

A botanical survey was not undertaken during our stay, but we will try to give a few comments concerning the botanical situation on the island. The island is predominantly covered by vegetation, mosses are dominant and cover large areas of the tundra. In certain areas (on the plains leading towards the beach) we found fields of sedge grass species *Cyperaceae* sp. and other grasses. On the drier ground and in the boulder field we observed among other plants, Arctic Willow *Salix polaris* and poppy species *Papaveraceae* sp. There were very few plants flowering in the vicinity during our stay. It was not until the last few days, that flowering began to take place. In the fields close to the beach we found flowering Purple-mountain Saxifrage *Saxifrage oppositifolia* and a forget-me-not species, *Myosotis* sp. was common in the tussocks. Poppy species, *Papaveraceae* sp. was not yet in flower by the 17th of July.



Purple-mountain Saxifrage (Saxifrage oppositifolia) grows in tussocks on sandy soil. The picture is taken from the northern side of Middle Lake, where we observed large quantities of the species.

4. FAUNA

4.1 ORNITHOLOGICAL RECORDINGS ON TROYNOY

The ornithological records relate to three daytrips which together covered the coastline around the island, plus records from the area surrounding the polar station during work on the Ivory Gull colonies. The records are given in Table 2 (next page).

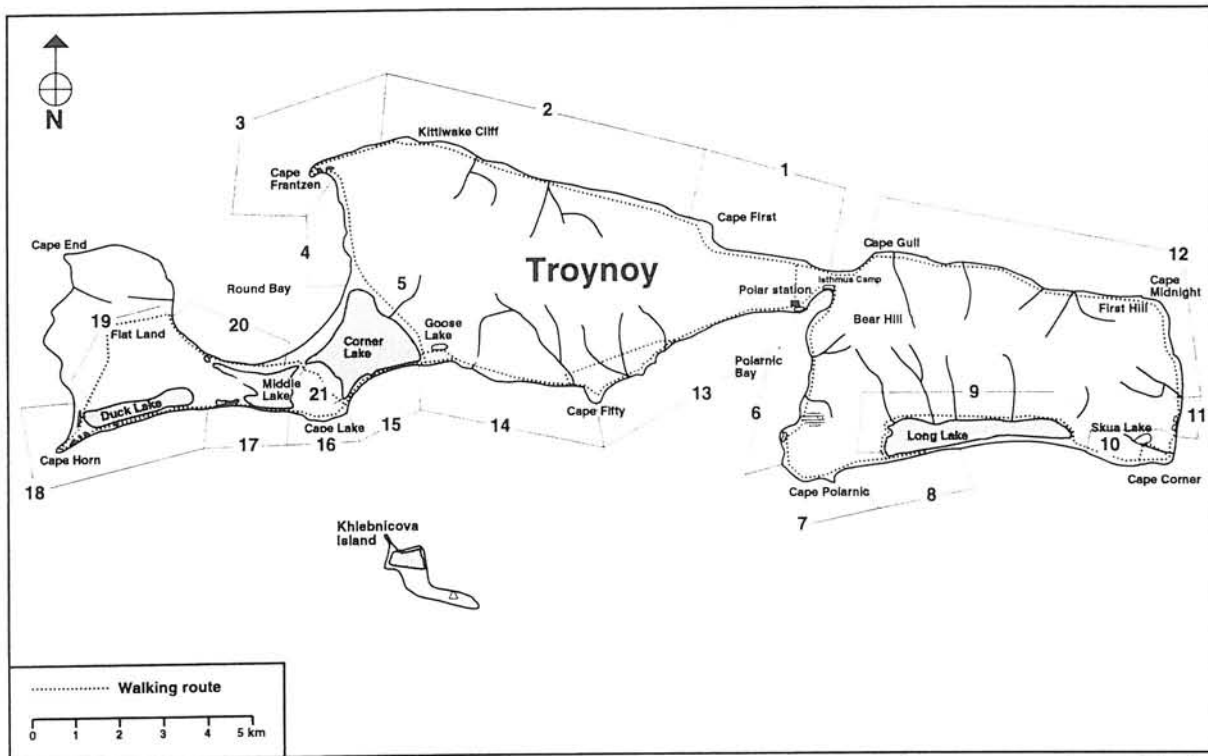


Figure 4. Zone classification of the surveyed areas along the coast of Troynoy, refer Table 2.

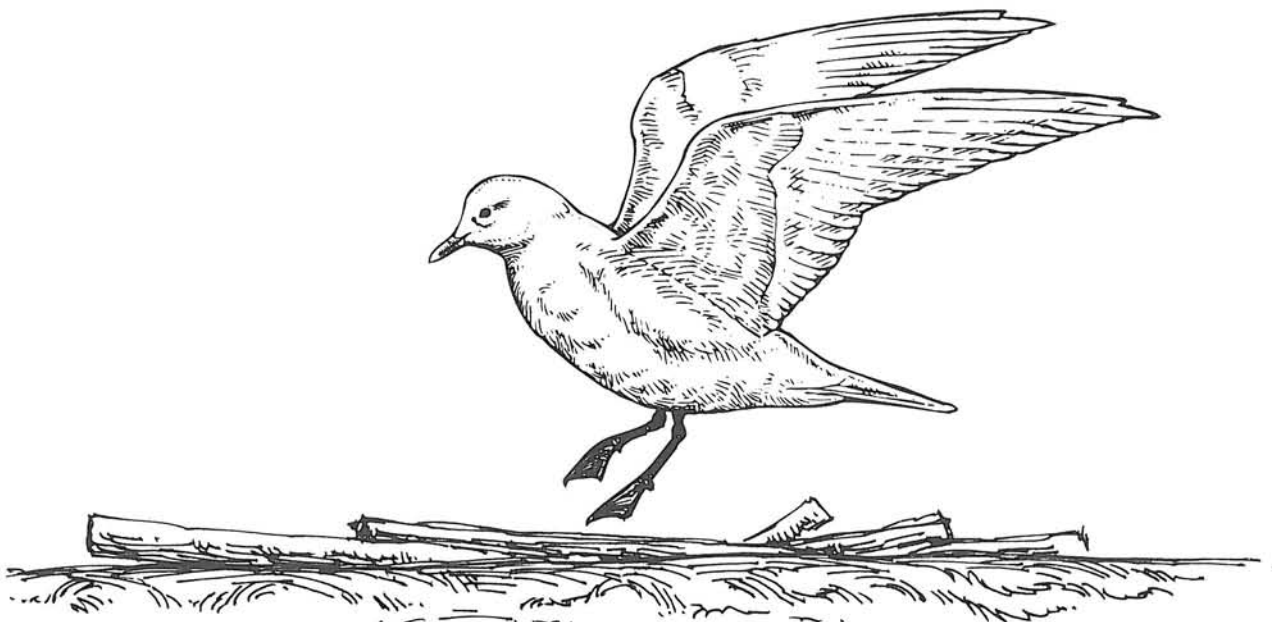


Table 2. Results from surveys along the coastline of the island. The zones are shown in figure 4. An inventory of the zones were made at the following times: 0=3-17 of July, 1-5=5 of July, 6-12=12 of July and 13-21=14 of July.

Species/Zone	0*	1	2	3	4	5	6	7
Red-throated Diver	2						1p	
Brent Goose	23p+19*	42p	39p	18p	40p	20p	50p+35*	7p
Eider	3p+1f		1fb	1p+1fb			2m2f	
King Eider	3m			4m6f	2fb	1m+1p		
Turnstone	2p							2pb+3
Purple Sandpiper	5		2p				4	3
Great Skua	1	1						
Pomarine Skua	130		2				97	70
Arctic Skua	10	3	1					
Herring Gull	3p+19*	2p+2	3+1(2k)	2p		2	6p+2	
Glaucous Gull	4p+76*	13p	3p+16	2p+11		2p+11	4p+4+35*	1p
Kittiwake	100	4	405p+90				36	20
Ivory Gull	746p++		2				10+	2
Arctic Tern	150p	40p	10	30p		4	60p	6p+3
Black Guillemot			37					
Snow Bunting	12	2	5					

Species/Zone	8	9	10	11	12	13	14	15
Red-throated Diver		6	2+1p					2pb+2
Brent Goose	2p	52p	22p	24p	19p	33p	123p+14*	5p+12*
Eider		2f1m+1p						
King Eider			3m+1f	1m+1f	1f			
Turnstone								
Purple Sandpiper	7	7	8		3	5	1b+3	2
Great Skua								
Pomarine Skua	115		198	14	2	2	10	2
Arctic Skua	2							1
Herring Gull		8p	18+2juv.	2p	1p+2		1p+2	26(13p)
Glaucous Gull	1p	7p+6+60*	1p+15+146*		5p	2	4p+11	3
Kittiwake			3	4		1	2	
Ivory Gull	24(6pb)	2	2	3	1	1	3	1
Arctic Tern	5p	3p	17p+1juv.	5p	26p+2	1p	1	4p
Black Guillemot								
Snow Bunting	2			1	1m			2p

Species/Zone	16	17	18	19	20	21	Total
Red-throated Diver		2	2pb+1		3p+6	1p+1	10p+22ind.
Brent Goose	19p	10p	14p	44p	20p	7p+10*	635+96*
Eider							8m+12f=20
King Eider			1fb				14m+14f=28
Turnstone						1p	4p+3=11
Purple Sandpiper	2	1	9	1		1	66
Great Skua							2
Pomarine Skua	1	6	2				651
Arctic Skua							1p+15
Herring Gull	1p	1p+4	16(8p+)		2p		50p+57*
Glaucous Gull	1p	1p+2	7p	4p	3p+4	3p+2	66p+84+317*
Kittiwake							405p+260
Ivory Gull	1						752p++28
Arctic Tern	2	2p	20p		2p		371p+23
Black Guillemot							37
Snow Bunting							27

0* = The area surrounding the polar station, m=male, f=female, p=pair(s), b=breeding, juv=juvenile, *=none breeding and 2K=1 year old bird

4.2 SPECIES LIST OF BIRDS WITH COMMENTS

Red-throated Diver *Gavia stellata*

There were few nesting birds around the waterbodies and smaller ponds on the island. 10 nesting pairs were noted in addition to 22 individuals. Under favourable ice-conditions, the nesting population would probably be somewhat higher. There were in particular many Red-throated Divers with very high nesting densities in the region of Cape Horn and Middle Lake. The species also nested in the brackish water on the western side of Polarnic Bay and in a pond by the beach directly north of Cape Corner.

Fulmar *Fulmarus glacialis*

There were few appearances of this species in the sea around the island. Only one and two individuals (dark phase) were seen flying over the drift ice beyond the north of the island, on the 8th and 9th of July respectively.

Brent Goose *Branta bernicla*

Common nesting bird all over the island. Refer chapter 4.3.

White-fronted Goose *Anser albifrons*

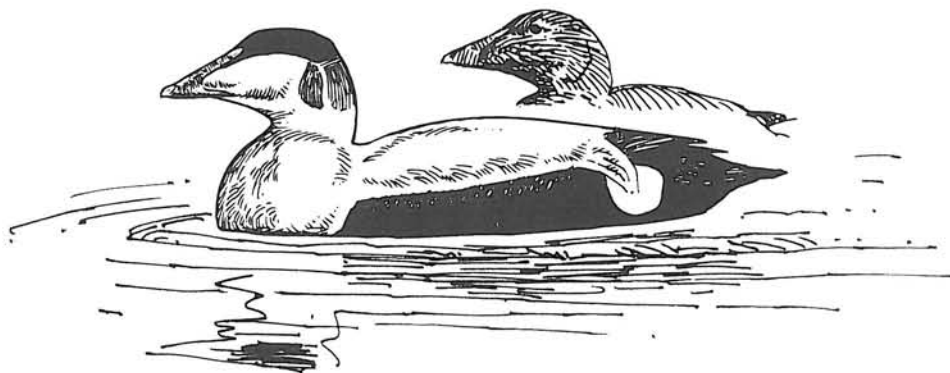
The species was not observed during our stay, but a moulted tail feather, which was probably from this species, was found on Cape Horn. The feather was probably from 1993.

Bean Goose *Anser fabalis*

One pair was noted almost daily during our stay, in the area surrounding the polar station (from the 3rd to the 17th of July).

Eider *Somateria mollissima*

An occasional nesting bird. **Breeding population:** Probably between ten and fifteen pairs nest on the island. Three or four pairs had their nest in the area between the polar station and the Isthmus Camp, two pairs on the west-side of Polarnic Bay, one or two pairs by Cape Frantzen, two pairs and a female at Long Lake and one female on a nest between Kittiwake Cliff and Cape First. Two nests were examined and both contained six eggs. Altogether 20 individuals were noted during the survey (refer Table 2). **Nesting biology:** *Egg size:* Length 75.29 mm (min.-max. 74.29-76.77), width 50,85 mm (49.9-51.47) and weight 101.7 grams (96.5-106) (n=6, one clutch, at Bear Hill on the 13th of July). A female was ringed and its biometry was measured. The birds were obviously in the egg laying phase (the pairs still stayed together most of the day) when we arrived on the 3rd of July. **Nest distribution:** The nests (n=3) were situated approximately 100 to 150 metres from the sea. Two of the nests were situated in the boulder field and one on the tundra.





The Eider female stayed on the nest even when we were one metre away. Troynoy is amongst the most eastern nesting grounds for this species in Siberia.

King Eider *Somateria spectabilis*

There were few nesting birds related to waterbodies and smaller ponds all over the island. **Breeding population:** There were probably between ten and twenty pairs nesting. Three nests were found with 4, 6 and 6 eggs respectively. Altogether 28 individuals were recorded (14 males and 14 females) during the survey (refer Table 2). **Nesting biology:** *Egg size:* Length 65.0 mm (62.25-66.8), width 45.85 mm (44.8-46.56) and weight 69.9 grams (65.0-73.5) (one clutch with six eggs, at Cape Horn on the 14th of July). *Nesting location* appeared to be consistently near water and smaller ponds. Two of the nests were located on the tundra and one was located in the high-water area.

Turnstone *Arenaria interpres*

An occasional nesting bird. The species was noted at two locations on the island. One or two pairs were nesting near the Ivory Gull colony number 3 at Bear Hill. Between two and four pairs were noted at Cape Polarnic on the 12th of July. One individual was also observed near the polar station on the 12th of July.

Little Stint *Calidris minuta*

Very few nesting birds. Two males and one female had courted and bred on the plain, east of Isthmus Camp on the 4th of July.

Purple Sandpiper *Calidris maritima*

A relatively common nesting bird all over the island. **Breeding population:** A minimum of 66 birds were observed (refer Table 2). Most probably there were more than one hundred pairs nesting on the island. Approximately ten pairs were nesting in the surroundings of the polar

station. One individual with red colour ring and a tag on each leg, was observed at Isthmus Camp on the 7th of July.

Great Skua *Stercorarius skua*

An occasional visitor. Two individuals were observed flying over the drift ice on the northern side of the island on the 5th and 8th of July respectively.

Pomarine Skua *Stercorarius pomarinus*

A common bird all over the island and in the sea around the island. It is often observed in large flocks, preferably close to the edge of the ice. During the period from the 3rd to the 7th of July only few individuals were observed on the island. The first crack in the ice appeared on the 8th of July on the northern side of the island, and at the same time several hundred Pomarine Skua appeared. There were approximately 130 individuals staying in the area surrounding the polar station on the 8th of July. In total over 600 hundred individuals were recorded over the whole island, from the 12th to the 15th of July (refer Table 2). A majority of the flock were immature birds. Approximately 2-3% were of dark phase. Skuas were observed chasing in particular Ivory Gulls and Arctic Terns, and also the eiders. Flocks of Pomarine Skuas "stressed" the nesting birds and the species is probably an important egg-predator in the area.

Arctic Skua *Stercorarius parasiticus*

An occasional nesting bird. All individuals were of the light type. Altogether seven individuals were observed (singly and in pairs) along the coastline all around the island. In the area by the polar station two to four individuals were observed almost daily. Ten individuals (including several immature birds) were observed at Isthmus Camp on the 9th of July. One pair nested (2 eggs) 600 metres to the north of the polar station.

