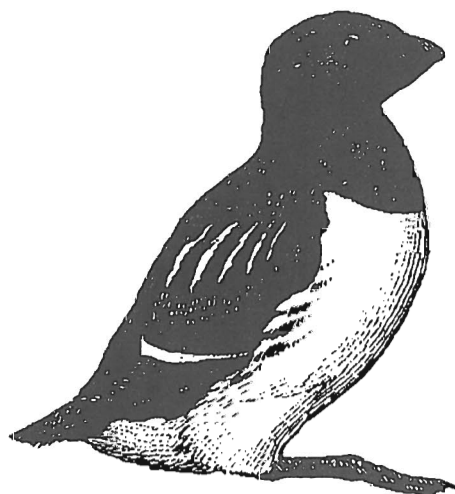


Hallvard Strøm, Ingar Jostein Øien, Jon Opheim,
Gennady V. Khakhin, Sergey N. Cheltsov &
Vadim Kuklin

Seabird Censuses on Novaya Zemlya 1996



The joint Norwegian-Russian Commission
on Environmental Cooperation
The Seabird Expert Group – Report No.13:1994/97



Norwegian Ornithological Society



Report No. 1-1997

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, VNIИ Priroda plays the corresponding role. The expert group is chaired by:

Alexander Golovkin - VNIИ Priroda, Moscow
Morten Ekker - Directorate for Nature Management, Trondheim

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NOF RAPPORTSERIE

RAPPORT NR. 1-1997

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**NORWEGIAN ORNITHOLOGICAL SOCIETY (NOF)
KLÆBU 1997**

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© Norsk Ornitologisk Forening, Klæbu
Editor: Ingar Jostein Øien
Front cover: Little Auk by Viggo Ree
Layout & digital maps: Magne Myklebust
and the Norwegian Polar Institute
Printed February 1997
Number of copies: 250
ISSN 0805-4932
ISBN 82-7852-013-5

PREFACE

The Agreement on Environmental Cooperation between Norway and the USSR was signed in 1988, and later renegotiated in 1992, this time between Norway and Russia. One result of this cooperative agreement was the establishment of an expert group on seabirds. As a part of this environmental joint venture, Bjørn Frantzen from The Norwegian Ornithological Society (NOF) initiated a joint Norwegian - Russian seabird project on Novaya Zemlya.

The project has been carried out by NOF and the All-Russian Research Institute for Nature Protection (VNII Priroda), Moscow. NOF, together with the Norwegian Polar Institute, has the scientific responsibility. The project is, from the Norwegian side, fully financed by the Directorate for Nature Management (DN). The project is part of the strategy and working plan for the Norwegian - Russian seabird expert group, and the work is also included in the working plan of the Russian Ministry of Protection of the Environment and Natural Resources.

The aim of the project is to map selected seabird colonies on the western coast of Novaya Zemlya. The project was planned for three years, with the first field season in the summer of 1994 (see Strøm et al. 1994), and the second field season in 1995 (see Strøm et al. 1995). This report describes the results of the third field season in 1996.

Project leaders on the Norwegian side has been Hallvard Strøm, and the Russian leader has been Gennady V. Khakhin (VNII Priroda). Also participating in the planning and the field work in 1996 were Sergey N. Cheltsov (VNII Priroda), Vadim Kuklin (Murmansk Marine Biological Institute), Jon Opheim (NOF) and Ingar Jostein Øien (NOF).

A number of people have contributed to the accomplishment of the project. Special thanks are addressed to Vidar Bakken at the Norwegian Polar Institute, for scientific assistance and support during all phases of the project. Special appreciations are also due to The Russian Navy, Morten Ekker (DN), Vera Sandlund, Kåre Strøm, Dag Vongraven and Laila Furulund for their respective contributions to the project. We are also indebted to Helseport AS, Norway, for financial support to the project and to the ship's company at *Dalnie Zelentsy* for excellent board and for logistic help on passage to Novaya Zemlya.

All the reference data from the three field seasons will be stored at the Norwegian Polar Institute (Oslo/Tromsø) and at VNII Priroda, Moscow.

Trondheim/Moscow, February 1997

Hallvard Strøm

Ingar Jostein Øien

Gennady V. Khakhin

ABSTRACT

This report contains the results from the third joint Norwegian - Russian seabird censusing expedition to Novaya Zemlya. The field work was carried out in Arkhangel'skaya Bay and Vil'kitski Bay in the period July 30 to August 14 1996. The seabird colonies on the shore south of Arkhangel'skaya Bay and on the southern shore of Vil'kitski Bay were counted.

In Arkhangel'skaya Bay the census resulted in the following minimum numbers of the six seabird species represented in the colonies: 49 pairs of Glaucous Gull *Larus hyperboreus*, 3,149 pairs of Kittiwake *Rissa tridactyla*, 131,192 ind. of Brünnich's Guillemot *Uria lomvia*, 1,074 ind. of Little Auk *Alle alle*, 88 ind. of Black Guillemot *Cephus grylle* and 77 ind. of Puffin *Fratercula arctica*.

In Vil'kitski Bay the census resulted in the following minimum numbers of the four species represented in the two colonies: 17 pairs of Glaucous Gull, 4,288 pairs of Kittiwake, 54,113 ind. of Brünnich's Guillemot and 11 ind. of Black Guillemot.

Nineteen monitoring plots for Kittiwake and Brünnich's Guillemot were established, containing on average 2,844,5 ind. of Brünnich's Guillemots. In the plots where Kittiwakes were represented the plots contained an average of 159 pairs.

A total of 2,761 Brünnich's Guillemots were ringed (862 adults and 1,899 chicks). Prey items were collected from adult Brünnich's Guillemots while feeding their chicks.

The report also summarises all observations of birds and mammals made during the field work. Twenty-one species of birds and five species of mammals were registered during the two weeks stay in Arkhangel'skaya Bay and Vil'kitski Bay.

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1. INTRODUCTION

1.1 BACKGROUND

The Barents Sea is one of the most productive waters in the world and supports large populations of seabirds (Norderhaug et al. 1977, Mehlum & Gabrielsen 1995). The seabirds breed in numerous colonies throughout the whole region, and the Barents Sea constitutes a larder for large populations of seabirds both during the summer and the winter seasons. The seabirds play a central part in the arctic ecosystem as a link between the marine and the terrestrial ecosystems. They transport large quantities of nutrients to the vegetation on land, particularly in the vicinity of the colonial breeding sites.

The huge seabird populations in the Barents Sea are increasingly exposed to environmental influences by fisheries, ship traffic, oil-related activity and pollution. The need to investigate the seabird population in the Barents Sea has therefore increased during recent decades. The responsibility for the management of the seabird resources in the Barents Sea is shared between Norway and Russia. In recent decades, a considerable effort has been made to map seabird colonies and monitor population trends of certain seabird species. This work has mainly been carried out in the Norwegian territory.

A significant part of the seabird populations in the Barents Sea region breeds on Novaya Zemlya. Some of the largest seabird colonies in the northern hemisphere are situated here (Uspenski 1956). Since the Soviet Navy took control of the area in 1954, and the nuclear test sites were established, no significant seabird work has been undertaken in this area. Thus we have currently very limited knowledge of the status and trends of the seabird populations on Novaya Zemlya. For these reasons, the Norwegian Ornithological Society (NOF) initiated a joint Norwegian - Russian seabird project on Novaya Zemlya in 1992.