Long-tailed Skua *Stercorarius longicaudus*

An occasional visitor. One to three individuals (immature birds) were observed in the area close to the polar station and Isthmus Camp between the 6th and the 9th of July.

Herring Gull *Larus argentatus heuglini*

A common nesting bird which preferred the large beach areas containing driftwood, around the island. **Breeding population:** 50 nesting pairs were noted in total, plus over 20 individuals in the nesting area. Between 60 and 70 nesting pairs tried to nest here in 1994. The highest nesting densities were located on the southern side of Corner Lake (minimum 13 pairs), Cape Horn (minimum 8 pairs) and on the northern side of Long Lake (8 pairs). **Juveniles:** Altogether 37 "non-nesting" birds were recorded (refer Table 2), of these 7 were "one year olds". Four "one year olds" gathered in a flock of 19 "non-nesting" Herring Gulls on the sea ice beyond Cape Gull on the 8th of July. **Breeding:** The species nested almost exclusively on the driftwood belts on the larger beaches. They were mostly single pairs, but also some scattered nesting groups, plus a recognised colony on the southern side of Corner Lake. **Egg size:** Length 68.5 mm (64.0-71.6), width 48.4 mm (45.1-50.8) and weight 80.8 grams (69.5-93) (n=33: out of 13 clutches). **Clutch size:** 2.6 (n=19 clutches). **Egg predation:** There were many empty nests in the colonies. There were eggs in five of the 27 nests in the colony on the southern side of Corner Lake. 26 adult individuals were resident in the colony. There had probably been predation of eggs by polar bears, as fresh footprints were observed nearby. **Nest measurement:** height 11-12 cm, depth 6 cm, nest-cup diameter inside 25 cm and the outside diameter was 60 cm. The nests were built mainly from mosses and lichen, and often with a large quantity of wing-feathers and sticks.

Glaucous Gull *Larus hyperboreus*

A common nesting bird, but less colonial and more widespread around the island than the Herring Gull. **Breeding population:** Minimum 66 pairs were found nesting, in addition 84 individuals (potential nesting birds) were recorded. Around 60 to 90 pairs probably tried to nest in 1994. **Breeding:** Most of the birds nested alone, but in some cases two to four pairs nested within a restricted area (200 metres in area). The nests were often placed on a hill far away from the sea (often on a scree slope) and were built mainly of mosses and feathers. Some of the nests on the flat land were large “master-pieces” (refer Picture 9). **Egg size:** Length 76.5 mm (70.8-82.4), width 52.1 mm (48.6-55.7), weight 99.5 grams (82-114) (n=33, 12 clutches). **Clutch size:** 2.85 eggs (n=20). One nest on Cape First had four eggs. **Nest measures:** The inside diameter of the nest cup was 27 cm, the depth of the nest cup was 11 cm, the height of the nest 35 cm and the total nest diameter was 140 cm (the example is from one of the large nests on the flat land). **Time of egg laying:** Three newly hatched chicks were recorded in a nest at Long Lake on the 12th of July, this means that the eggs were laid around the 10th of June. On the 12th and 14th of July agitated pairs reacted even though their nests were empty. This indicates that several of the gull pairs had chicks in the area. **“Flock-gulls”:** “Non-nesting flock-gulls” were found near Long Lake (60 individuals) and Cape Corner (146 individuals). Altogether, there were approximately 300 “non-nesting birds” recorded during the field-survey (refer Table 2). The number of sub adult individuals was high in these flocks. **One example:** One flock of 76 individuals outside Cape Gull, had the following age-groups: 51 adults, 16 sub adults, 6 two-year olds and 3 one-year olds.



Many of the gull nests were large “master-pieces” like this one of the Glaucous Gull.

Great Black-backed Gull *Larus marinus*

An occasional visitor. A sub adult had settled into a flock of "non-nesting" Glaucous Gulls and Herring Gulls just outside Cape Gull on the 8th of July.

Kittiwake *Rissa tridactyla*

Common in the sea around the island. Small flocks and individuals nests along the coast of the island.

Breeding population: The colony on Kittiwake Cliff was situated on an unstable scree slope (some loose and cracked rocks) at about 10-15 metres height and 150-200 metres in area. The colony had 405 occupied nests. In addition 70 individuals sat on the ice beyond the colony on the 5th of July. There were large snowdrifts on parts of the mountain which were occupied by the birds. The total number of nesting birds would probably have been somewhat higher under more favourable snow-conditions. The colony is separated into 3 parts, with 145 pairs in the eastern part, 208 pairs in the middle and 52 pairs in the western part. Fifteen fresh bodies of recently dead Kittiwakes lay on the ice next to the colony. They had probably been killed by Glaucous Gulls. One of the birds had a Russian ring with the inscription: Moscow 039617, plus a red ring on the opposite leg. This bird was ringed by the scientific expedition in 1992 led by E. Syroechkovski Jr. The average wing length was 325 mm (314-336) (n=17), foot (tarsus + toe) 81.5 mm (76-86) (n=6), tarsus 34.5 mm (31.1-36.8) (n=8). Two nesting birds were killed at the polar station on the 14th of July for tissue samples. Full biometry was taken from the two birds. During the period 8th to 11th of July a group of up to 100 individuals were sited on the ice just north of the beach at Isthmus Camp, of which between 10 and 20% were one-year old "flock-gulls".

Ivory Gull *Pagophila eburnea*

A common nesting bird in high numbers, especially in the colonies close to Isthmus Camp and on Bear Hill. See chapter 4.4.

Arctic Tern *Sterna paradisaea*

A common nesting bird. **Breeding population:** In total there were over 370 pairs recorded on the island: The largest colony was at Isthmus Camp, where approximately 150 pairs nested. Otherwise we observed scattered colonies all over the island, but they were usually related to the larger beach areas with plenty of driftwood. One example: Cape First (40 pairs observed flying 150 metres from the sea), Cape Frantzen (30 pairs), Polarnic Bay east (30 pairs on a hill approximately 200 metres from the sea), by the outlet of the river delta west of Cape Midnight (20 pairs) and Cape Horn (20 pairs). **Juveniles:** Two "one year olds" were observed during the stay, at Isthmus Camp on the 4th of July and Cape Polarnic on the 12th of July respectively. **Breeding:** **Egg size:** Length 40.75 mm (35.5-44.4), width 29.36 mm (27.7-30.7) and weight 18.2 grams (14-20.5) (n=30, 15 clutches with two eggs). **Food:** The terns fished in the surface water above the ice and between the cracks in the ice. Fish of approximately 5-7 cm were seen being caught.

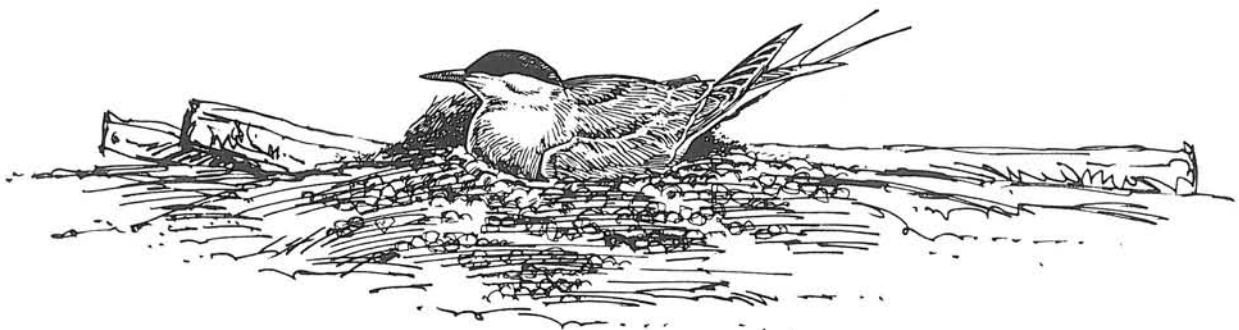


Table 3. Biometrical measurements from five nesting birds that were collected for tissue samples.

Sex	Weight (g)	Wing (mm)	Tarsus	Beak	Head+beak	Height of beak		Outer tail feather
						A	B	
Male	140	277	16.8	32.5	73.1	8.11	7.3	206
Male	112	282	15.8	32	72.2	8.25	7.5	202
Male	105	277	15.6	32.4	73.7	8.6	7.2	204
Female	128	285	15.7	32.4	72	8.15	6.9	186
Female	128	277	14.9	30	–	8	7.4	185

Black Guillemot *Cephus grylle*

An occasional nesting bird. 37 individuals were recorded in the Kittiwake colony on the 5th of July. Most of the birds sat in the scree above the western part of the colony. The species was not observed at any other places on the island. We observed two fresh bodies of Black Guillemots in the colony. They could have been killed by Glaucous Gulls. The following measurements were taken from the bodies: Wing 168 and 175 mm, foot 72 mm and tarsus 31.9 mm.

Snowy Owl *Nyctea scandiaca*

An occasional visitor. The body of a female or immature plumaged individual, shot by staff of the polar station in 1992, was inspected.



This Snowy Owl was shot in 1992 and have been used to block a leak in one of the buildings at the polar station.

Redwing *Turdus iliacus*

Uncommon visitor. One individual was observed at the polar station from the 8th to the 10th of July.

Reed Bunting*Emberiza schoeniclus*

Uncommon visitor. One female was observed around the houses at the polar station on the 7th of July.

Snow Bunting*Plectrophenax nivalis*

Obviously a regular breeding bird seen around the buildings, dumping ground, large driftwood accumulations on the beach and in scree and cliffs.

Altogether 27 birds were observed around the island (refer Table 2). In addition five pairs nested around the polar station, plus two pairs on Bear Hill. It was recorded that there was feeding of two chicks on the 3rd of July, at the same time as there were eggs in another nest. In one nest hatching of a clutch of six eggs occurred on the 12th and 13th of July.

Egg size: Length 23.0 mm (22.1-23.51) and width 16.3 mm (16.0-16.74) (n=6, 1 clutch).



A nest box was placed at the Polar station for the Snow Bunting.

4.3 BRENT GOOSE *Branta bernicla*

A common nesting bird all over the island. Breeding population: There were at least 623 nesting pairs recorded in the areas adjacent to the coast of the island (refer Table 2 and 4). The inner part of the island was not surveyed, so the total number of nesting pairs was probably between 700 and 1200 during 1994. A very high nesting density was recorded between Cape Frantzen and Cape Fifty, together with some smaller localities around the rest of the island. In certain years the climate can be so bad that the species do not nest on the island. This happened in the season of 1992 (pers. obs). The geese arrived that year at the normal time, but the island was still covered with snow so most of the geese flew away (refer to climate for this season in Figure 3).

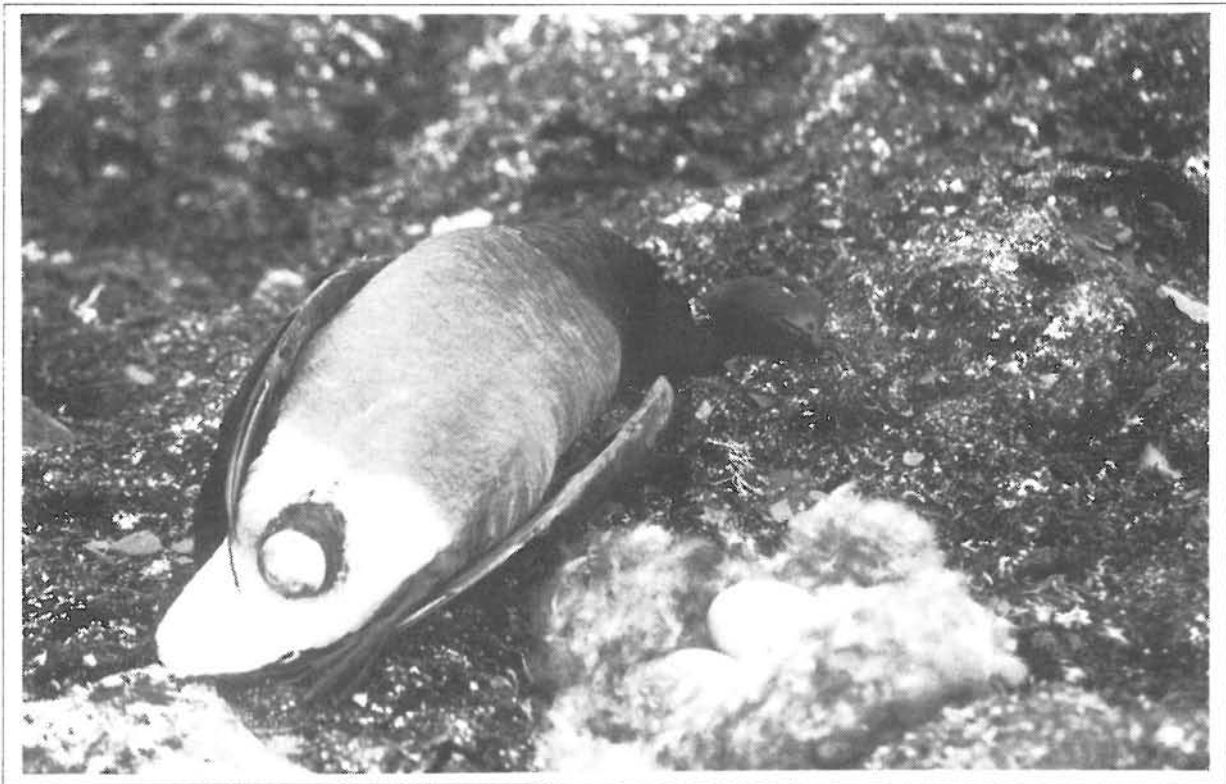
Table 4. Classification of Brent Goose zones. Area number corresponds to Figure 4.

Area number	Area	Date	Min. numbers of pairs	No. of empty nests	** 2	** 3	** 4	** 5	** 6	*** Total no. of nests	A	B
0	Area near Ivory Gull colony no. 2	04.July	23	2		1				1	23	
1	Station-Cape First	05.July	42	1	1			1		2	2	*19
2	Cape First-Kittiwake Cliff	05.July	39			3	5	2		10	10	
3	Kittiwake Cliff-Cape Frantzen	05.July	18			2	2		2	6	6	
4	Cape Frantzen-Corner Lake	05.July	40	1			3	13		16	16	
5	East part of Corner Lake	05.July	20	2			3		1	4	4	
6	Isthmus Camp-Cape Polarnic	12.July	50	1			5	3		8	7	35
7 & 8	Cape Polarnic-Eastern Long Lake	12.July	9							0	2	
9	North part of Long Lake	12.July	52		1		1			2	15	
10, 11 & 12	Cape Corner-round NE part of Troynoy	12.July	65			1		1		2	10	
13	P. Station-Cape Fifty	14.July	33				3			3	3	
14	Cape Fifty - Corner Lake	14.July	78				3	2		5	28	14
14	NE corner of Corner Lake to Goosepond	05.July	45				5	10	2	17	17	
15	South part of Corner Lake	14.July	5							0		18
16	Cape Lake	14.July	19	4				1		1	6	
17	Middle Lake (north and west)	14.July	10						1	1	2	
18	Duck Lake and Cape Horn	14.July	14			1		1		2	4	
19 & 20	Duck Lake-Round Bay, Flatland	14.July	64			1		3		4	20	
21	Between Middle Lake and Corner Lake	14.July	7								2	10
Total			623	11	2	9	30	37	6	84	177	96

* = 8. July, ** = nests with x eggs, *** = total numbers of visited nests, A = hatching birds near the rout and B = no breeding birds

Breeding: Clutch size: 4.5 eggs, n=84. (refer Table 4). Egg size: Length 70.9mm (66.2-74.5), width 47.0 mm (44.6-49.7) and weight 78.5 grams (68-89) (n=38: out of 9 clutches). Laying date of eggs has been estimated backwards to have been during the period between the 15th and 23rd of June. The average temperature in the egg-laying phase was -0.7 C (refer Figure 2). Predation of eggs from nests appears to be very low. Very few nests were found that had been robbed and likewise there were very few "flock-geese" (non-nesting geese and geese that had failed to nest). In an area far to the east on the island, we found traces of a polar bear which had found a nest of geese and robbed it. The same area had large numbers of "flock-geese". The most important egg predators are probably the Pomarine Skuas, Herring Gulls and Glaucous Gulls. There was no sign of Arctic Fox being present during this summer. In some cases where the Ivory Gull colonies were close, the gulls were quick to rob the nests when we had scared the geese off them. Nesting site: Most nests looked as if they had been randomly placed throughout the terrain. The vast majority of nests were spread around the tundra, while a few were placed in high-water areas and boulder fields. Some of the nests looked as if they were old "traditional" nesting places, as the vegetation around the nest gave the indication that the nest-cup had been used for a number of years. The minimum distance between two nests was measured at 25 metres. Most of the nests were placed more than 50 metres apart from one another. It was clearly evident that there was a higher nesting

density around Glaucous Gull nests. In the immediate vicinity of a Glaucous Gull nest one could find up to eight Brent Geese nesting. *Behaviour at nest:* There were great differences in the birds behaviour when humans came into the vicinity of the nests. Some birds left their well feathered concealed nests, when we were still some distance away (> 150 m) from the nest. Other birds stayed on their nests until we were between 2 to 5 metres away. In some cases the mate stayed close to the brooding bird. The usual situation was, however, that the mate flew several hundred metres away, with its neck lowered. There were great differences in the birds "staying behaviour" between the different areas. In one area all the birds stayed longer on the nests than in the other areas.