The time schedule of the project was three years, and the work has been carried out in 4-6 selected

seabird colonies on the west coast of Novaya Zemlya. The project had the following aims:

- to estimate the size of the breeding populations of auks and gulls in the colonies
- to establish a monitoring program for long term studies of Kittiwake *Rissa tridactyla* and Brünnich's Guillemot *Uria lomvia*
- to map the migration routes and wintering areas of Brünnich's Guillemots breeding on Novaya Zemlya
- to map the genetic characteristics of Kittiwakes and Brünnich's Guillemots through blood sampling and biometrical studies
- to identify food preferences of Guillemots *Uria aalge* and Brünnich's Guillemots
- to map the bird and mammal fauna in the visited regions

1.2 FIELD WORK 1996

The 1996 expedition was accomplished during the period July 18 to August 20, with field work on the northern island in the period of July 30 to August 14. The period July 18 to July 26 was spent in Murmansk in order to receive the necessary permits. The field work was carried out in the seabird colonies in Arkhangel'skaya Bay in the period July 31 to August 14 and in Vil'kitski Bay during the period August 07 and 08-11, and implied two weeks field work.

Transport was accomplished by the research vessel *Dalnie Zelentsy* from the Murmansk Marine Biological Institute to Arkhangel'skaya Bay, where the base camp was established (Figure 1). The crossing from Murmansk to Arkhangel'skaya Bay started at 02.00 on July 27 and we landed July 30 at 0800. The passage back was effected during the period 14 August (18.00) to August 19 (06.00). For transport between the seabird colonies we made use of a *Zodiac* rubber boat. The weather conditions during the stay were unstable. Usually, the days were rainy and foggy but rarely windy.



Figure 1. The camp in Arkhangel'skaya Bay. Photo: Ingar Jostein Øien

The temperature averaged $+ 5.7^{\circ}\text{C}$, the extremes being $+ 14^{\circ}\text{C}$ and $+ 2^{\circ}\text{C}$. The dense fog and wet weather delayed the work somewhat, but are not considered to have exerted significant influence on the accuracy of the collected data material.

2. THE STUDY AREA

2.1 NOVAYA ZEMLYA

Novaya Zemlya is a group of islands consisting of two large islands, Severny (northern island) and Yuzhny (southern island), in addition to a number of small islands. The islands stretch out in a north/north-easterly direction, from 70°30' N to 77°00' N (Figure 2). The northern and southern islands are separated by the narrow Matochkin Shar strait, which is only 1-2 km wide. The two large islands extend about 900 km, and cover an area of 82,179 square km. In addition, the smaller islands have a total area of 1,000 square km. Novaya Zemlya therefore covers a total area of over 83,000 square km.

Novaya Zemlya separates the Barents Sea from the Kara Sea (Figure 2). In geological terms the group is, together with Vaygach, a northern extension of the Ural Mountains, which separate the European from the Asian land mass. The narrow strait between the northern and southern islands constitutes no natural line of demarcation between the two islands, neither geological or otherwise.

Novaya Zemlya can therefore be considered as one geographical unit (Holtedahl 1922). The two islands have very different topography. The southern part, and the eastern and western coast of the southern island, are dominated by coastal plains, which cover vast areas, particularly along the coast. This tableland does not normally attain heights over 300 metres. The central parts of the southern island, up to 73°N, are dominated by small mountains that attain heights of about 700 metres. On the northern part of the southern island, the mountains rise, and can attain heights over 1,000 metres. The southern part of the northern island also features large mountain formations, and the highest mountain on Novaya Zemlya is situated here (1547 metres above sea level). Further north, glaciers dominate the landscape, and north of 75°N there is a continual ice cap. Some dispersed smaller glaciers occur on the northern part of the southern island.

The climate on Novaya Zemlya is cooler than in the western parts of the Barents Sea, because much

of the heating effect of the relatively warm Atlantic water masses brought up along the Norwegian coast by the Gulf Stream is lost in the eastern Barents Sea. However, the remains of it serve to make the western coasts of Novaya Zemlya distinctly warmer than the eastern coast bordering the Kara Sea.

At the weather station of Karmakuly on the western coast of the southern island, the mean air temperature in July-August is 6-7°C and -17°C in February. The annual amount of precipitation is low, around 300-400 mm. Again, due to the effects of the Gulf Stream, the amount of precipitation is higher along the western coast than along the eastern coast and in the inland. Snow constitutes a major part of the precipitation and normally it falls throughout the island between October and May. Strong winds and blizzards occur frequently during the winter (Holtedahl 1928).

The western coast of Novaya Zemlya contains typical areas of convergence (polar fronts), as a branch of the Gulf stream here meets cold streams from the polar areas. This phenomenon causes a strong growth of planctonic algae, which subsequently makes the basis for high occurrences of zooplankton and fish. The high biological productivity forms the foundation for the rich birdlife on Novaya Zemlya (Uspenski 1956).

2.2 ARKHANGEL'SKAYA BAY

Arkhangel'skaya Bay is situated on the north-western coast of the northern island, about 260 km south-west of the northernmost point (75°53' N) (Figure 2). Several islands is situated close to the bay, the biggest being Gorbovy Island.

The mountains inland reach heights of about 700-1000 metres above sea level, while the mountains closer to the coast reaches heights between 200 and 500 metres above sea level. The coastline south of the bay (where the seabird colonies are located) is characterised by a narrow stripe 5-30 metres of stony beach, and with steep cliffs inside. The cliffs vary in height, but are on average 20-

30 metres in most parts of the colony. Beneath the cliffs there are scree areas several places. To the north of the colony there are remains of old settlements where among others Norwegian trappers stayed at the turn of this century. Close to the camp, huge amounts of drift-timber has gathered on the shore (Figure 3).

2.3 VIL'KITSKI BAY

Vil'kitski Bay (75°35' N) is situated 35 km south of Arkhangel'skaya Bay (Figure 2). The bay is about 10 km deep and the width is about 5 km in the outer parts. A great glacier which usually reaches the sea occupies the inner part of the bay, and the bay is therefore from time to time characterised by a huge amount of icebergs of different sizes. The relatively deep *Zelenaya River* has built up a delta on the southern shore in the inner part of the bay. As in Arkhangel'skaya Bay, the coastline in Vil'kitski Bay is dominated by steep cliffs with scree below. The land stripe between the colonies and the sea has rich vegetation due to guano deposits. A more detailed description of the colonies in Vil'kitski Bay is given by Rusanoff (1911).

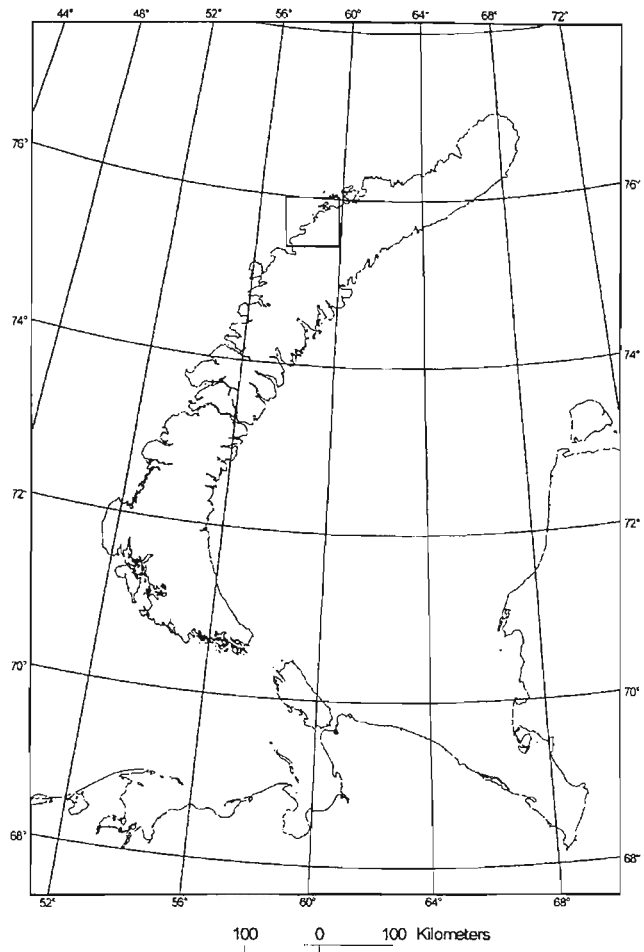


Figure 2. Novaya Zemlya. The square indicates the location of Arkhangel'skaya Bay and Vil'kitski Bay.



Figure 3. The shoreline close to the camp in Arkhangel'skaya Bay is characterised by huge amounts of drift-timber. Photo: Ingar Jostein Øien

3. COLONY COUNTS

3.1 INTRODUCTION

A comprehensive description of the Novaya Zemlya seabird colonies is given by Portenko (1931) and Uspenski (1956). Based on his own field work during the years 1941 and 1948-50, response to questionnaires and previously published data, Uspenski (1956) declare a total number of 47 seabird colonies to be found along the western coast of Novaya Zemlya in 1950. He further assessed the minimum number of Brünnich's Guillemots, the dominant seabird species in the colonies, to be about 2,000,000 birds.

The seabird colony at Arkhangel'skaya Bay was first described by Rusanoff (1911). L. O. Belopolski visited the bay in 1942 and provided an estimate of the breeding population of Brünnich's Guillemots to about 400 000 individuals (Uspenski 1956). Uspenski (1956) describes the seabird colony at Arkhangel'skaya Bay to be the largest on Novaya Zemlya at that time. Later the colony has been visited in 1967 (Golovkin 1972) and in 1992 (Pokrovskaya and Tertitski 1993). The main colony is situated along the shore to the south of the bay and it has a total length of about 1.5 km (Figure 4,5 and 6). To the north and to the south of the main colony, there are scattered occurrences of breeding seabirds. Thus the seabirds breeds more or less continuously from the southern shore of Arkhangel'skaya Bay to the inner part of Bespokoylnaya Bay.

The seabird colonies at Vil'kitski Bay are situated along the sea coast to the south of Vil'kitski Bay (the main colony) and with one colony cliff, appearing as a steep stone wall on the south shore in the inner parts of the bay (The Zelenaya River colony) (Figure 7,8 and 9). The total length of the Vil'kitski Bay main colony is about 1 km (Figure 4). Rusanoff (1911) was the first to describe the seabird colonies in Vil'kitski Bay. L.O. Belopolski estimated in 1942 the number of Brünnich's Guillemots to be 300 000 (Uspenski 1956). Later the colony has been visited in 1967 (Golovkin 1972).

Additionally there is a small colony situated at Cape Solunskogo, to the north of Vil'kitski Bay

(Figure 4). Due to shortage of time we were not able to visit this colony.

There has been a long tradition of economic exploitation of the Novaya Zemlya seabird colonies (Uspenski 1956). The colonies in Arkhangel'skaya Bay was exploited between the 1920's until L.O. Belopolski's expedition in 1942, but after that time the exploitation was irregular and on a small scale. There has been several attempts to exploit the guano deposits in Vil'kitski Bay, but for various reasons they have been unsuccessful (Uspenski 1956). A more comprehensive description of the history of the Novaya Zemlya seabird colonies is given in Strøm et al. (1994).

This year's work was carried out in the colonies on the shore to the south of Arkhangel'skaya Bay and in both the colonies of Vil'kitski Bay.

3.2 METHODS

As in previous years the work followed international standardised methods (see Bibby et al. 1992, Walsh et al. 1995). The counting unit used for Glaucous Gull *Larus hyperboreus* was breeding pairs and for Kittiwake apparently occupied nest sites. For Brünnich's Guillemot the counting unit was adult birds present on the breeding ledges. For Black Guillemot *Cepphus grylle*, Puffin *Fratercula arctica* and Little Auk *Alle alle* the counting unit was adult birds present at the colony.

The entire colony was photographed from the land side with Polaroid colour prints and with colour slide film, and from the sea side with black and white prints. The Polaroid photographs made up the basis for dividing the colony into smaller sections in order to facilitate the counting. The slides taken from the land side comprises material for control and reference, both for this year's counts and for future work.

The counts were undertaken from the land side, alternating between points above and under the colony. Usually, binoculars (10X42 and 10X40)