A Brent Goose female was found dead by the nest. One egg was stuck in the cloaca and this was most probably the cause of death. Another goose was still brooding on the four eggs in the nest. The female weighted 1360 grams.

Moult: According to the station crew there are large numbers of geese (> 500 individuals) which are visible from the polar station (particularly in an area south-west of the station). Up to 200 geese directly gather around the station buildings. **Migration:** The geese leave the island during the latter part of September (approximately the 20th of September) according to the station crew.

Distribution on other islands in the Kara Sea: The species nested on *Ringnes Island* in 1994 and at least 20 individuals were observed during a short visit on the 3rd of July. Further information were received by telegrams from other polar-stations in the Kara Sea. *Uyedineniya:* The species nests on the island. *Ostrov Vize:* The species was not observed. *Heiberga:* The species does not nest on the station island, but approximately 50 pairs nest on a small island directly south of the station island.

4.4. IVORY GULL *Pagophila eburnea*

Numerous nesting birds were found at the Isthmus Camp and Bear Hill colonies. **Breeding population:** In total 752 brooding birds were recorded and distributed over four colonies (Figure 5). In addition there were a total of 70 empty nests in colony no. 2 and no. 3. Over 800 pairs of Ivory Gulls probably tried to nest on Troynoy during 1994. In total there were 6 colony localities recorded on the island, four of these were inhabited during 1994 (Table 5). The main concentration of nesting populations on the island were connected to three colonies (locality 1, 2 and 3) which were all close to the polar station (1994) (refer Table 5). In addition to these, there was only one inhabited colony in the high-water area on the western side of Long Lake, close to the old polar station. Colony locality no. 4 (refer Figure 5) was inhabited in 1992 and no. 6 has probably not been inhabited in the last two years. Approximately 30 pairs tried to nest at colony no. 5 in 1994 (as there were many new nests).

Table 5. Ivory Gull colonies on Troynoy.

Colony number	Locality	No. of nest with eggs, 1994	No. of nest without eggs, 1994	No. of adults in colony	Type of colony	Distance from Polar Station (km)	Comments
1	Isthmus Camp	22	150	55	A	1.9	1993: 122 adults 250 nests (17 with eggs)
2	Bear Hill, north	376	20+	570	B	2.2	About 700 adults and 300 nests in 1993 in one colony (Frantzen 1993)
3	Bear Hill, south	348	20+	650	B	1.4	
4	Polar Station	0	360	0	B	0.6	Occupied in 1992. Extent about 150x300 m (many small colonies)
5	Long Lake, west	6	47	24	A	4 (0.2 *)	Extent 200 m
6	Corner Lake	0	36	0	A	10	Extent 60 m
TOTAL		752		1321			

A= Drift wood Zone, beach, B= Tundra, inland and *= Old Polar Station

Breeding: Most of the birds nested within the colony, with a minimum distance of 30-150 cm from their "neighbour". Some pairs nested very close to the "nuclei-colony" (5 to 30 metres) from the edge of the colony. Egg predation appeared to be higher in the nests outside the colony itself. One pair nested solitarily and had their nest 215 metres east of colony no. 3. The nest had three eggs, but they were taken by Pomarine Skuas. Most of the brooding birds had their mate standing or sitting close to the nest. In some cases the mate had built an additional small nest close to the main nest. In one case there were two eggs in the "main nest" and one in the "mate nest". On the next survey check the egg in the "mate's nest" was gone. In colony no. 1 eggs were being laid throughout our stay (refer Table 6). The number of occupied nests and the number of actual eggs increased during the period, but this was probably a result of egg gathering by the station crew previous to our arrival. The number of brooding birds in the main colonies (no. 2 and 3) increased during our stay (Table 6).

Table 6. Number of brooding Ivory Gulls during the period between the 4th and the 16th of July in the respective colonies.

Date	Colony 1	Colony 2	Colony 3A	Colony 3B	Colony 4	Total
4. July	15	367	98	226	6*	712
16. July	22	376	116	232	6*	752

*= 12.July

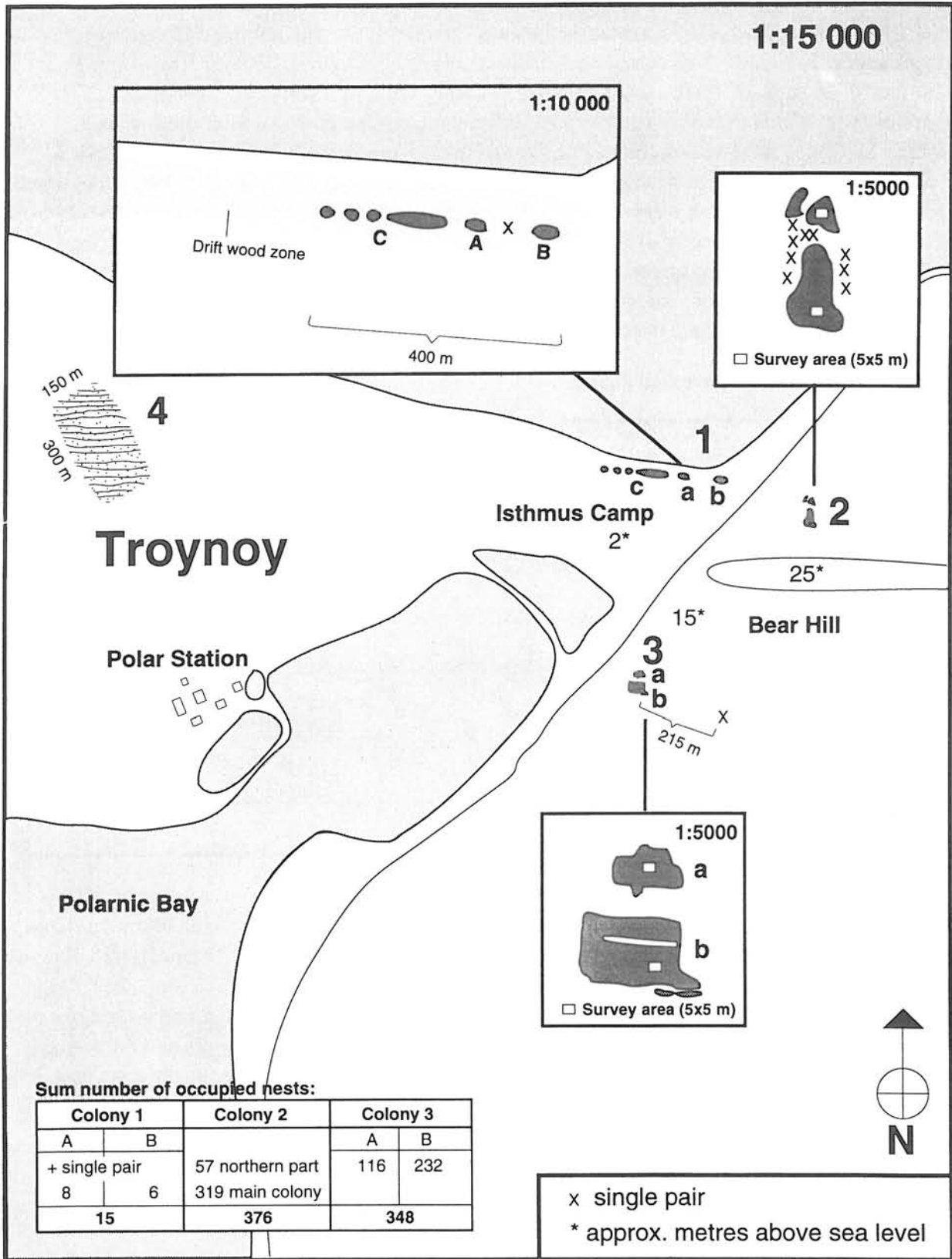


Figure 5. Map of the Ivory Gull colonies near the polar station.

Date of egg laying: Egg hatching took place in one nest on the night between the 16th and 17th of July. The nest was placed centrally in one part of the colony and consisted of a recently hatched chick, one egg was due to hatch and one had a crack (time 06:00 on the 17th of July). The eggs are incubated for 25 days (Cramp and Simmons 1983), which indicates that the first egg was laid on the 21st of June. The 20th of June was the first day when the average temperature was more than 0°C (refer Figure 2). A crack was also recorded in one of the eggs of a neighbouring nest. Colony no. 1, 2 and 3 were checked during the day of the 6th of July, without any sign of hatching being discovered. Ivory Gulls in colony no. 1 began their egg laying at a similar time to colony no. 2 and 3. This was confirmed by calculating the reciprocal average of the egg density (refer Table 7). *Clutch size:* 1.98 (n=692) (refer Table 8). *Egg size:* Length 59.95 mm (54.5-63.9), width 42.75 mm (39.7-45.4) and weight 56.4 grams (44-65). The average egg volume was larger for clutches with three eggs than for clutches of two or one egg (refer Table 7). *Nest density:* The shortest distance between nests was only 34 cm (measured from the outside edge of the nest-cup). But in general the distance was in the order of 40 to 60 cm. In colony no. 1 and no. 5 the density was lower than in colony no. 2 and no. 3. This is probably due to predation in colony no. 1 and no. 5. The average distance to the adjacent nests in the most densely occupied part of colony no. 1 was 2.25 metres (six nests). There were 0.9 unoccupied nests per m² in the densest part of colony no. 3 (refer Table 11).



The first Ivory Gull chick saw daylight on the 17th of July this year.

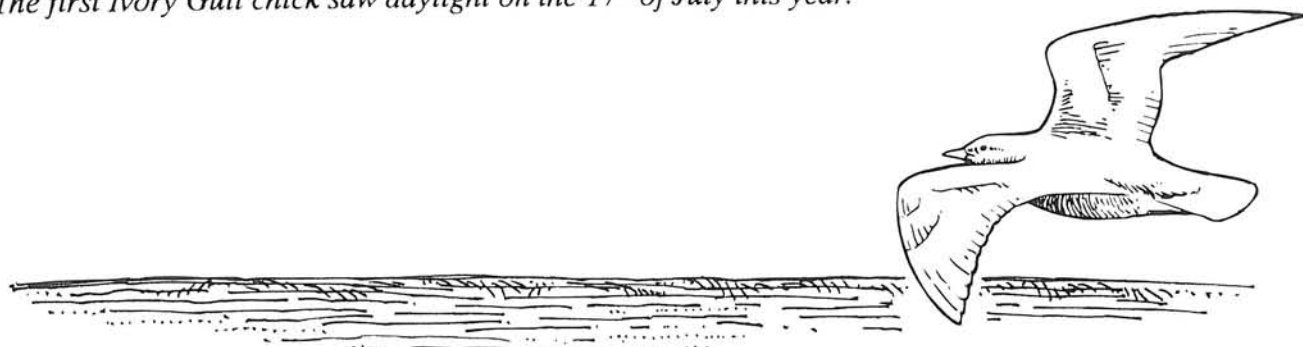


Table 7. Measurements of Ivory Gull eggs, by clutch size. Thirty eggs were measured in each colony.

Clutch size	Length (mm)	Width (mm)	Weight (g)	Volume	Density
1	59.95 (56–62.8)	42.16 (39.7–42.2)	54.35 (44–63)	55.35	0.91
2	59.65 (55.9–63.8)	42.80 (40.6–45.4)	56.45 (50–63)	56.03	1
3	60.26 (54.5–63.9)	43.29 (40.8–44.7)	58.5 (50–65)	57.65	1.02
Average	59.95 (54.5–63.9)	42.75 (39.7–45.4)	56.43 (44–65)	56.34	0.97

Table 8. Clutch sizes in the different colonies.

	Colony 1	Colony 1	Colony 2	Colony 3	Colony 5
Date	03.July	16.July	07.July	08.July	12.July
Empty nests	0	0	31	39	47
Nest with 1 egg	8	8	50(14.5%)	57(18%)	2
Nest with 2 eggs	7	14	234(67.5%)	217(68.5%)	4
Nest with 3 eggs	0	0	63(18%)	43(13.5%)	0
Total nests with eggs	15	22	347	317	6

Table 9. Physical measurements from eight Ivory Gull nests in colony number 2.

Nest number	Diameter of outer nest (cm)	Diameter of nest-cup (cm)	Height of nest-cup (cm)	Total nest height (cm)
1	75	19	8	18
2	45	18	7	8
3	40	18	7	8
4	48	18	7	13
5	50	18	7	16
6	37	17	7	7
7	48	19	7	13
8	16	17	6	7
Average	45	18	7	11

Nest size and nest construction materials: The nests were of very similar construction both in size and material. The variations were greatest in relation to their outer diameter and nest height (refer Table 9). The nests were largely constructed of mosses and occasionally feathers. Some nests were particularly different in regard to their construction materials. One nest had a very large amount

of bear hairs, one had bits of white lichen, one had short sedge plants and one had a large quantity of feathers.

Measurements: Biometric measurements were taken of 110 individual birds. *Wing length:* 349.1 mm (319-368), *1-beak length* (refer Figure 6) 36.3 mm (31.3-40.4), *2-beak height* 13.59 mm (11.7-15.4), *3-beak height* 12.1 mm (10.5-14.1), *4-nose to beak tip* 17.8 mm (15.0-19.7), *5-head plus beak* 94.7 mm (86.1-101.4), *6-tars plus toe* 85.5 mm (74-93), *7-tarsus plus toe with nail* 91.9 mm (82-100) and weight 590 grams (445-710). The highest weight given by Cramp and Simmons (1983) is 687 grams. A recently dead starved female with a broken egg in the oviduct, weighted 510 grams. *Flight pattern:* Small flocks of 10 to 20 individuals arrived at the colonies, at the same time. The continual flight of single birds in the colony area made the flight pattern a bit diffuse. The brooding individuals who were released from their brooding, went down on the ice just below the colony, where they washed in the surface water on the ice. Several small flocks were seen arriving at the colony from the south.

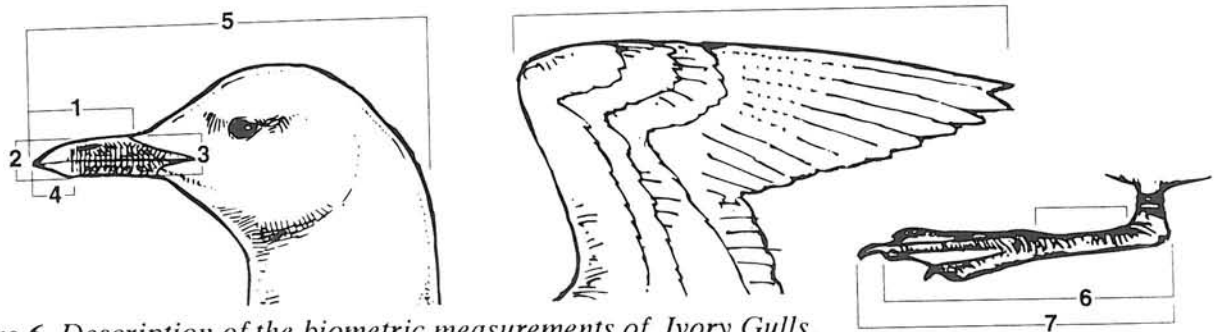
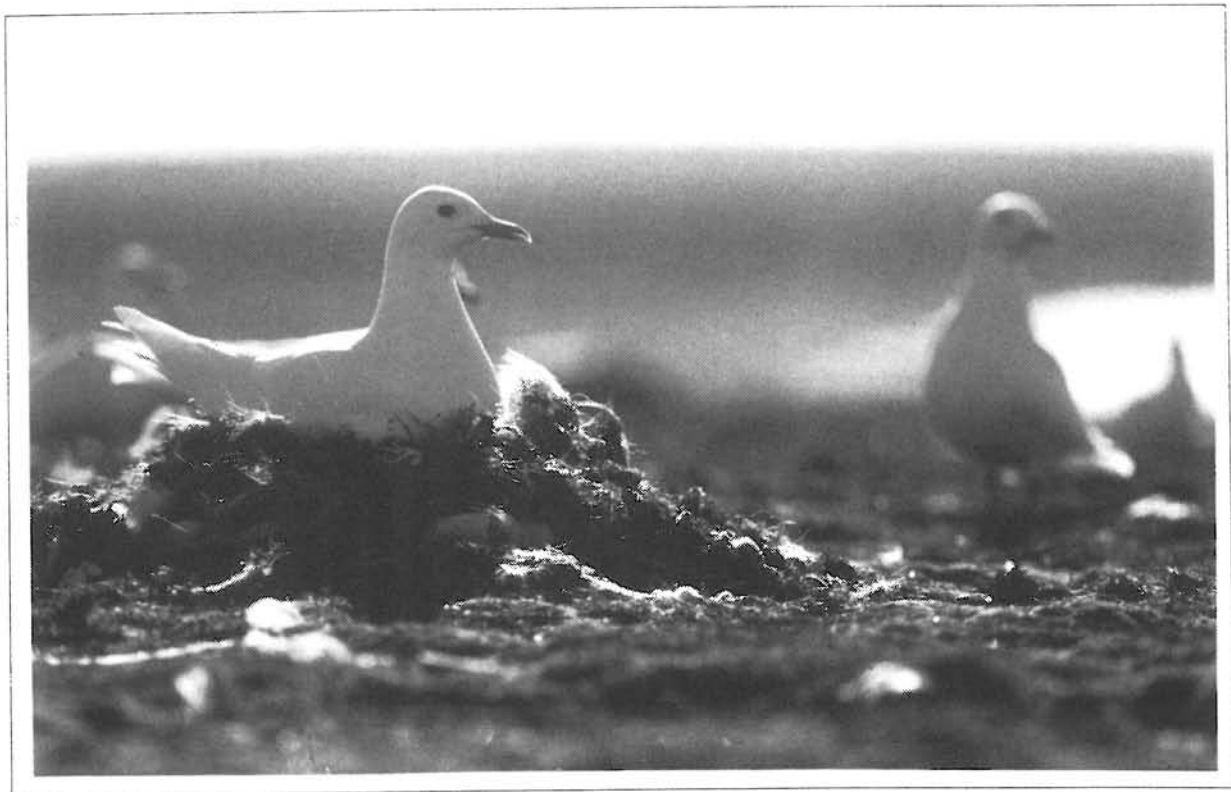


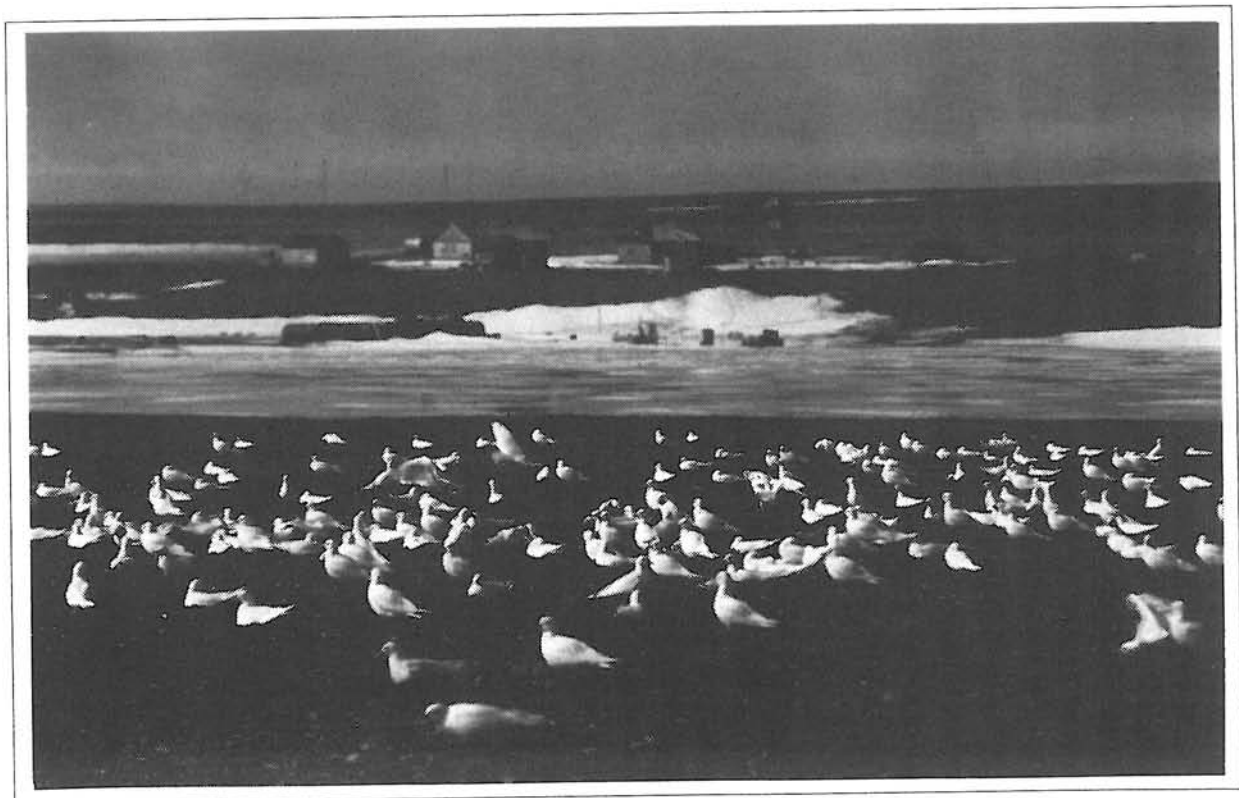
Figure 6. Description of the biometric measurements of Ivory Gulls.



Ivory Gull nest built with a large amount of hair from Polar Bear.



Ivory Gull colony number 2.



Ivory Gull colony number 3, with the polar station in the background.

Disturbances: At the initial human approach towards a colony, at the distance of approximately 20-30 metres, about 1/3 of the birds always took flight, and made a short round over the colony before landing and calling loudly. The birds flew away at a greater distance when we flew over with a helicopter, but in this case they were quicker to return. The remaining birds stayed much longer and it was only the nearest ones who left their nests when visitors approached the colony.

Plumage: 100 birds were investigated for their plumage characteristics. The colour distribution on the beak of birds with brooding spots had the following colour distribution: 48% yellow, 27% pale yellow, 12% pale orange, 6% strong orange, 3% very pale and 3% white. Immature birds (n=4) had black or brown orbitals. No sub adult individuals were recorded in the colonies.

Moulting of immature birds: Juveniles: In addition to four young birds which were caught on bait, only two other young birds were observed during the stay. In addition one individual was observed on the ice, the bird had adult plumage - but one could still see some dark feathers by the beak (refer Table 10). After a period of trapping the birds with a flap net and bait, the Ivory Gulls started to become cautious and more difficult to trap. During this trapping exercise four juvenile birds were captured.

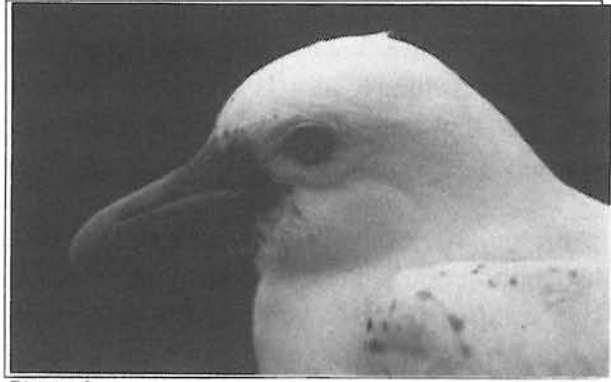
Table 10. Moulting pattern of the juvenile Ivory Gulls on the 11th of July. The feather development on the wing. 100% old primary black tip = 0 point (p), 100% new all over totally white primary = 50 p, code for the single primary feather: 0=old feather, 1=feather shaft without feathers, 2= < 1/3 full sized, 3= 1/3-2/3 full sized, 4= > 2/3 full sized and 5=full sized. All the individuals had pale yellow beaks, dark feathers by the start of the beak and missing brood patches.

Individual (ring number)	Orbital	Moult points	Number of greater primary coverts with black tip	Weight (g)	Wing (mm)
Nr. 1 – 6155644	Black	50p	2	545	345
Nr. 2 – 6155669	Brown	45p	1	535	353
Nr. 3 – 6155669	Black	45p	1	565	342
Nr. 4 – 6155687	Black	29p	4	585	337
Nr. 5 *	–	29p			

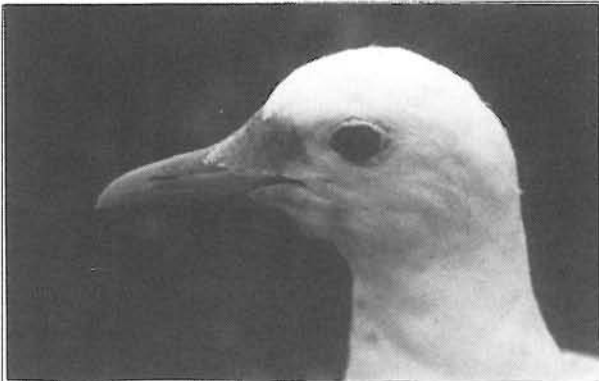
* = The three tail feathers in the middle were new and had no black tip. The individual was photographed in the air, near colony no. 1.



Picture 1



Picture 2

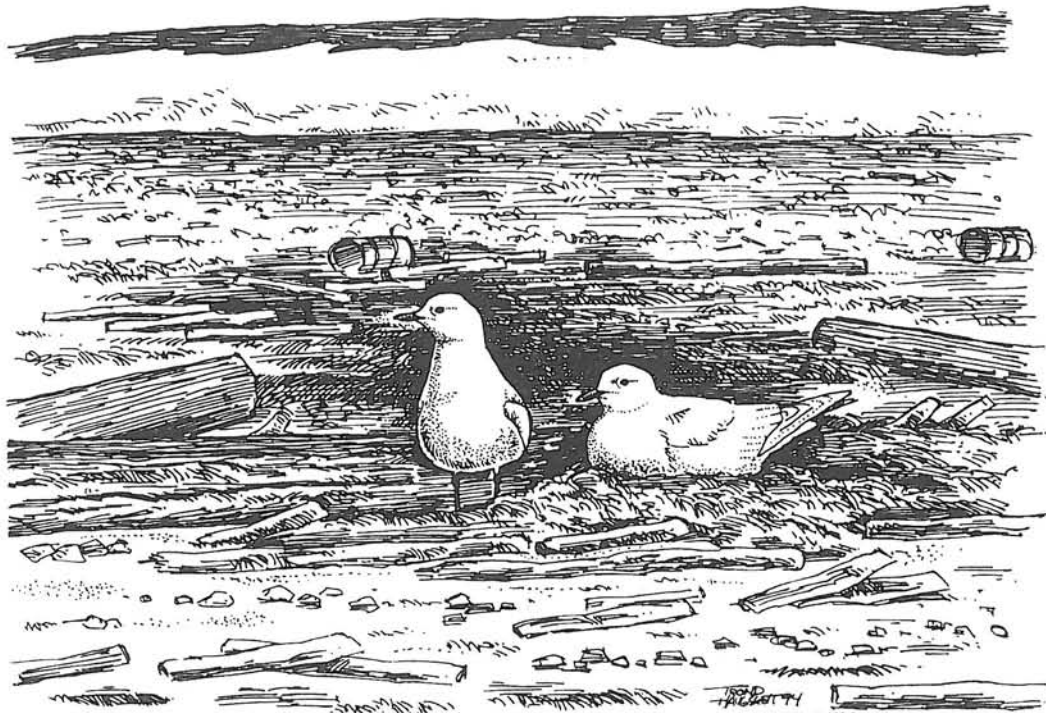


Picture 3



Picture 4

Picture 1 and 2 refer to bird no. 2, picture 3 refer to bird no. 3 and picture 4 refer to bird no. 4 in Table 10.



A single pair of Ivory Gull on Isthmus Camp.

Food: Very few of the birds that were captured with the flap net, threw up the stomach contents. In four cases there were pieces of approximately 10-15 cm long "Polar Cod" or similar fish regurgitated. Identical fish were considerably more common in regurgitations among the birds that were caught inside the colonies. In one case a Ivory Gull was observed as it caught a fish of 15-20 cm, from the sea beyond Cape Gull. Faeces from more or less all the birds with brooding patches, were of the similar light solution of green or green-yellow fluid. The faeces of a one-year old bird was more firm and black.

Quadrats: Four quadrats were created, two in colony no. 2 and two in colony no. 3 respectively. The quadrats were 5x5 metres each, and were placed in the areas with the highest nest density. The fields were marked with a stick (on which the field number was inscribed) and a flat stone placed at each corner. The fields are shown in Figure 5, and the survey is listed in Table 11. The number of nests and eggs were stable in all the quadrats from the 8th to the 16th of July, except from in quadrat 1, where a new nest appeared during the period, which contained two eggs.

Table 11. Number of nests and nest density in the quadrats.

Survey area	Colony	Nest with 1 egg	Nest with 2 eggs	Nest with 3 eggs	Total number of nests in survey area	Number of pairs per m ²
I	2		4	3	7	0.28
II	2		6	6	12	0.48
III	3A		9	5	14	0.56
IV	3B	3	12	7	22	0.88

Predation: The station crew collects eggs from the Ivory Gull colonies every year. They picked around 30 eggs in colony no. 1 in the last week of June. Several of the birds started to brood new eggs in the period from the 3rd to the 16th of July (refer Table 6). Egg collection was even more widespread earlier, when the crew numbers in the polar stations were higher. In 1992 a Polar Bear had residence in the Ivory Gull colony no. 4, and ruined the nesting season for most of the pairs (told by the station crew). Predation of eggs and chicks by Polar Bears is probably the largest single threat, but also the Pomarine Skuas and Glaucous Gulls are important predators of eggs and chicks. Some years the climate can be the reason for a low nesting success. A fresh body of a Ivory Gull female was found in colony no. 1, it was immediately being attacked by its fellow gulls. The largest number of nesting Ivory Gulls were found in the colonies closest to the polar station. The reason for this is probably that the gulls reduce their chance of predation by Polar Bears. A polar bear very rarely approaches the polar station in the summer months. Two dogs stayed at the polar station, and they were observed by the Ivory Gulls in colony no. 2, and traces in the sand showed that the dogs had also visited colony no. 1. The dogs, most probably, steal eggs from the colonies.