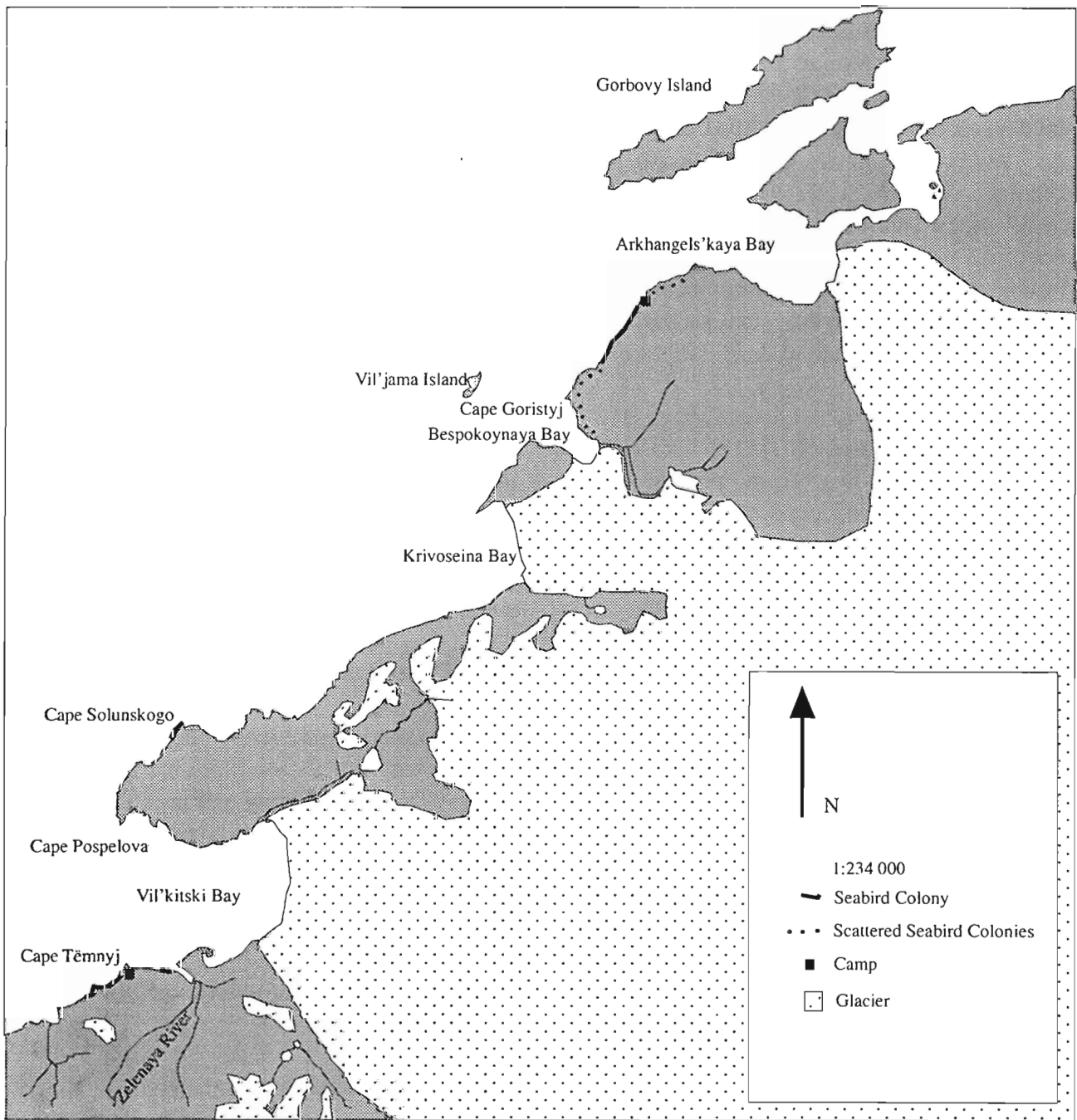


Figure 4. Arkhangel'skaya Bay and Vil'kitski Bay.

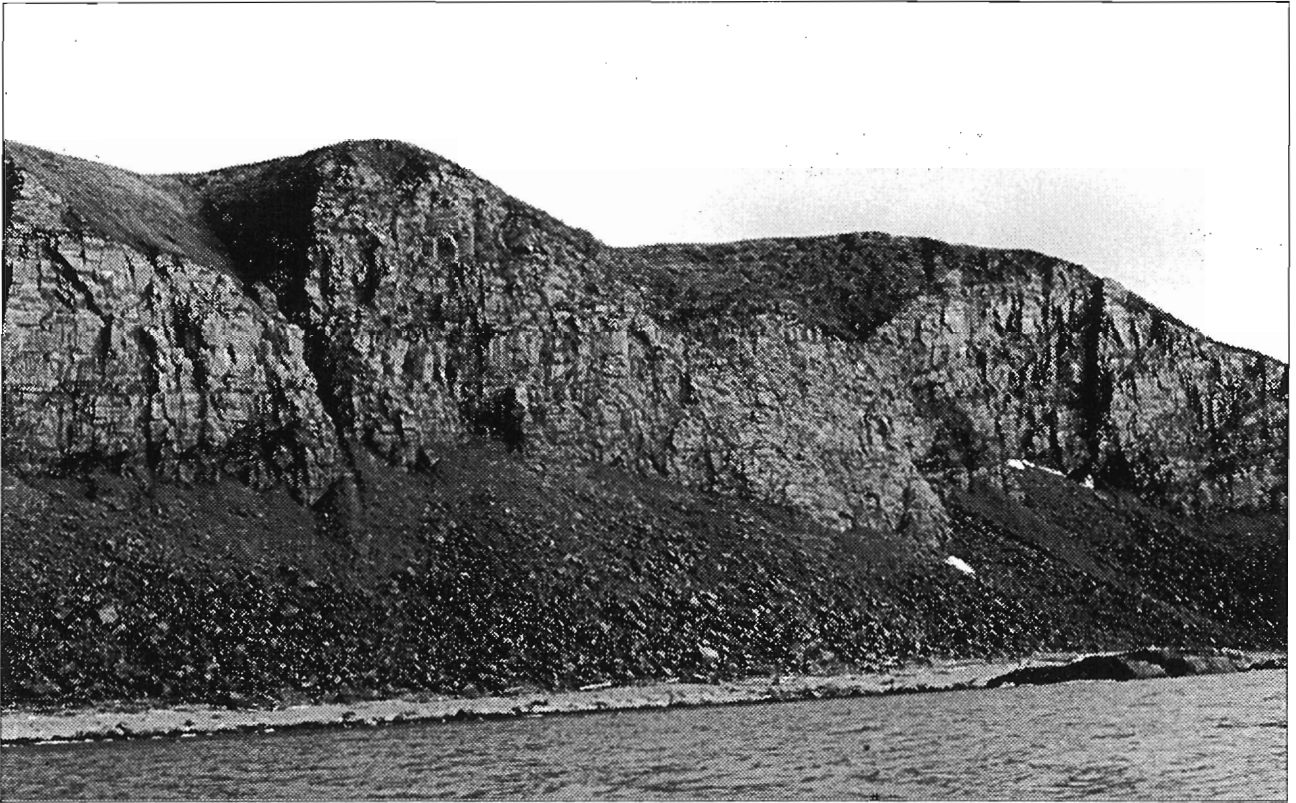


Figure 5. The northern parts of the colony on the shore south of Arkhangel'skaya Bay. The cliffs are between 20 and 30 metres high and has large screes beneath. Photo: Hallvard Strøm



Figure 6. The central parts of the colony on the sea shore south of Arkhangel'skaya Bay. The picture is taken from the top of the colony towards south. Photo: Hallvard Strøm



Figure 7. The colony at the mouth of the Zelenaya River on the south shore of Vil'kitski Bay. The colony is situated in a 100 metres long steep stone wall towering 20-30 metres above the ground. Photo: Hallvard Strøm



Figure 8. The northern parts of the main colony on the southern shore of Vil'kitski Bay. The cliffs are 30 to 50 metres high and the length of the colony is about 1 km. Photo: Hallvard Strøm

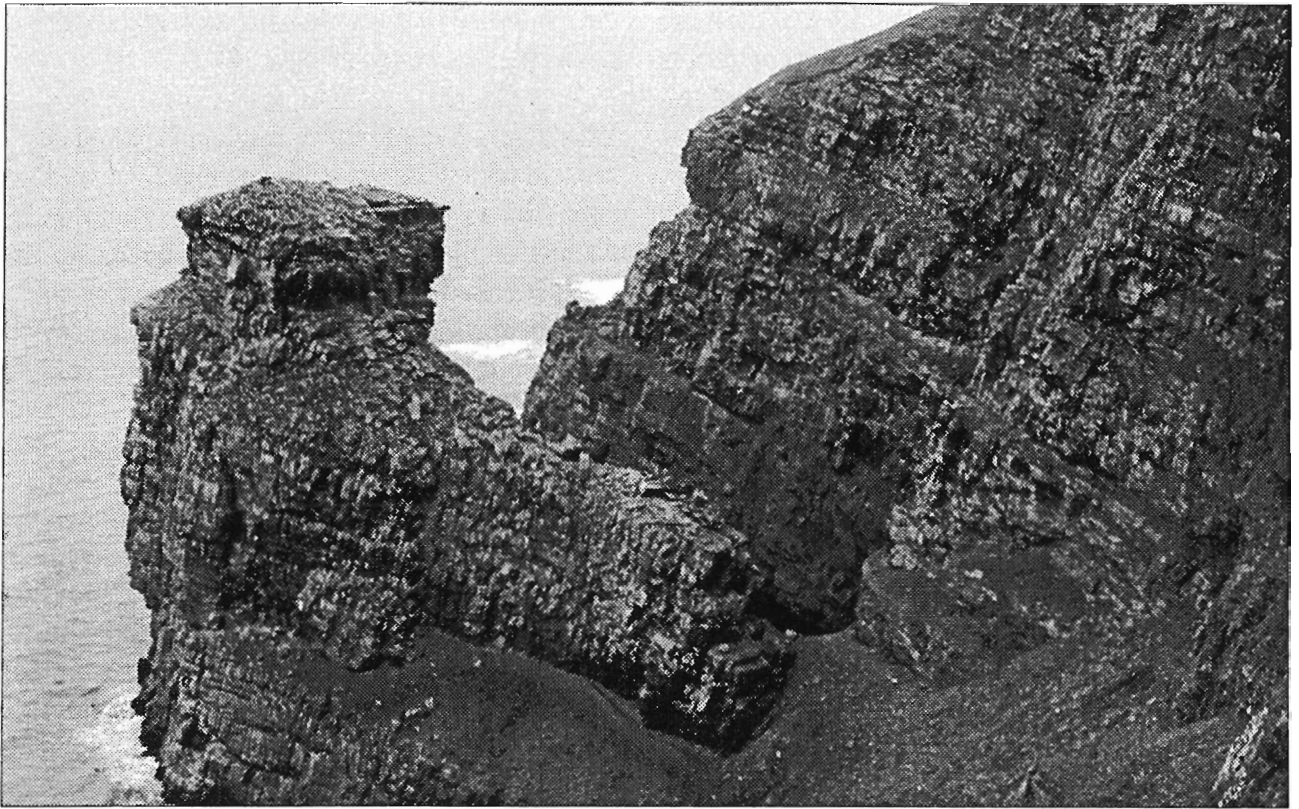


Figure 9. The southern parts (including the stack) of the main colony on the south shore of Vil'kitski Bay. This part possess the highest density of breeding Brünnich's Guillemots. Photo: Hallvard Strøm

were used, but where the distances were extremely short, the counts were carried out without binoculars, and some more distant parts of the colonies were counted using a telescope (20-60X). The counting units were registered in groups of 10 on hand tally counters, which we used in order to facilitate and ensure the accuracy of the counts. All species occurring in the colony, except for Little Auks breeding in the boulder screes, were counted this way.

3.3 RESULTS

The counts in Arkhangel'skaya Bay were completed in nine days during the period July 31 to August 14 and the colonies in Vil'kitski Bay in three days during the period August 7-9. The counts were carried out in the time period from 12 a. m. to 12 p. m. (Moscow time). Three to four people participated simultaneously in the counts.

In Arkhangel'skaya Bay we divided the colony
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into 36 sections. Section 1-25 covered the main colony. Section 26-35 covered the small, scattered colonies situated south of the main colony and in Bespokoyaya Bay. Section 36 covered the small colonies to the north of the main colony. The Zelenaya River colony in Vil'kitski Bay was divided into two sections and the main colony in Vil'kitski Bay was divided into 13 sections.

The numbers of birds in the sections are presented in Appendix 1, 2 and 3. The total numbers from the counts are presented in Table 1 and represent minimum numbers, except for Little Auk. The species are presented below.

Glaucous Gull *Larus hyperboreus*:

Bred scattered throughout all three colonies. The counts resulted in 49 occupied nests in Arkhangel'skaya Bay, two occupied nests in the Zelenaya River colony and 15 occupied nests in the main colony in Vil'kitski Bay. All nest sites were situated close to the seabird colonies. In Arkhangel's-

kaya Bay Glaucous Gulls were breeding both on the top of the cliffs and in the screes beneath. Two small colonies containing respectively five and six nests were found to the north of and in the middle of the colony in Arkhangel'skaya Bay. In the main colony in Vil'kitski Bay a small colony containing six pairs was found in the middle of the colony. The Glaucous Gull chicks were about 2-3 weeks of age at the onset of the field work.

Kittiwake *Rissa tridactyla*:

Bred scattered throughout the colony in Arkhangel'skaya Bay and the main colony in Vil'kitski Bay. In the Zelenaya River colony the birds were breeding in relatively high density, with a total of 3,076 apparently occupied nests. In Arkhangel'skaya Bay a total of 3,149 occupied nests were registered, and in the main colony in Vil'kitski Bay a total of 1,212 occupied nests were counted.

The Kittiwake preferred the steepest walls, and was breeding both solitary and clustered in small to medium sized groups. In most parts of the colonies the birds were breeding in close association with Brünnich's Guillemots, but some parts consisted almost exclusively of Kittiwakes. In all three colonies the breeding birds were evenly distributed throughout the colonies. When we arrived, most of the nests contained small to medium sized chicks (for age classification see Walsh 1995).

Brünnich's Guillemot *Uria lomvia*:

This species was the most numerous species in all three colonies. The counts gave a total of 131,192 birds on breeding ledges in Arkhangel'skaya Bay, 5,221 birds in the Zelenaya River colony and 48,892 birds in the main colony in Vil'kitski Bay. The Brünnich's Guillemot bred mainly on relatively narrow ledges, with space for one row of birds only.

In Arkhangel'skaya Bay the species bred throughout the whole colony, but the density varied considerably, and high and low density sections were mixed. The highest densities were found in the middle part of the colony, probably due to occurrence of broader ledges that allows several rows of breeding birds (Figure 10). In the southern and northern part of the colony the occupied ledges were more scattered, which can be explained by the suitability of the rock as nesting site.

In the main colony in Vil'kitski Bay the density also varied considerably, with the highest density found on the stack in the middle of the colony. About 12,500 Brünnich's Guillemots were counted on this cliff. On the top of the stack the birds were breeding open on nearly flat ground (Figure 11).

When we arrived Arkhangel'skaya Bay August 30, most chicks were between one and two weeks of age. Chicks leaving the ledges by jumping and gliding to the sea were first seen in Vil'kitski Bay August 7. In Arkhangel'skaya Bay jumping chicks was not observed until August 13. In both colonies only some few chicks left the ledges during the period of field work.

Little Auk *Alle alle*

The Little Auk was found breeding in Arkhangel'skaya Bay only. Most of the birds were breeding in the boulder screes at the base of the cliffs, with some few birds breeding scattered in the cliffs, together with Kittiwakes and Brünnich's Guillemots. The Little Auk bred throughout the colony, but having the largest concentrations in the northern part of the colony due to the large screes beneath the colony at this place (Figure 12). One large colony was also found to the south of the main colony, at the northern shore of Bespokoy Bay.

Due to shortage of time and lack of appropriate counting methods, we could not give priority to Little Auk countings. Only the birds observed in the cliffs were counted. The number of birds breeding in the boulder screes was only estimated roughly. The counts gave a total number of 1,074 adult birds present at the colony. The number of birds inhabiting in the boulder screes was estimated to about 30,000. This is, however, only a very rough "guesstimate" and should only be treated as an order of magnitude.

Little Auks were seen as far south as off Krivoseina Bay, between Arkhangel'skaya Bay and Vil'kitski Bay.

Black Guillemot *Cephus grylle*:

The Black Guillemot occurred in small numbers, and the counts gave a total of 88 birds present in the colony in Arkhangel'skaya Bay and 11 birds

in the main colony in Vil'kitski Bay. Black Guillemots bred scattered throughout both colonies. In Arkhangel'skaya Bay the highest density was found in the southern part of the colony, in Vil'kitski Bay the density was highest in the northern part of the colony.