Breeding population on other islands in the Kara Sea: The information was received by telegram from the polar stations on the respective islands. *Vedineniya* (north of Troynoy) no nesting. *Ostrov Vize:* Two colonies with at least 200 pairs. *Heiberga:* Approximately 100 pairs. In addition comes 13 traditional nesting localities on Severnaya Zemlya, several of these are smaller colonies with a total estimate of less than 1000 pairs. The largest colony (approximately 700 pairs) is situated

on flatland on Domashny Island which is part of the Sedov-Archipelago Islands in the western parts of Severnaya Zemlya (de Korte and Volkov 1993 and de Korte et. al. In press).

Ringing and trapping methods: In total 200 Ivory Gulls were ringed (Stavanger Museum, Norway 6155601-6155800); 196 adults and four sub adults. 99 of these were given individual colour rings (three colours and a metal-ring in combination). The colour marked individuals were measured and their plumage characteristics were recorded. In total 78 of the colour-marked individuals were trapped using the flap net between colony no. 1 and no. 2, and by the polar station. The other 21 colour-marked birds were trapped while still lying on their nests with the use of a "cage-trap" or snare. More or less all of the 101 individuals that were ringed without colour-rings, were caught in colony no. 2 and no. 3, either with a head-snare or with the "cage-trap" over the nest. Three individuals had Russian rings. Two of these, had the following ring numbers: EB 372600 (colony no. 2) and EB 372545 (colony no. 3). The birds had a ring of poor quality aluminium, plus a red coloured ring on the opposite foot. These birds was ringed by the scientific expedition in 1992 led by E. Syroechkovski Jr.

The best trapping method for Ivory Gull, was to put food in a bag (fat from a seal), and then catch them with the flap net. The trapping of specific individuals within the colony was done most successfully by using a "cage-trap" over the nest. Some of the brooding Ivory Gulls stayed for a long time on their nests, and were therefore easy to catch by snare-pole.



Trapping of Ivory Gulls in colony no. 2, by the use of a snare.



Trapping of Ivory Gulls by using an flap net. Here nine individuals have been trapped.

4.5 MAMMALS ON TROYNOY

Arctic Fox *Alopex lagopus*

The species resided on and around the island in the winter months. No animals or fresh traces were observed during our stay. The station crew informed us that it is not unusual to see Arctic Foxes on the island during the summer months. See chapter 5.1., "Traditional trapping in relationship to the polar stations" for further details. A great quantity of carcasses and bones of Arctic Fox were found all around the island.

Polar Bear *Ursus maritimus*

Common on the ice surrounding the island. Five different individuals were seen during our stay, plus many fresh traces. See chapter 5.1. "Traditional trapping in relationship to the polar stations". The station crew informed us that reproduction is taking place, they have observed cubs twice in the area just east of the polar station. The last observation was on the 3rd of March 1992, when a female gave birth to two cubs, but all died (refer chapter 5.1.). The remains of a body of a one year old cub was found on Cape Fifty. It must have died during the previous winter.

Ringed Seal *Phoca hispida*

Common on the ice on the northern side of the island during the period of 4th to the 8th of July. Over 360 animals were counted at Isthmus Camp on the 4th of July. Over 400 animals lay on the ice between Isthmus Camp and Kittiwake Cliff on the 5th of July. Most of them disappeared on the 9th of July when the ice begun to break up just north of Isthmus Camp. A few animals were seen on the ice on the southern side of the island.

Unidentified Seal (probably **Bearded Seal** *Erignathus barbatus*)

Some seals were recorded which appeared larger than the Ringed Seal, but because of the great distance it was difficult to identify the species.

Beluga Whale *Delphinapterus leucas*

Over one hundred animals were sighted where the ice had begun to break up, north of Isthmus Camp and Cape Gull on the 8th and 9th of July. We observed both pods of young whales and sub adult individuals, plus pods with only adults.

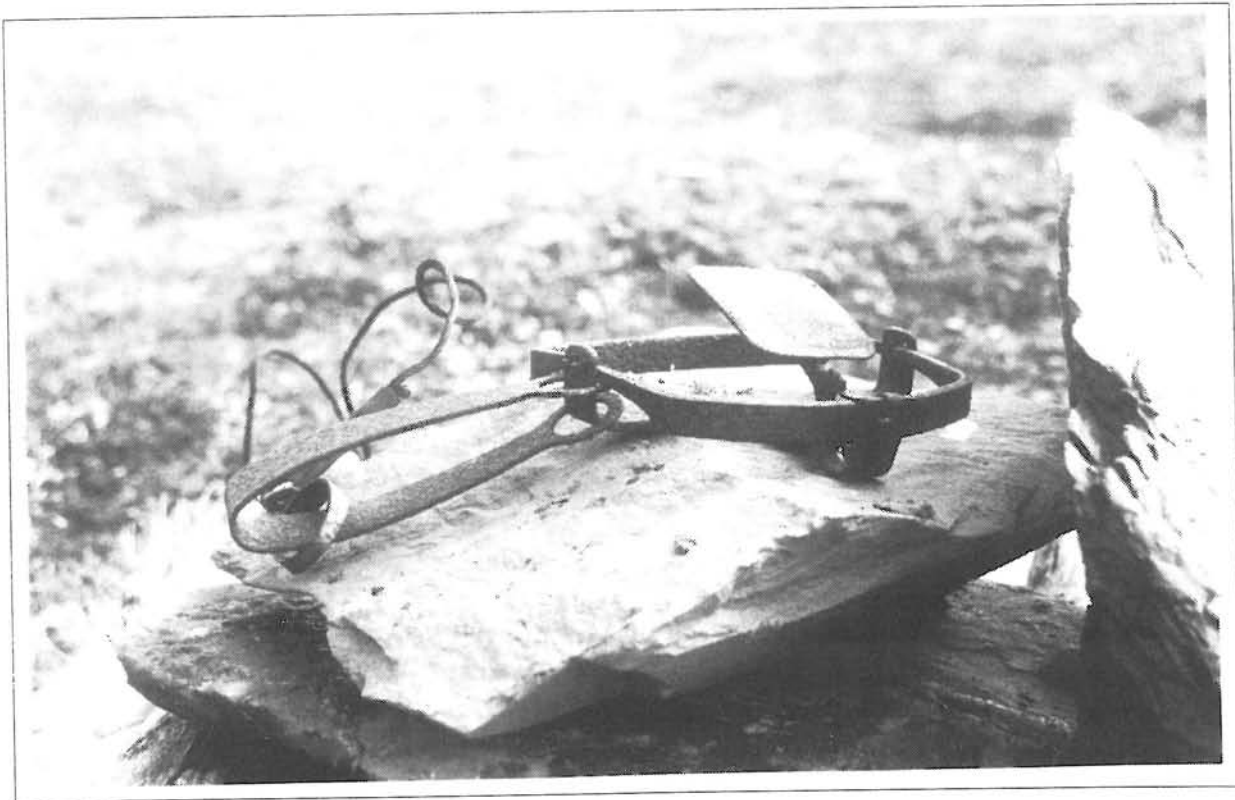
5. HUNTING AND TRAPPING

5.1 TRADITIONAL TRAPPING IN RELATIONSHIP TO THE POLAR STATIONS

It is usual that the station crew on the polar stations trap in addition to their work at the station. Trapping of Arctic Fox is mainly undertaken in the period between October to March. In the summer months Brent Geese are hunted, and they collect eggs both from geese and Ivory Gulls. In those cases where a Polar Bear is shot, the skin is sold, while the meat is used domestically. Sometimes seals are taken for dog-food and as bait for the fox traps. Because of Russia's difficult economy, several stations have closed over the past few years. In the stations that are still operating the crew size is much reduced. This has led to less leisure time for the employed. Fuel has also been reduced, and this has meant that hunting and trapping has also been reduced tremendously compared to earlier times.

Arctic Fox

Arctic Fox trapping is the most important trapping activity on Troynoy. The Arctic Fox is the only terrestrial mammal on Troynoy. The fox is hunted using gin-traps. The traps are spread all along the coastline and on obvious hills across the terrain, but often at a distance of approximately 400 metres.

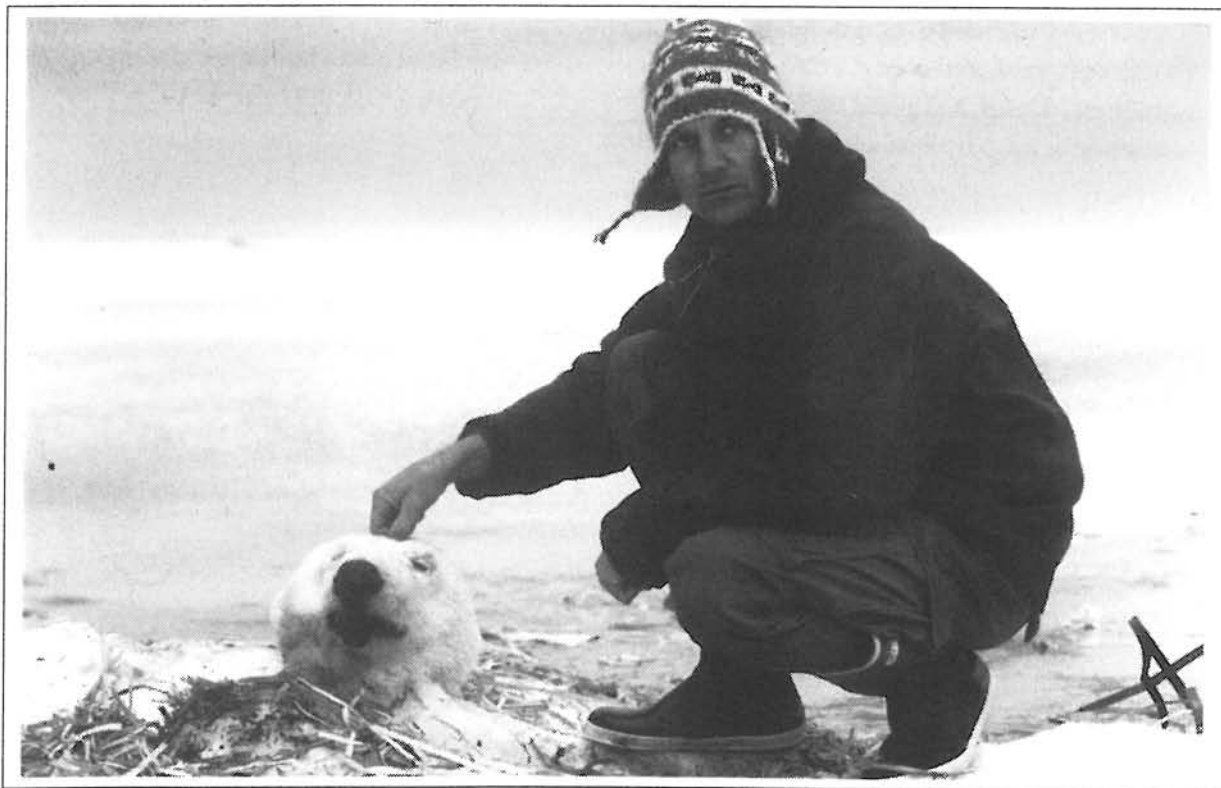


A gin-trap being used to trap Arctic Fox on Troynoy.

In total there are approximately 170 traps. Snow-scooters are used to check the traps. This is done twice a week. If there is too much time between checks of the traps, the fox may eat off its own foot and escape, or it may die of exhaustion. Trapped animals are sometimes also eaten by fox or bears. During the winter season of 1993-94, 54 Arctic Fox were trapped at Troynoy.

Polar Bear

Most of the polar stations in the Kara Sea lie in an area where the bear is active throughout the year. It is prohibited to shoot bears, but as they can be a threat to human beings some are shot in self-defence. The fur is highly sought after as a souvenir both among the Russians and other nationalities, as a symbol of the Arctic. The crew at Troynoy meet bears throughout the year, but they are sighted most often in late July and during the whole of August. This occurs when the ice is breaking up, and some stay around the island, especially in the large bays. Large numbers of seals also gather together here, and this again attracts the bears. During this period the bears have enough food, and are therefore an insignificant threat to the crew at the polar station. In the winter, however, bears may visit the polar station in search of food. In 1992 the kitchen staff observed approximately 20 bears in Polarnic Bay. This observation was in late July. Comments were made that because of the diesel-generators running all day long, throughout the year, fewer bears are being observed around the houses. We found in total 15 bear carcasses on the island. Most of them were old and were lying close to the station.



The carcass of a Polar Bear was found out on the ice, north of Isthmus Camp. It had been shot the previous winter.

Many of the carcasses which lay around the station had their fur. The crew admitted that they shoot, on average, one bear every year in self-defence. Through conversations with the people at the station, we got the impression that they had a generally negative attitude towards the bears. We were told that the bear is aggressive, dangerous to humans and very hard to scare away even with distress

flare. One of the station crew stated that the flares had no scaring effect on the bears. The bears have on some occasions either played with the burning flare as it spins and jumps around in the snow, or not taken notice of it at all. Only in some cases where the flare has stuck to the fur has the bear been scared. The station crew felt that it was more effective to shoot the bear in the leg with a rifle of small calibre, as they believed that such a wound will make the bear afraid of humans for the rest of their life.

Two females have been observed denning on the island. This probably happens nearly every year. On the 3rd of March 1992, the station crew on Troynoy found a den approximately one km west of the "end of snowplots" in the drift snow. The female had two cubs, but she was sick. They noticed blood traces in the snow and presumed that there had been complications with the birth. Outside the den they found the female lying on her side not moving, but still awake. For two days they fed the cubs with milk from a bottle, and in addition tried to give the female food. The female managed to move back into the den and due to bad weather the crew were unable to follow up the situation. When the snow melted they found all three bears dead.

Brent Goose

Brent Geese are often hunted (also during spring time). Many used cartridges were found in the area. Several "decoy-geese" were put up to attract attention to two places close to the station. Brent Geese are said to be a delicatessen among the crew. The geese gather in large flocks in the moulting period, and become easy targets. Many stories were told about hunting and trapping; one in particular, where 200 geese were trapped in one hour and beaten to death by a ski pole. This happened at the Nordensheld Arkhipelag station.



"Decoy geese" being used for hunting geese. The picture is from Dikson Land.

Egg collecting

The crew collects eggs from both Brent Geese and Ivory Gulls to supplement their diet.

5.2 TRADITIONAL TRAPPING IN RELATIONSHIP TO HUNTERS AND THE POPULATION IN DIKSON

Arctic Fox is mainly hunted on the mainland. There are six official trapping stations inside the Great Arctic Reserve. The hunters who live in the trapping-huts can have between 700 and 1000 foot-traps each. The hunting-season lasts from October to March, but approximately 75% of the trapping is undertaken in the period from November to December, and from the middle of February to March. The record from 1983 is 850 Arctic Foxes caught by one trapper. This form of trapping, over large areas, requires the use of a tractor. One can also find trappers who live and operate from Dikson. We observed some "decoy-geese" around Dikson. A Polar Bear was also seen in the area around Dikson during the winter. However there is reason to believe that it was seen as a threat and shot.

6. MANAGEMENT OF GAME ANIMALS AND THE ENVIRONMENT

6.1 GAME RESOURCES

Troynoy is rich in game animals throughout most of the year. This makes the potential to obtain a reasonable take, more easy to achieve. The most important contribution to the diet are birds eggs in June and July and goose meat the rest of the summer (Table 12). Polar Bears that are shot, are also eaten.

Table 12. Traditional hunting and trapping on Troynoy. X=Utilised to a small scale, XX=Utilised to a larger extent and O=not utilised at all.

Species	Household needs		Feathers	Fur and skins	Food for dogs
	Meat	Egg			
Brent Goose	XX	X	O		
Glaucous Gull	O	X			
Herring Gull	O	X			
Ivory Gull		XX			X(XX?)*
Arctic Tern		X			X*
Arctic Fox				XX	
Ringed Seal					XX
Polar Bear	X			X	

* = Dogs are loose for periods and take bird eggs. Dogs were observed in the Ivory Gull colonies and traces of the dogs were recorded in the Tern colony on Isthmus Camp

6.2 THOUGHTS ON MANAGEMENT FOR HUNTING AND TRAPPING

Several game species on Troynoy are adapted to extreme Arctic conditions. Any changes in the environment can have severe impacts on them. Some years, due to weather conditions the birds arrive late, and may not have the chance to breed successfully at all during that season. These populations are vulnerable, because any further stresses or disturbances to them will add to the natural conditions which already limit their lives. Some species are common on Troynoy, but on a wider scale they may be rare or endangered. Following are some personal thoughts relating to the management of hunting and trapping in the area, taking into account that the island is part of a strict nature reserve (Zapovednik).

If it is not possible to eliminate hunting and trapping totally within the reserve or on the island, it should be a condition that harvesting is only allowed for the staff of the polar station for subsistence reasons. The number of species involved should be limited to the most common, and must be managed so that harvesting does not lead to a decline in the local populations. Within this framework at least the following restrictions should be followed:

Egg collection: This should take place at a modest level being limited to Herring Gulls and Glaucous Gulls only. Harvesting the local Ivory Gull colonies can not be justified as too little is known about the breeding ecology of this globally rare species.

Trapping methods for Arctic Fox: Gin-traps should be replaced by trapping-methods which are more efficient and humane.

Trapping of Polar Bear: The letter of the law should be enforced. There are unfortunately too many bears being shot in "self-defence".

Hunting of Brent Goose: Goose-hunting should only be allowed after the breeding and moulting season.

Snowy Owl: Total protection. This from the experience gained concerning the negative impact of hunting in North-Scandinavia.

Ringed Seal: Hunting should only be allowed for the staff of the Polar Station for feeding the inhabitants.

6.3 OBSERVATIONS RELATING TO POLLUTION AND MOTORISED TRAFFIC IN THE TERRAIN

The pollution in the areas where people are living is tremendous. This means generally around the polar stations and the trapping-huts. It is very energy-consuming and it put great demands on technical installations to maintain an active polar station. All electricity is obtained from several large diesel generators, and all the heating is obtained by diesel combustion. The diesel is stored in barrels and large tanks. The barrels arrive by the hundreds on boats during the summer months and are stored unsystematically outside the stations directly on the ground. Many stay and rust, even if they are full of diesel. Empty barrels are not being taken away. The crew of most of the stations undertake trapping activities in their spare time, and for this they use snow-scooters. It is therefore usual to place depots over large areas. All technical equipment which is exhausted, such as the diesel generators, tractors and other instruments, are just left outside and dumped close to the stations. In addition household packaging, sewage, plastic and glass is dumped.

The crew stated that the polar station on Troynoy, was the cleanest one in the Kara Sea. The station is still very polluted. A large number of oil barrels can be found lying around the station. Down by the lake, 50 metres away from the station, are the main supply tanks, five in total. These are placed down on the beach close to the water edge. Oil is being pumped from here up into a day-tank which again supplies the generators. We did not record any direct leakage around the tanks or the generators, but one could smell oil and this indicated that there was some leakage. The station's dump is approximately 150 metres south of the buildings, close to the sea. Everything from household materials such as cans, paper and large amounts of glass are being dumped here. All the technical instruments and broken machines are also dumped there. Old motors, tractors and sledges are found lying around the station. Due to the climatic and permafrost conditions, is it impossible to solve the dumping problems by burying it in the ground. A large quantity of the rubbish is therefore moved on to the ice to await the summer, when it disappears into the sea.

One to two professional hunters hunt and fish the year around, and they live in the hunting-huts on the mainland. They use a so called "tractor-car" (a heavy vehicle with belts) in their daily work. One also finds many empty oil barrels which relate to their depots. The most obvious pollution, and a direct threat to the natural environment, are the many tractor tracks all over the island, but the concentration being greatest along the coastline.



Motor tracks in the tundra, Troynoy, a result of driving with the "tractor-car".



Large amounts of dumped instruments, motors and other rubbish along the beach by the station.

7. THE POLAR STATIONS IN NORTH-WEST TAYMYR

During the last few years the upheavals in Russia have had a negative impact on the Russian economy. This has led to Russian involvement in the Arctic being neglected. There are few polar stations in the Kara Sea today which are still at full capacity. Two stations are temporarily closed (Ust-Taymyra and Island Isachenko), while Island Pravda and Island Russki are planning to close down as soon as possible. There are 9 polar stations in the Kara Sea (Figure 7). All except for Ostrov Vize, are based within the Great Arctic Reserve.

The first polar station was established in 1934 on the island of Uedineniya. The station on Troynoy has been running since 1953. It consists of 5 buildings, 3 are used daily, the main building, containing a workshop and a generator and sauna. The other 2 buildings are useless due to leaks and rotting construction. The main building consist of 4 large bedrooms, a living room, kitchen, technical room and toilet. All the fresh-water supplies are from melt-water and are being kept in halved oil-barrels. The generator produces 220 V, which provides the station with light and runs the instruments. Heating is by a diesel fired central oven. At present four to six people work there during winter, during the summer months there are only 2 people who each take 12 hour shifts. The highest number of people that have been employed there are 11. The polar stations in the Kara Sea are a resource which could provide a good base for scientific work. As the situation is today, the stations will probably be closed. The polar station on Troynoy will probably close when the present oil-reserves on the island have been exhausted.

From our observations on Troynoy we feel strongly that if there should be a role for the continuence of the polar stations, then their management must be integrated into the stated purpose of the Great Arctic Reserve.

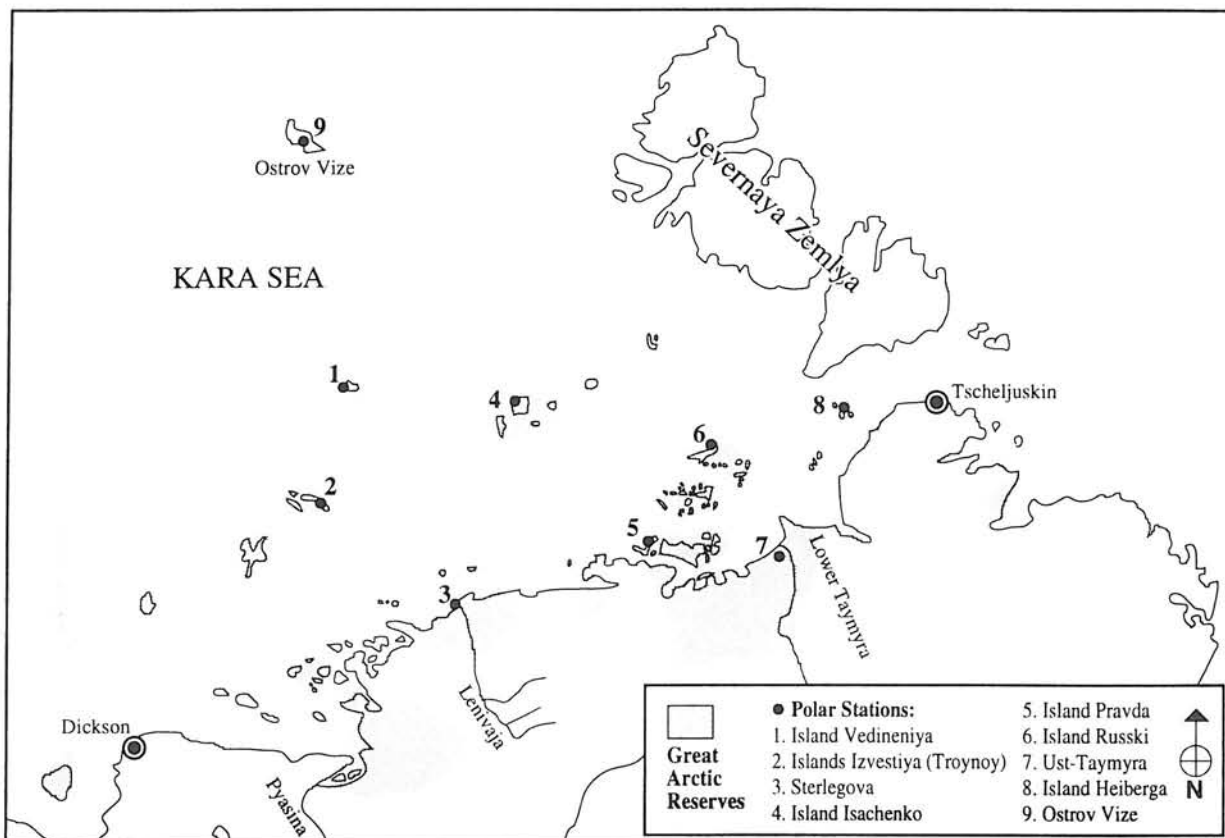


Figure 7. The polar stations in the Kara Sea.

8. LITERATURE

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9. APPENDICES

9.1 ORNITHOLOGICAL RECORDINGS FROM DIKSON ISLAND

During the transit visit on Dikson Island (Ostrov Dikson) on the 18th of July, we recorded fauna in the areas surrounding the community (also on the opposite side of the bay). The observation conditions were favourable (no wind, sunny and warm). Participants:

Georg Bangjord, Rune Korshavn, Kjell Mork, Rune L. Holstad and Ståle Sætre. The following observations were made:

Brent Goose *Branta bernicla*: Six individuals flew over the airport towards the west on the 3rd of July.

Stellers Eider *Polysticta stelleri*: Three males and four females were observed in a flock by the bay close to the community.

Ptarmigan *Lagopus mutus*: One male, plus one female with at least four chicks flying.

Rough-legged Buzzard *Bufo lagopus*: One pair nesting in the hills just west of the airport. The nest contained five eggs (one of the eggs was being incubated), plus one individual.

Ringed Plover *Charadrius hiaticula*: Common nesting bird. Minimum ten pairs. One pair with small chicks was observed.

Pacific Golden Plover *Pluvialis fulva*: Common nesting bird. Minimum 12 territories. Two nests were checked, both had three eggs and one recently hatched egg. Eggbiometry (n=6.2 clutch), length 47.1 mm (45.0-48.7) and width 32.4 mm (31.45-33.14).

Dunlin *Calidris alpina*: One individual passing by.

Little Stint *Calidris minuta*: Common nesting bird. Minimum ten individuals were recorded (several had nesting behaviour). One clutch of four eggs was measured: Length 28.8 mm (28.23-29.58) and width 20.5 mm (20.28-20.9).

Temminck's Stint *Calidris temminckii*: Three individuals in total. Two of these had migration tendencies.

Turnstone *Arenaria interpres*: Common nesting bird. At least 15 pairs.

Arctic Skua *Stercorarius parasiticus*: Six light coloured individuals.

Long-tailed Skua *Stercorarius longicaudus*: Two pairs were found nesting. One of the pairs was brooding two eggs.

Arctic Tern *Sterna paradisaea*: Two individuals observed.

Snowy Owl *Nyctea scandiaca*: At least 6 adult birds were recorded. One pair had a nest with 5 chicks and two infertile eggs. The oldest chicks had already left the nest. The nest was located approximately 1 km from the town centre. The egg biometry of the two infertile eggs were: 54.35 x 43.64 mm and 57.96 x 43.5 mm.

Shore Lark *Eremophila alpestris*: Relatively common nesting bird. Approximately ten individuals were observed. Several chicks capable of flying were observed, plus a nest with three eggs. Egg size (mm): 23.08 x 15.84, 22.72 x 15.84 and 23.72 x 15.98.

Red-throated Pipit *Anthus cervinus*: Common nesting bird. Minimum eight pairs. Most of them were observed carrying food.

White Wagtail *Motacilla alba*: One pair feeding.

Bluethroat *Luscinia svecica*: One male carrying food.

Redpoll *Carduelis flammea*: Four individuals.

Lapland Bunting *Calcarius lapponicus*: Common nesting bird. At least 30 pairs (several individuals were observed carrying food).

Snow Bunting *Plectrophenax nivalis*: Very common nesting bird. Many chicks capable of flying.

MAMMALS

Stoat *Mustela erminea*: Two individuals.

Collared Lemming *Dicrostonyx torquatus*: One individual was found dead in a Snowy Owl nest.

Ringed Seal *Phoca hispida*: One individual on a ice-flow in the bay by the community.

Beluga Whale *Delphinapterus leucas*: Several hundred individuals were observed in the bay just beyond the town.

9.2 ORNITHOLOGICAL RECORDINGS FROM RINGNES ISLAND

Ringnes Island (Ostrov Ringnes) 75 57' 5"N 82 27'9"E. In the following we present some of the observations we made during our 30 minute visit to Ringnes Island. We arrived by helicopter at 02:55 on the 3rd of July, and landed close to a cairn on the north-eastern side of the island. We flew over the island at a low height afterwards. The island appeared to consist mainly of light coarsely crystalline granite. Large areas of the island were comprised of boulder fields and only small patches of vegetation were present on the flat parts in the middle of the island. There were very good views and favourable conditions for observations. *Records of birds*: On the north-eastern edge of the island we found a colony of Arctic Terns with at least 40 individuals and one pair of Glaucous Gulls. Additional observations were made from a helicopter during a single flight, and these records must be considered unsatisfactory. On the vegetated parts of the island, approximately 20 Brent Geese took to their wings when we approached. There are probably many more geese on the island. We observed at least 6 Herring Gulls, 10 individual Glaucous Gulls and 40 individuals of Black Guillemot.



Ringnes Island seen from the north.

9.3 GENERAL OBSERVATIONS ON THE JOURNEY BETWEEN DIKSON AND MYS STERLAGOVA

A one hour stop on the large waterbodies just east of Ostrov Kolosovykh (approximately 74 50'N 88 05'). The observation conditions were favourable. The water was more or less covered with ice, but had a few cracks along the waters edge. Bird observations: Yellow-billed Diver *Gavia adamsii* one pair, Long-tailed Duck *Clangula hyemalis*, singing Knot *Calidris canutus* and Shore Lark *Eremophila alpestris*.

Otherwise the following observations made from the helicopter should be mentioned: Snowy Owl 50-80 (several near their nests), reindeer 4, large flocks of geese and skuas, plus approximately 30 Stellers Eider near the water-system between Uboynaya and the Pyasina delta.

9.4 IVORY GULL BIOMETRY

Table 13. Biometry of 99 ringed Ivory Gulls.