Puffin *Fratercula arctica*:

The Puffin was found breeding in the southern part of the colony in Arkhangel'skaya Bay (the northern shore of Bepokoylnaya Bay). Two birds were also observed in the cliff and the boulder screes in the northern part of the colony. A total of 77 birds were registered. The Puffin bred on rocky cliff sites or in boulder screes. In Vil'kitski Bay one bird was seen flying westward August 8.

3.4 DISCUSSION

The counts were carried out from the land side, alternating between points above and under the colonies. However, this do not prevent some birds and certain ledges in the colonies to be missed by the observers. This problem pass for the Brün-nich's Guillemot and arise especially when the birds breeds on broad ledges. This may have been a source of error in some small parts of the colony in Arkhangel'skaya Bay.

The attendance of the six species in the colonies varies during the day, and it would probably be best to census the different species at different times of day (Bibby et al. 1992, Walsh et al. 1995). Because of the limited time available and the weather conditions during the field work, it was not possible to take this into consideration, and the numbers presented in Table 1 and Appendix 1, 2 and 3 are not adjusted to what time of day the counts were undertaken.

As mentioned in chapter 1, the weather conditions during the stay were severe and variable. However, the weather conditions probably had no significant effect on the reliability of the censuses, as the counting was stopped when the weather conditions became too harsh.

Rusanoff (1911) and Gorbunoff (1929) found the Common Guillemot breeding in Arkhangel'skaya

Bay. The species were not seen in 1967 (Golovkin 1972) or in 1992 (Pokrovskaya and Tertitski 1993). The Common Guillemot were neither seen by us, even though we checked all suitable breeding ledges both in Arkhangel'skaya Bay and Vil'kitski Bay. It is therefore reasonable to assume that the Common Guillemot no longer breeds in Arkhangel'skaya Bay

Regarding the Black Guillemot, counting the breeding population is difficult because the nests are situated in cracks and gullies, generally hidden from the observers. Additionally the species generally nests at low density and the colony attendance vary considerably during the day. Thus our numbers are probably to low for the Black Guillemot.

This year's counts were carried out thoroughly, and probably give a reliable estimate of the number of birds present when we counted the colonies. Even considered the above mentioned potential sources of error, it is unlikely that the margin of error for our censuses exceeds 10%, except for the Little Auk in Arkhangel'skaya Bay.

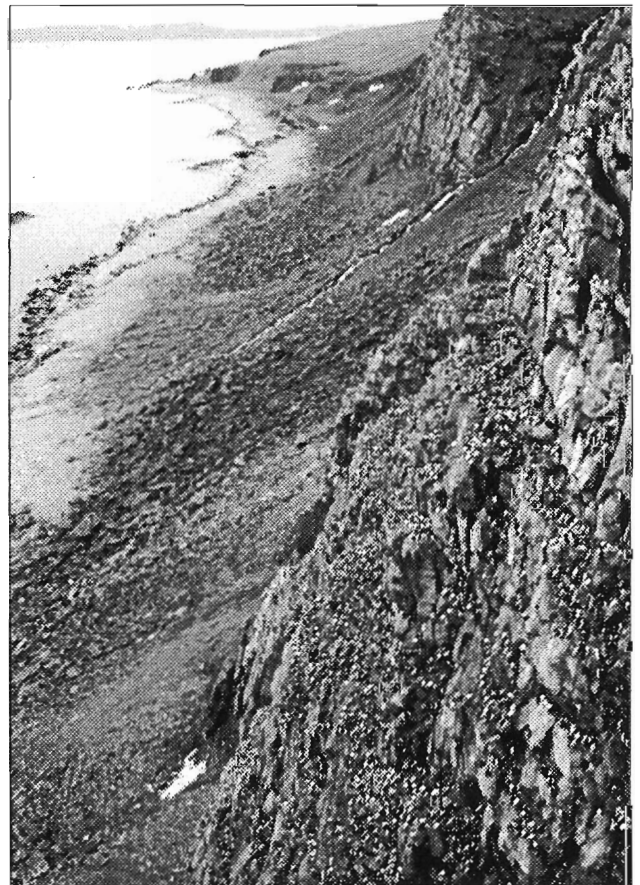
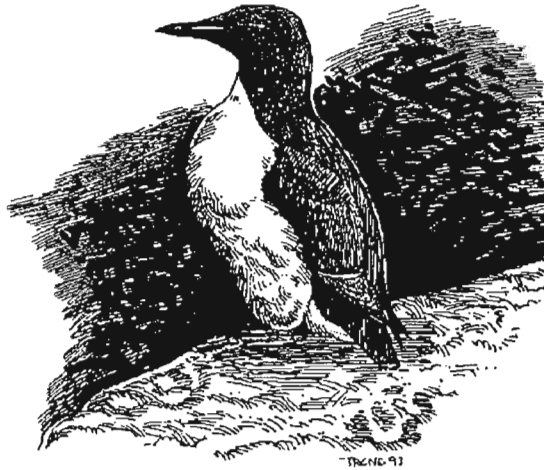


Figure 10. The central parts of the colony on the sea shore south of Arkhangel'skaya Bay. The picture is taken from the top of the colony towards north. Photo: Hallvard Strøm



Figure 11. The top of the "stack" in the main colony in Vil'kitski Bay. Here, the Brünnich's Guillemot breeds on nearly flat ground. Photo: Hallvard Strøm



Brünnich's Guillemot. Drawing by Trond Haugskott

Table 1. Colony counts in Arkhangel'skaya Bay and Vil'kitski Bay (the Zelenaya River colony and the main colony) 1996.

Species	Arkhangel'skaya Bay	The Zelenaya River colony	The main colony
Glaucous Gull ¹⁾	49	2	15
Kittiwake ²⁾	3,149	3,076	1,212
Brünnich's Guillemot ³⁾	131,192	5,221	48,892
Little Auk ⁴⁾	1,074 ⁵⁾	-	
Black Guillemot ⁴⁾	88	-	11
Puffin ⁴⁾	77		

1) Breeding pairs

2) Apparently occupied nest sites

3) Adult birds present on the breeding ledges

4) Adult birds present at the colony.

5) Counted within the sections. The total number estimated in the screes beneath the colony was approximately 30,000 birds.



Figure 12. The scree beneath the colony in Arkhangel'skaya Bay with breeding Little Auks. View from the south. Photo: Ingar Jostein Øien

4. MONITORING PLOTS

Nine monitoring plots were established in Arkhangel'skaya Bay and respectively three and seven plots were established in the Zelenaya River colony and the main colony in Vil'kitski Bay.

The monitoring plots are well defined areas where the number of apparently occupied nest sites (Kittiwake) and the number of birds (Brünnich's Guillemot and Little Auk) were counted with high accuracy several times throughout the breeding season. The purpose of these monitoring plots is to detect possible population changes by regular countings over a period of several years. This years counts will serve as a reference for the population size in the visited colonies.

All plots were photographed with both Polaroid colour prints, colour slides and black and white film. The plots were accurately marked on the Polaroid prints, and the counting points were marked by metal rods. The counting points were also photographed.

All 19 monitoring plots contained Brünnich's Guillemots, while six plots contained Kittiwakes. Little Auks occurred in one plot. The 19 plots contained a mean total of 2,844,5 Brünnich's Guillemots, which gives an average of 149,5 birds per plot. The six plots where Kittiwakes were represented contained a mean total of 159 Kittiwakes. The results of the counts in the monitoring plots are given in Table 2 and 3. Due to shortage of time, the 10 monitoring plots in Vil'kitski Bay was only counted once.