Ring-number (Stav. Mus. Norway)	Colour left foot	Colour right foot	Date	Time	Loc- ation	Age	Orbi- -tal	Col- our end of bill	Brood- pouch	Length of ring (mm)	1. Length of bill (mm)	2. Height of bill (mm)	3. Height of bill (mm)	4. Bill (mm)	5. Head and bill (mm)	Weight (gram)	Tarsus and toe without nail (mm)	Metod of capture
6155601	MW	RR	7.7	12.00	2	AD	O	PO	YES	352	39.4	14.7	11.9	18.8	100	640	93	SR
6155602	MW	RY	7.7	22.00	ST	AD	O	Y	YES	357	39.2	14.8	12.9	18.1	95.3	580	80	N
6155603	MW	RG	7.7	22.00	ST	AD	O	Y	YES	360	38.1	15.4	13.1	17.7	95.3	640	89	N
6155604	MW	RO	8.7	17.45	2	AD	PO	Y	YES	335	34.1	12.7	11.5	17.5	89.7	595	80	SR
6155605	MW	RB	8.7	18.00	2	AD	SO	Y	YES	344	35.2	12.9	11.3	17.0	93.1	570	82	SR
6155606	MW	RW	8.7	18.00	2	AD	SO	PO	YES	344	35.6	13.0	12.1	17.4	92.4	600	83	SR
6155607	MW	RBL	8.7	18.00	2	AD	O	Y	YES	342	34.4	12.4	11.5	17.4	88.4	540		SR
6155608	MW	YY	8.7	18.00	2	AD	O	Y	YES	344	33.3	13.0	11.2	16.9	90.7	580	81	SR
6155609	MW	YG	8.7	19.00	2	AD	PO	PO	YES	337	34.4	13.1	11.3	16.5	90.1	555	79	SR
6155610	MW	YO	8.7	19.00	2	AD	O	PO	YES	352	36.8	14.0	12.5	17.4	97.0	660	87	SR
6155611	MW	YB	8.7	19.00	2	AD	O	SY	YES	360	35.6	13.4	12.1	17.5	98.9	640		SR
6155612	MW	YW	8.7	19.00	2	AD	O	SY	YES	345	32.9	12.1	10.6	16.5	90.7	545	86	SR
6155613	MW	YBL	8.7	19.00	2	AD	PO	Y	YES	345	37.5	13.6	12.2	18.9	100	680		SR
6155614	MW	GG	8.7	20.45	2	AD	SO	PO	YES	334	36.0	13.7	12.4	18.9	93.8	615		SR
6155615	MW	GO	8.7	20.45	2	AD	O	Y	YES	337	34.8	12.1	10.8	17.3	90.0	560		SR
6155616	MW	GB	8.7	20.45	2	AD	O	Y	YES	361	38.0	13.7	12.9	18.8	97.1	670		SR
6155617	MW	GW	8.7	20.45	2	AD	SO	O	YES	334	32.9	12.9	10.9	16.1	89.7	560	81	SR
6155618	MW	GBL	8.7	20.45	2	AD	PO	PO	YES	340	33.9	13.8	12.2	17.5	91.0	590	83	SR
6155619	MW	OO	9.7	20.00	1	AD	O	Y	YES	351	35.0	12.9	11.7	17.1	91.4	575	85	B
6155620	MW	OB	9.7	22.00	1-2	AD	PO	SY	YES	359	38.7	14.4	12.4	18.4	99.3	685	88	N
6155621	MW	OW	9.7	22.00	1-2	AD	PO	PO	YES	356	39.1	13.7	12.6	19.3	99.7	630	89	N
6155622	MW	OBL	9.7	22.00	1-2	AD	PO	PY	YES	353	38.1	14.4	13.2	18.9	97.4	647	89	N
6155623	MW	BB	9.7	22.00	1-2	AD	O	PO	YES	357	37.1	13.5	12.5	17.5	96.8	705	87	N
6155624	MW	BW	9.7	22.00	1-2	AD	SO	PY	YES	361	37.1	14.6	13.1	17.1	96.4	710	90	N
6155625	MW	BBL	9.7	22.00	1-2	AD	PO	Y	YES	353	37.4	14.2	12.4	18.7	98.3	610	85	N
6155626	MW	WW	9.7	22.00	1-2	AD	O	SY	YES	361	35.8	13.5	12.7	17.8	95.9	655	90	N
6155627	MW	WBL	9.7	23.00	1-2	AD	PO	PY	YES	348	38.6	14.3	12.9	19.7	98.8	630	89	N
6155628	MW	BLBL	9.7	23.00	1-2	AD	O	PO	YES	349	37.6	14.6	12.5	18.5	98.1	640	91	N
6155629	MW	YR	9.7	23.00	1-2	AD	O	SY	YES	356	38.0	13.9	12.0	19.0	98.1	605	87	N
6155630	MW	GR	9.7	23.00	1-2	AD	O	SY	YES	354	36.6	14.6	12.2	18.2	98.0	560	80	N
6155631	MW	OR	9.7	23.00	1-2	AD	PO	SY	YES	350	37.4	14.6	12.6	17.6	98.7	610	89	N
6155632	MW	BR	9.7	23.00	1-2	AD	O	VP	YES	357	34.3	13.4	12.1	18.0	92.6	530	82	N
6155633	MW	WR	10.7	00.05	1-2	AD	PO	Y	YES	346	38.8	13.7	12.3	19.5	99.1	600	89	N
6155634	MW	BR	10.7	00.05	1-2	AD	O	PY	YES	355	38.7	14.8	13.3	19.3	97.7	632	90	N
6155635	MW	GY	10.7	00.50	1-2	AD	PO	Y	YES	353	36.5	13.8	12.0	18.2	95.5	592	88	N
6155636	MW	OY	10.7	00.50	1-2	AD	VP	PY	YES	347	33.3	12.1	10.7	16.4	88.2	465	75	N
6155637	MW	BY	10.7	00.50	1-2	AD	PO	PY	YES	365	36.5	14.4	13.2	19.0	97.9	692	89	N
6155638	MW	WY	10.7	00.50	1-2	AD	O	Y	YES	353	36.6	14.8	13.3	17.3	97.4	690	88	N
6155639	MW	BLY	10.7	18.00	1-2	AD	PO	SY	YES	348	35.6	14.3	12.5	18.3	94.2	600	84	N
6155640	MW	OG	10.7	18.00	1-2	AD	PO	Y	YES	362	36.4	13.1	12.2	18.6	95.2	590	85	N
6155641	MW	BG	10.7	18.00	1-2	AD	PO	Y	YES	346	37.4	13.7	12.3	18.3	95.2	585	86	N
6155642	MW	WG	10.7	18.00	1-2	AD	Sk	Y	YES	340	32.8	12.3	11.2	17.4	91.3	520	81	N
6155643	MW	BLG	10.7	18.00	1-2	AD	O	Y	YES	337	33.8	12.9	11.4	15.6	89.9	515	83	N
6155644	MW	BO	10.7	18.00	1-2	SAD	S	PY	NO	345	36.6	13.6	12.3	18.4	96.7	545	84	N
6155645	MW	WO	10.7	18.00	1-2	AD	O	PO	YES	328	32.2	12.0	10.5	15.8	86.1	445	74	N

Continuation table 13.

Ring-number (Stav.mus Norway)	Colour left foot	Colour right foot	Date	Time	Loc- ation	Age	Orbi- tal	Col- our end of bill	Brood- pouch	Length of wing (mm)	1. Length of bill (mm)	2. Height of bill (mm)	3. Height of bill (mm)	4. Bill (mm)	5. Head and bill (mm)	Weight (gram)	Tarsus and toe (mm)	Method of capture
6155646	MW	BLO	10.7	18.00	1-2	AD	O	Y	YES	332	35.3	12.4	11.7	17.1	91.2	560		N
6155647	MW	WB	10.7	18.00	1-2	AD	O	Y	YES	344	36.9	13.7	12.3	17.0	93.8	560	84	N
6155648	MW	BLB	10.7	18.00	1-2	AD	O	Y	YES	333	33.3	12.5	11.3	16.6	90.1	545	84	N
6155649	MW	BLW	10.7	20.00	1-2	AD	O	SY	YES	342	35.7	14.1	12.4	18.1	92.5	620	82	N
6155650	RR	WM	10.7	20.00	1-2	AD	O	Y	YES	358	37.5	14.0	12.4	18.9	96.6	570	89	N
6155651	RY	WM	10.7	20.00	1-2	AD	PO	PY	YES	350	36.9	14.0	12.5	17.8	94.1	600	83	N
6155652	RG	WM	10.7	20.00	1-2	AD	O	Y	YES	360	35.8	13.7	12.1	18.8	96.2	660	86	N
6155653	RO	WM	10.7	21.20	1-2	AD	O	Y	YES	351	37.6	14.4	12.4	16.7	95.7	595	90	N
6155654	RB	WM	10.7	21.20	1-2	AD	PO	Y	YES	362	39.4	13.9	12.9	18.8	96.7	615	86	N
6155655	RW	WM	10.7	21.20	1-2	AD	O	PY	YES	353	38.0	14.2	12.3	18.7	96.9	660	86	N
6155656	RBL	WM	10.7	21.20	1-2	AD	O	Y	YES	358	38.3	13.3	12.6	19.1	97.5	600	87	N
6155657	YY	WM	10.7	21.20	1-2	AD	O	Y	YES	345	38.4	13.3	11.9	18.0	95.5	580	86	N
6155658	YG	WM	10.7	21.20	1-2	AD	O	PY	YES	345	33.5	13.1	11.6	15.6	89.3	525	82	N
6155659	YO	WM	10.7	21.20	1-2	AD	SO	SY	YES	368	37.3	13.8	12.2	19.1	98.6	630	90	N
6155660	YB	WM	10.7	22.40	1-2	AD	PO	Y	YES	337	34.4	12.6	11.1	16.8	91.5	530	85	N
6155661	YW	WM	10.7	22.40	1-2	AD	O	Y	YES	350	34.9	13.4	11.6	16.7	91.1	540	82	N
6155662	YBL	WM	10.7	22.40	1-2	AD	VP	PY	YES	359	36.8	14.0	12.5	18.1	97.7	620	84	N
6155663	GG	WM	10.7	22.40	1-2	AD	O	Y	YES	350	37.0	12.3	11.8	18.4	95.1	555	85	N
6155664	GO	WM	10.7	22.40	1-2	AD	PO	Y	YES	354	37.5	14.1	13.0	19.1	97.5	575	86	N
6155665	GB	WM	10.7	22.40	1-2	AD	O	PO	YES	355	36.7	14.1	12.6	18.7	97.6	595	87	N
6155666	GW	WM	11.7	16.15	1-2	AD	PO	Y	YES	347	33.8	13.1	11.8	16.6	91.5	565	83	N
6155667	GBL	WM	11.7	16.15	1-2	AD	PO	PY	YES	339	33.9	13.0	11.4	17.0	91.7	550	86	N
6155668	OO	WM	11.7	16.15	1-2	AD	PO	PY	YES	354	38.5	13.8	12.0	17.8	94.9	595	87	N
6155669	OB	WM	11.7	16.15	1-2	SAD	P	PY	NO	353	36.0	14.4	12.1	17.9	94.2	535	88	N
6155670	OW	WM	11.7	17.00	1-2	AD	VP	PY	YES	342	31.3	13.2	11.4	15.2	86.8	500	74	N
6155671	OBL	WM	11.7	17.00	1-2	AD	O	Y	YES	351	34.1	13.1	11.2	15.8	89.8	510	82	N
6155672	BB	WM	11.7	17.00	1-2	AD	PO	SY	YES	343	34.4	12.6	11.3	16.5	91.2	575	83	N
6155673	BW	WM	11.7	17.00	1-2	SAD	S	PY	NO	342	36.2	13.6	11.8	17.6	97.4	565	85	N
6155674	BBL	WM	11.7	18.15	1-2	AD	PO	Y	YES	350	37.1	13.5	11.9	18.2	96.0	545	85	N
6155675	WW	WM	11.7	18.15	1-2	AD	PO	PY	YES	335	34.7	12.5	11.1	16.3	90.8	540		N
6155676	WBL	WM	11.7	18.15	1-2	AD	PO	Y	YES	358	38.5	14.2	12.3	18.4	97.4	605	88	N
6155677	BLBL	WM	11.7	18.15	1-2	AD	PO	PY	YES	358	35.4	12.5	11.9	17.2	92.3	590	87	N
6155678	YR	WM	11.7	18.15	1-2	AD	Sk	PY	YES	319	31.9	12.2	10.8	15.0	86.1	515	82	N
6155679	GR	WM	11.7	19.00	1-2	AD	PO	PY	YES	351	38.2	14.0	12.2	17.9	94.4	545	86	N
6155680	OR	WM	11.7	19.00	1-2	AD	PO	PY	YES	352	38.5	14.2	12.3	19.4	97.2	630	89	N
6155681	BR	WM	11.7	19.00	1-2	AD	O	Y	YES	351	39.0	14.5	13.3	19.2	97.7	600	90	N
6155682	WR	WM	11.7	19.45	2	AD	PO	Y	YES	326	33.1	11.7	10.5	15.8	88.7	495	82	SR
6155683	BR	WM	11.7	19.45	2	AD	O	Y	YES	352	35.9	13.6	12.1	17.2	93.4	595	83	SR
6155684	GY	WM	11.7	19.45	2	AD	PO	PY	YES	354	37.5	14.4	12.3	19.2	97.8	595	89	SR
6155685	OY	WM	11.7	20.15	1-2	AD	PO	Y	YES	357	36.1	13.8	12.6	18.6	97.0	585	84	N
6155686	BY	WM	11.7	20.15	1-2	AD	PO	PY	YES	348	36.1	13.6	12.2	18.6	98.4	660	89	N
6155687	WY	WM	11.7	20.45	1-2	SAD	S	PY	NO	337	34.6	13.1	12.0	17.5	96.6	585	89	N
6155688	BLY	WM	11.7	20.45	1-2	AD	PO	Y	YES	338	39.4	13.1	12.4	19.3	99.1	605	88	N
6155689	OG	WM	11.7	21.10	1-2	AD	PO	BG	YES	363	39.2	14.6	12.9	19.5	99.7	650	92	N
6155690	BG	WM	11.7	21.10	1-2	AD	PO	G	YES	354	35.6	13.6	12.4	17.1	95.0	600	88	N
6155691	WG	WM	11.7	21.45	1-2	AD	PO	PY	YES	362	37.8	14.9	13.0	18.1	95.4	580	84	N
6155692	BLG	WM	11.7	21.45	1-2	AD	PO	Y	YES	364	40.4	14.6	13.2	19.7	101.1	630	90	N
6155693	BO	WM	11.7	21.45	1-2	AD	O	Y	YES	339	37.7	13.0	11.9	18.1	96.2	580	88	N
6155694	WO	WM	13.7	23.30	1-2	AD	O	Y	YES	352	37.6	14.4	12.6	18.6	97.2	610	89	N
6155695			13.7	23.30	1-2	AD		PY	YES	340	32.4	12.8	11.4	16.0	88.6	510	80	N
6155696	WB	WM	13.7	23.45	1-2	AD	PO	Y	YES	359	39.4	15.2	14.1	19.5	101.4	615	89	N
6155697	BLB	WM	13.7	23.55	1-2	AD	O	PO	YES	351	39.0	14.5	12.9	19.6	98.9	625	89	N
6155698	BLW	WM	13.7	23.55	1-2	AD	O	Y	YES	353	35.2	12.3	10.9	17.2	91.6	485	85	N
6155701	BLO	WM	16.7	16.25	2	AD	PO	Y	YES	351	35.5	13.8	12.5	16.5	93.2	600	80	SR

Code for colours: M = metal, W=white, BL=black, O=orange, B=blue, G=green, R=red, Y=yellow. Methode of capture: SR=snare on nests, N=elastic net and B=cage. Age: AD=adult and SAD=subadult, Orbital: O=orange, P=pale, S=strong, V=very, Sk=skin-coloured. Colour end of bill: P=pale, O=orange, Y=yellow and S=strong. Number at biometry: see Figure 6.

9.5 EGG BIOMETRY OF IVORY GULL, BRENT GOOSE, HERRING GULL AND GLAUCOUS GULL

Table 14. Egg biometry of Ivory Gull.

No.*	Length	Width	Weight	Date	C. no.**	Volume	Density	No.*	Length	Width	Weight	Date	C. no.**	Volume	Density
1	58.4	43.7	57.5	7.7	2	56.88	1.01	18	58.3	43.3	56	7.7	2	55.75	1.00
1	62.5	44.6	62	7.7	2	63.40	0.98	19	58.8	43.1	57	7.7	2	55.71	1.02
1	56	42.6	51.5	7.7	2	51.83	0.99	19	58.4	43	58	7.7	2	55.07	1.05
2	54.5	44.7	63	7.7	2	55.54	1.13	20	57.8	45.1	52	7.7	2	59.96	0.87
2	61.1	44.6	62	7.7	2	61.98	1.00	20	58.5	45.4	62	7.7	2	61.49	1.01
2	60.1	43.6	59.5	7.7	2	58.27	1.02	21	60.8	42.3		16.7	1	55.48	-
3	57.7	41.1	51	7.7	2	49.71	1.03	21	62.3	42.6		16.7	1	57.66	-
3	56.4	40.8	50	7.7	2	47.88	1.04	22	58.5	42.3		16.7	1	53.38	-
3	56.7	42.5	53	7.7	2	52.23	1.01	22	58.9	43		16.7	1	55.54	-
4	63.1	43.2	60	7.7	2	60.06	1.00	23	61.7	42.6		16.7	1	57.11	-
4	61.6	42.1	57.5	7.7	2	55.68	1.03	23	61.4	41		16.7	1	52.64	-
4	63.9	43.1	60	7.7	2	60.54	0.99	24	61.9	41.3		16.7	1	53.85	-
5	63.4	42.3	59	7.7	2	57.85	1.02	24	61.2	42		16.7	1	55.06	-
5	61.9	43.7	62	7.7	2	60.29	1.03	25	58.1	40.6		16.7	1	48.84	-
5	62.7	44.5	62.5	7.7	2	63.32	0.99	25	69	42		16.7	1	62.08	-
6	59.9	44	60	7.7	2	59.14	1.01	26	60.2	40.3	50	7.7	3	49.86	1.00
6	61.1	43.6	59	7.7	2	59.24	1.00	27	60.6	44	61.5	7.7	3	59.83	1.03
6	60.5	44.5	61.5	7.7	2	61.10	1.01	28	60.7	43.1	54	7.7	3	57.51	0.94
7	60.9	44.7	65	7.7	2	62.06	1.05	29	61	42.4	56.5	7.7	3	55.93	1.01
7	63.4	43	61.5	7.7	2	59.79	1.03	30	59.7	43.2	57	7.7	3	56.82	1.00
7	61.4	44.5	65	7.7	2	62.01	1.05	31	57.6	42.9	56	7.7	3	54.06	1.04
8	60.9	43.6	58	7.7	2	59.04	0.98	32	61.4	43.2	52	7.7	3	58.44	0.89
8	58.1	42.4	53.5	7.7	2	53.27	1.00	33	62.8	44.2	63	7.7	3	62.57	1.01
8	61.4	42.4	55	7.7	2	56.30	0.98	34	61	40.8	54	7.7	3	51.79	1.04
9	63.2	43.1	59	7.7	2	59.87	0.99	35	58.5	41.8	52	7.7	3	52.13	1.00
9	62.9	42.5	58	7.7	2	57.94	1.00	36	59.7	41.8		16.7	1	53.20	-
9	60.8	42.1	55	7.7	2	54.96	1.00	37	60.8	43.5		16.7	1	58.67	-
10	57.7	44.2	59	7.7	2	57.49	1.03	38	56.9	42.1	54	16.7	1	51.43	1.05
10	57.9	44.2	59	7.7	2	57.69	1.02	39	61.2	41.9	53.2	16.7	1	54.80	0.97
10	57.6	42.9	56	7.7	2	54.06	1.04	40	58.9	42		16.7	1	52.99	-
11	61.3	43.2	58	7.7	2	58.34	0.99	41	56	39.7	44	16.7	1	45.01	0.98
11	60.1	42	56	7.7	2	54.07	1.04	42	59.2	52.5	55.5	16.7	1	83.22	0.67
12	57	42.3	52.5	7.7	2	52.01	1.01	43	58.8	41.7	52.5	16.7	1	52.15	1.01
12	59.1	42.9	56	7.7	2	55.47	1.01	44	58	42.6		16.7	2	53.68	-
13	57.5	43.4	57	7.7	2	55.24	1.03	45	58.4	43.2		16.7	2	55.58	-
13	57.3	41.8	53	7.7	2	51.06	1.04	46	61.7	41.5		16.7	2	54.19	-
14	56.4	43.1	55	7.7	2	53.43	1.03	47	60.1	41.9		16.7	2	53.81	-
14	55.9	42.8	54	7.7	2	52.22	1.03	48	63.5	42.3		16.7	2	57.95	-
15	59.6	41.6	51	7.7	2	52.60	0.97	49	60.2	41.2		16.7	2	52.11	-
15	59.9	41.3	50	7.7	2	52.11	0.96	50	59.7	41.4		16.7	2	52.18	-
16	62	44	60	7.7	2	61.22	0.98	51	62.8	40.5		16.7	2	52.53	-
16	62.4	44.2	60	7.7	2	62.17	0.97	52	62.8	41.5		16.7	2	55.16	-
17	63.6	43.3	61.5	7.7	2	60.81	1.01	53	56.6	42.6		16.7	2	52.38	-
17	62.6	44.4	62	7.7	2	62.94	0.99	54	62.5	43.7		16.7	2	60.87	-
18	58.3	44	58	7.7	2	57.56	1.01	55	57.2	41.2		16.7	2	49.52	-

* = Clutch number and ** = Colony number

Table 15. Egg biometry of Brent Goose.

Clutch no.	Length	Width	Weight	Volume	Density	No. days incubated	Approximate laying date
1	69.9	46.2	75.5	76.09	0.99	20.27	22.Jun
1	72.7	47.1	82	82.25	1.00	19.45	23.Jun
1	69.2	46.5	74.5	76.31	0.98	23.07	19.Jun
1	68.9	46.4	75	75.65	0.99	20.43	22.Jun
1	67.6	45.8	71	72.32	0.98	22.11	20.Jun
2	70.4	45.9	73	75.64	0.97	25.03	17.Jun
2	69.9	46.7	76.5	77.75	0.98	21.72	20.Jun
2	69.6	46.1	76	75.44	1.01	17.61	24.Jun
2	72.7	47	78	81.90	0.95	27.26	15.Jun
2	71.2	46.9	77	79.87	0.96	25.21	17.Jun
3	71.6	49.7	89	90.20	0.99	21.24	21.Jun
3	71.8	48.8	88.5	87.20	1.01	16.31	26.Jun
3	74.2	49.1	88	91.23	0.96	25.11	17.Jun *
3	70.9	49.3	88	87.88	1.00	18.68	23.Jun
3	72.2	48.5	87	86.61	1.00	18.13	24.Jun
4	74.5	46.1	79	80.75	0.98	22.70	19.Jun
4	70.2	46.2	78	76.42	1.02	15.29	27.Jun
4	73.9	46.9	81.5	82.90	0.98	21.87	20.Jun
4	71.3	47.3	81.8	81.35	1.01	17.96	24.Jun
5	73.8	47.3	81	84.21	0.96	25.58	16.Jun
5	72.6	46.2	81	79.03	1.02	14.55	27.Jun *
5	74.4	46.1	77	80.64	0.95	26.82	15.Jun
5	71.7	47.3	79	81.81	0.97	24.93	17.Jun
6	69.5	46.6	75	76.97	0.97	23.40	19.Jun
6	70.9	47	79.5	79.88	1.00	19.74	22.Jun
6	66.3	46.1	79	71.86	1.10	1.51	10.Jul *
6	72.4	47.1	80.5	81.91	0.98	21.93	20.Jun
7	70.8	44.6	70.5	71.82	0.98	22.14	20.Jun
7	68.8	44.9	69.5	70.74	0.98	21.98	20.Jun
7	68.9	45	68.1	71.16	0.96	26.44	16.Jun
8	67.8	48.6	79.5	81.67	0.97	23.57	19.Jun *
8	73.3	48.4	84.5	87.57	0.96	25.06	18.Jun *
8	73.4	48.5	83	88.05	0.94	28.97	14.Jun *
8	73.5	48	80.5	86.37	0.93	30.81	12.Jun *
8	70.5	48.8	79.5	85.62	0.93	31.44	12.Jun *
9	67	46.1	73	72.62	1.01	17.99	19.Jun
9	66.4	44.9	69.5	68.27	1.02	15.76	21.Jun
9	68.3	47.1	76	77.27	0.98	21.80	15.Jun
n= 38	(66.3-74.5)	(44.6-49.7)					
Average	70.87	46.98	78.55				

* = Possible incorrect measurement

Table 16. Egg biometry of Herring Gull.

Clutch	Length	Width	Weight	Date	Area	Clutch	Length	Width	Weight	Date	Area
1	71	49.3	89	7.7	Isthmus Camp	7	67.4	50.1	82	12.7	Long Lake N.
1	70	47.7	83	7.7	Isthmus Camp	7	70.5	50.2	85.5	12.7	Long Lake N.
1	69.7	49.2	85	7.7	Isthmus Camp	8	67	45.8	73.5	12.7	Long Lake N.
2	67.6		80.5	12.7	Polarnic Bay E.	8	72.7	45.1	74	12.7	Long Lake N.
2	68.6	49.3	82	12.7	Polarnic Bay E.	8	66.4	47.4	75	12.7	Long Lake N.
2	69.5	48.4	83	12.7	Polarnic Bay E.	9	64	48.8	76.5	12.7	Long Lake E.
3	71.6	49.7	87	12.7	Polarnic Bay E.	9	65.3	48.7	78.5	12.7	Long Lake E.
3	69	49.4	84	12.7	Polarnic Bay E.	10	64.6	47	74	12.7	Cape Midnight
3	69.8	50.8	88.5	12.7	Polarnic Bay E.	11	70.9	47.5	77	14.7	Cape Fifty
4	68.7	50.6	93	12.7	Polarnic Bay E.	11	68.8	45.7	74	14.7	Cape Fifty
4	71	50	92	12.7	Polarnic Bay E.	11	67.3	47.1	71	14.7	Cape Fifty
4	68.3	49.7	88	12.7	Polarnic Bay E.	12		49.6	89	14.7	Corner Lake S.
5	70.9	48.3	84	12.7	Long Lake N.	12	70.1	46.9	74	14.7	Corner Lake S.
5	72.5	49.8	89.5	12.7	Long Lake N.	13	66.4	47.4	71.5	14.7	Corner Lake S.
5	67.8	48.7	82	12.7	Long Lake N.	13	65.2	46.9	69.5	14.7	Corner Lake S.
6	64.3	46.2	70	12.7	Long Lake N.	13	65.4	47.5	74	14.7	Corner Lake S.
7	70.7	50.3	87.5	12.7	Long Lake N.						
						Average	69.47	49.21	85.18		

Table 17. Egg biometry of Glaucous Gull.

Clutch	Length	Width	Weight	Date	Area	Clutch	Length	Width	Weight	Date	Area
1	76.4	52.9	102	6.7	Bear Hill	7	74.2	51.2	93	13.7	Cape Corner
1	75.1	53.4	100	6.7	Bear Hill	7	79.4	50.9	84	13.7	Cape Corner
2	76.5	51.2	100	7.7	P. Station N	8	73.4	50.8	89.5	14.7	Cape Fifty
2	77.2	48.6	90.1	7.7	P. Station N	8	71.3	50.4	82	14.7	Cape Fifty
2	78.4	50.7	98	7.7	P. Station N	8	74.6	50.9	90.5	14.7	Cape Fifty
3	81.2	55.6	119	12.7	Cape Polarnic	9	71.9	51.1	89	14.7	Goose Lake
3	82.4	55.2	118	12.7	Cape Polarnic	9	72.4	52	92	14.7	Goose Lake
3	78.8	55.7	119	12.7	Cape Polarnic	9	70.8	51.7	87.5	14.7	Goose Lake
4	76	50.9	100	12.7	Long Lake W	10	76.2	54.5	113	14.7	Cape Horn
4	78.9	51	101	12.7	Long Lake W	10	76.6	55.1	114	14.7	Cape Horn
4	76.1	49.4	94	12.7	Long Lake W	10	78	50.3	96.5	14.7	Cape Horn
5	76.2	52	96.5	12.7	Long Lake N.	11	74.6	50.1	89.5	15.7	Duck Lake NW
5	75	52.8	97.5	12.7	Long Lake N.	11	74.6	51.8	95.5	15.7	Duck Lake NW
6	80.2	53	108	12.7	Long Lake N.	11	75.9	51.9	97.5	15.7	Duck Lake NW
6	81.9	52.9	108	12.7	Long Lake N.	12	76.8	51.1	99.5	15.7	Flatland
6	80.4	53.6	110	12.7	Long Lake N.	12	75.2	53.9	108	15.7	Flatland
7	77.4	52.9	100	13.7	Cape Corner	12	78.12	52.46	103.59	15.7	Flatland
						Average	76.7	52.1	99.5		

9.6 CLIMATIC DATA FROM TROYNOY DURING THE PERIOD 1988 TO 1994
(Data from the Polar station).

Table 18. Average temperature in 10 day periods for the years 1988–1994.

Month	Ten days period	1988	1989	1990	1991	1992	1993	1994	Average
June	1.	-0.5	-4.1	-1.7	-3.2	-5.2	-0.5	-2.9	-0.23
	2.	-0.2	-1.6	-0.3	-1.8	-1.5	-0.5	-2.6	-0.14
	3.	0	-0.3	-0.2	0.3	-0.4	0.3	1.4	0.12
	Average for month	-0.23	-2.00	-0.73	-1.57	-2.37	-0.23	-1.37	0.26
July	1.	0.6	0.3	0.6	1.4	0.3	0		0.37
	2.	0.4	0.3	0.8	2.1	1.1	-0.1		0.29
	3.	0.1	0.7	2.7	0.4	0.5	0.3		0.32
	Average for month	0.37	0.43	1.37	1.30	0.63	0.07		0.29
August	1.	0.5	-0.1	0.9	0.3	1.7	1		0.47
	2.	0	0.6	-0.2	0.2	-0.4	2		0.46
	3.	0.9	-0.2	-0.7	0.9	-1.4	-0.1		0.46
	Average for month	0.47	0.10	0.00	0.47	-0.03	0.97		-0.61
September	1.	0	-1	-1.9	1	-1.2	-0.8		-2.47
	2.	-2.3	-3.9	-0.8	1.6	-1.7	0.6		-3.29
	3.	-5.1	-2.9	-1.8	0.4	-4.8	-1.9		-3.78
	Average for month	-2.47	-2.60	-1.50	1.00	-2.57	-0.70		-2.47

Table 19. Temperature at Troynoy in June and July 1994.

Date	01.6	02.6	03.6	04.6	05.6	06.6	07.6	08.6	09.6	10.6	11.6	12.6
Mean	-2.2	-0.8	-0.5	-3.7	-4.6	-3.5	-3.5	-3	-3.1	-2.9	-2.8	-5
Min.	-4.4	-4.1	-1.5	-4.6	-7.5	-4.2	-6.8	-3.7	-3.9	-3.8	-4.4	-6.7
Max.	0.8	0.8	0.2	0.2	-3.1	-2.6	-1.7	-1.8	-2.3	-2	-0.8	-2.4
Date	13.6	14.6	15.6	16.6	17.6	18.6	19.6	20.6	21.6	22.6	23.6	24.6
Mean	-5	-2.2	-2.4		-2.3	-3.2	-0.5	0.7	0.8	0.6	-0.8	0.2
Min.	-8.6	-3.7	-3.3		-3.7	-6.4	-2.8	0.3	-0.5	-1.3	-2.4	-0.1
Max.	-2.4	-0.7	-1.5		-0.7	-0.6	0.9	1.4	1.7	1.3	1.2	0.7
Date	25.6	26.6	27.6	28.6	29.6	30.6	01.7	02.7	03.7	04.7	05.7	06.7
Mean	2.3	3.7	2.9	0.8	1.1	2.3	3.2	3.7	3.1	3.6	0.7	0.6
Min.	-0.1	2.7	1.1	-0.3	-1.2	1.3	1.8	0.6	1	2	0.1	0.3
Max.	3.7	4.8	5	5.7	4.1	3.6	5.3	6.9	5.3	5	2	1
Date	07.7	08.7	09.7	10.7	11.7	12.7	13.7	14.7	15.7	16.7		
Mean	0.8	-0.4	3.9	1.5	0.2	0.6	-0.9	-0.9	-2	0.4		
Min.	-1	-2.3	1	-0.6	-1.8	-0.6	-1.8	-2.1	-0.9	-2.3		
Max.	3.8	1.6	7.3	7.2	1.8	2.2	0.4	0.6	-3	2.8		