The monitoring plots should be randomly distributed throughout a colony in order to be representative for the entire colony (Bibby et al. 1992, Walsh et al. 1995). However, this is often difficult to achieve. In Arkhangel'skaya Bay the monitoring plots were concentrated to the northern part of the colony because of it's accessibility. In Vil'kitski Bay the plots were distributed more evenly throughout the colony, but with most of the plots situated in the southern part.

5. RINGING

A total of 2,761 Brünnich's Guillemots (862 adults and 1899 chicks) were ringed during the stay. The ringing of adult birds was undertaken during the period July 31- August 13. The ringing of chicks was carried out during the period August 05 - August 13. In addition, 81 Glaucous Gull chicks were ringed. The ringing of Brünnich's Guillemots was carried out in the upper parts of all suitable sections both in Arkhangel'skaya Bay and Vil'kitski Bay. The Glaucous Gull chicks were ringed in the nests both on the top and beneath the colonies. Out of the total; 50 ad. and 200 pull. Brünnich's Guillemots and 6 chicks of Glaucous Gull were ringed in Vil'kitski Bay.

The ringing of Brünnich's Guillemots is part of an international programme, initiated by the Circumpolar Seabird Working Group (CSWG), aimed at mapping the migratory routes and wintering grounds of this species.

The accessibility of the seabird colonies both in Arkhangel'skaya Bay and in the Vil'kitski Bay colony is highly variable. Steep cliffs with the shoreline or heap of stones 30-40 metres below, where ringing is impossible, dominate. However, it is possible to ring birds on the upper ledges in some of these cliffs, and a few cliffs allow ringing on the lower ledges. In Vil'kitski Bay, the top of the stack in the northern part of the colony (Figure 9) may be reached with simple equipment for mass-ringing of Brünnich's Guillemots. On both sides of the stack wooden ladders are left from the time of economic exploitation of the colony. We could not reach the top because of the guano deposits.

The ringing of adult Brünnich's Guillemots and Glaucous Gull chicks was accomplished through the use of a telescopic glass-fibre fishing rod, with a metal hook at the end. The metal hook was, however, unsuitable for catching the Brünnich's Guillemot chicks. We therefore used a neck snare at the end of the telescopic rod, and a shorter stick with a pliers-like mechanism for this purpose.

Table 2. Counts of monitoring plots in Arkhangel'skaya Bay.

Mon. plot no.	Species	No. of counts	Mean	Min.	Max.
1	Kittiwake ¹⁾	4	12,0	12,0	12,0
	Br. Guillemot ²⁾	4	139,0	138,5	139,5
2	Br. Guillemot ²⁾	4	119,0	108,5	129,0
3	Br. Guillemot ²⁾	4	267,0	244,5	290,0
4	Br. Guillemot ²⁾	4	226,0	215,0	238,0
	Little Auk ³⁾	3	14,0	12,0	16,0
5	Br. Guillemot ²⁾	4	196,0	193,0	218,5
6	Br. Guillemot ²⁾	3	238,5	223,5	266,5
7	Br. Guillemot ²⁾	3	273,5	257,5	293,0
8	Br. Guillemot ²⁾	1	178,0	-	-
9	Br. Guillemot ²⁾	2	165,5	151,0	179,5
Total	Kittiwake		12,0		
	Br. Guillemot		1,802,5		
	Little Auk		14,0		

1) Apparently occupied nest sites

2) Adult birds present on the breeding ledges

3) Adult birds present at the colony

Table 3. Counts of monitoring plots in Vil'kitski Bay. Plot 1-3 is in the Zelenaya River colony, plot 4-10 is in the main colony.

Mon. plot no.	Species	No. of counts	Mean
1	Kittiwake ¹⁾	1	33,0
	Br. Guillemot ²⁾	1	1,0
2	Kittiwake ¹⁾	1	48,5
	Br. Guillemot ²⁾	1	2,0
3	Kittiwake ¹⁾	1	29,5
	Br. Guillemot ²⁾	1	27,0
4	Br. Guillemot ²⁾	1	304,0
5	Br. Guillemot ²⁾	1	101,5
6	Br. Guillemot ²⁾	1	107,5
7	Kittiwake ¹⁾	1	30,0
	Br. Guillemot ²⁾	1	84,5
8	Kittiwake ¹⁾	1	6,0
	Br. Guillemot ²⁾	1	157,0
9	Br. Guillemot ²⁾	1	146,0
10	Br. Guillemot ²⁾	1	111,5
Total	Kittiwake		117,0
	Br. Guillemot		1042,0

1) Apparently occupied nest sites

2) Adult birds present on the breeding ledges

6. COLLECTION OF FOOD ITEMS

As a part of the work in the colonies observation and sampling of food items given by adult Brünnich's Guillemots to their chicks was undertaken. Examinations of the food preferences of Brünnich's Guillemots have been carried out earlier on Novaya Zemlya, among others by Gorbunoff (1925), Krasovski (1937), Belopolski (1942, in Uspenski 1956) and Uspenski (1956). Based on all available data, Uspenski compiled a species list containing 96 species registered as prey for Brünnich's Guillemot. The dominant fish species were Polar Cod *Boreogadus saida*, Cod *Gadus morhua*, Haddock *Melanogrammus aeglefinus*, Capelin *Mallotus villosus* and Herring *Clupea harengus*.

Twenty four items were collected, and forty five items were identified through direct observations of feeding. In the direct observations it was only possible to identify the food items as Polar Cod or fish *sp.* All registered food items were fish. Represented in the sample were Polar Cod *Boreogadus saida* (n=50), Haddock *Melanogrammus*

aeglefinus (n=1), Two-horn Sculpin *Icelus bicornis* (n=1), Eel Blenny *Lumpenus lampraetaeformis* (n=1), and fish *sp.* (n=16)(Figure 13).

A Puffin was once observed with Cuttlefish larvae, and Black Guillemots were three times observed with Sculpin *Icelus sp.*

Polar Cod predominates the samples, but the material from this year's field work is too limited to make any general conclusions concerning food preferences of the Brünnich's Guillemots breeding on Novaya Zemlya.



Figure 13. Prey items given by Brünnich's Guillemots to their chicks in Arkhangel'skaya Bay. The main prey was Polar Cod. Photo: Hallvard Strøm

7. OBSERVATIONS OF BIRDS AND MAMMALS

All observations of birds and mammals during the field work are summarised below, including observations from walking tours to areas outside the colony as well as observations from the rubber boat on the route between Arkhangel'skaya Bay and Vil'kitski Bay.

A total of 21 bird species and 3 species of mammals were observed. In addition, we found faeces a skull from Polar Bear *Ursus maritimus*, and antlers from Reindeer *Rangifer tarandus*.

LIST OF SPECIES WITH COMMENTS:

BIRDS:

Fulmar *Fulmarus glacialis*:

In Arkhangel'skaya Bay only occasionally observed in the colonies; 5-6 ind. 31.07 and 2-3 ind. 01.08 and 03.08. One colony where Fulmars probably breeds is situated at Cape Solunskogo north of Vil'kitski Bay (see chapter 3).

Red-throated Diver *Gavia stellata*:

Three individuals in Bespokoylnaya Bay, 13.08.

Diver sp. *Gavia sp.*

One ind. flying northwards over the main colony in Vil'kitski Bay 07.08.

Bean Goose *Anser fabalis*:

In Arkhangel'skaya Bay small to medium sized groups of moulting moulting individuals observed beneath the colonies; between forty and fifty ind. on the sea 31.07, 12 ind. 01.08, two ind. 04.08 and four and 11 ind. 05.08 and 06.08 respectively. In Vil'kitski Bay one ind was observed 07.08, and a flock of 20 ind. + 8 ind. 08.08. In Bespokoylnaya Bay, to the south of Arkhangel'skaya Bay, one moulting flock of 387 ind. and some smaller flocks consisting of 63, 28 and 42 ind. was seen 13.08. Four dead ind. showed the characteristics of the ssp. *fabalis* (see Figure 14). One of the dead birds (a male) was ringed in Otajärvi, 80 km south-east of Oulu in Finland 01.08.1985 (ring no. M21764).

Common Eider *Somateria mollissima*:

Three + five female coloured ind. were observed close to the camp in Arkhangel'skaya Bay 30.07, and five females at the same place 31.07. Two females with 10 young in Arkhangel'skaya Bay 02.08, and three females 03.08. Two females with nine young in Arkhangel'skaya Bay 04.08. Ten females + three females with brood (nine, three and one young), a group of five females with 13 young and two groups consisting of two females with nine and five young respectively in Arkhangel'skaya Bay 06.08. Fifty-two birds in Vil'kitski Bay 08.08. One female with three young close to the camp in Arkhangel'skaya Bay 12.08, and seven-eight broods observed along the whole colony in Arkhangel'skaya Bay 13.08.

Long-tailed Duck *Clangula hyemalis*:

Thirteen individuals were observed in the inner parts of Vil'kitski Bay 07.08. Sixty-seven birds were observed in Vil'kitski Bay 08.08.

Red-breasted Merganser *Mergus serrator*:

One pair in the inner parts of Vil'kitski Bay, 07.08.

Goosander *Mergus merganser*:

Six female-coloured birds were observed in Arkhangel'skaya Bay 30.07, and seven at the same place 31.07. One moulting female in Arkhangel'skaya Bay, 06.08.

Ringed Plover *Charadrius hiaticula*:

Ringed Plovers were only observed once during the field period. One pair with two fledged young in Arkhangel'skaya Bay 13.08.

Purple Sandpiper *Calidris maritima*:

The only common wader species. The Purple Sandpiper were observed scattered, but regularly in all visited areas during the field work. A group of six birds in Arkhangel'skaya Bay 31.07. A group of 14 birds in Arkhangel'skaya Bay 02.08, and a group of six birds in Arkhangel'skaya Bay 03.08. Twenty birds close to the camp, 04.08., and 14 birds the same place 06.08. Between 10 and 12 birds in Vil'kitski Bay 08.08, 09.08 and 12.08.

Pomarine Skua *Stercorarius pomarinus*:
Two in Vil'kitski Bay 07.08.

Great Skua *Stercorarius skua*:
Single individuals were observed three times during the field work. One ind. was observed in Arkhangel'skaya Bay 30.07 and 31.07, and one bird was observed in Vil'kitski Bay 07.08.

Arctic Skua *Stercorarius parasiticus*:
One ind. was observed in Arkhangel'skaya Bay 02.08 and 06.08, and one pair showing territorial behaviour in Arkhangel'skaya Bay 13.08 together with a 2Y bird (both sexes were of the pale phase).

Glaucous Gull *Larus hyperboreus*:
See colony counts (Chapter 3).

Kittiwake *Rissa tridactyla*:
See colony counts (Chapter 3).

Arctic Tern *Sterna paradisaea*:
Two ind. in Arkhangel'skaya Bay 06.08. Three and two ind. in Vil'kitski Bay 07.08 and 08.08 respectively.



Figure 14. Four dead specimens of Bean Goose *Anser fabalis fabalis*. Photo: Ingar Jostein Øien

Brünnich's Guillemot *Uria lomvia*:
See colony counts (Chapter 3).

Black Guillemot *Cephus grylle*:
See colony counts (Chapter 3).

Little Auk *Alle alle*:
See colony counts (Chapter 3).

Puffin *Fratercula arctica*:
See colony counts (Chapter 3).

Snowy Owl *Nyctea scandiaca*:
One old male was observed in Arkhangel'skaya Bay 03.08 and 04.08, and a female and an old male at the top of the colony in Arkhangel'skaya Bay 05.08 and 06.08. One old male was observed hunting for Brünnich's Guillemot chicks in the colonies of Arkhangel'skaya Bay 11.08. In the small colonies to the south of the main colonies in Arkhangel'skaya Bay, an old male was observed successfully hunting for Little Auks 13.08. The same day, two ad. males were seen flying together close to the same place, and one female close to the camp in Arkhangel'skaya Bay.

Snow Bunting *Plectrophenax nivalis*:
Common in all the visited areas. Five-six clutches around the colony in Arkhangel'skaya Bay.

MAMMALS:

Reindeer *Rangifer tarandus*:
No direct observations, but a lot of antlers were found both in Arkhangel'skaya Bay and in Vil'kitski Bay.

Arctic Fox *Alopex lagopus*:
Four broods were found during the field work. One den close to the camp in Arkhangel'skaya Bay, containing six pups, and one den with at least four pups was situated in the middle part of the colonies of Arkhangel'skaya Bay. In Vil'kitski Bay, two dens containing four and two pups respectively was situated beneath the main colony (one in the southern part, and one in the northern parts). The prey remnants showed that the Arctic Fox were preying upon Brünnich's Guillemot, Little Auk and Bean Goose.

Polar Bear *Ursus maritimus*:
Faeces were found on several occasions, probably from the winter 1995/96

Arctic Lemming *Dicrostonyx torquatus*:
One ind. seen 31.07 at the camp in Arkhangel'skaya Bay.

Bearded Seal *Erignathus barbatus*:
One ind. seen swimming outside the camp in Vil'kitski Bay 10.08.

8. COLLECTION OF SAMPLES FROM SEABIRDS

Five individuals from each of the following species were collected: Little Auk, Brünnich's Guillemot, Kittiwake, and Glaucous Gull. The birds were sexually determined, and standard biometrical measurements were taken. The purpose of the collection was parasitologic analyses, which will be carried out at Murmansk Marine Biological Institute (MMBI).

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10. APPENDICES

Appendix 1. Colony counts in Arkhangel'skaya Bay 1996.

Section	Glaucous Gull ¹⁾	Kittiwake ²⁾	Brünnich's Guillemot ³⁾	Little Auk ⁴⁾	Black Guillemot ⁴⁾	Puffin ⁴⁾
1	2	92	2,608	373	2	
2		14	2,507			1
3	1	72	5,892	6		
4		5	3,682	25		
5		73	3,090			
6	1	7	1,857			
7	8	301	13,040	155		
8		109	7,493	39		
9	1	61	13,505	15		
10			2,210			
11	1	113	3,720	30		
12	4	71	2,960			
13		7	1,776	10		
14	1	109	9,890	17		
15	1	27	9,440			
16	4	113	13,135	6	1	
17		110	7,401	23		
18	3	121	4,930	8	1	
19	1	294	4,210	20	1	
20	1	106	750			
21	1	339	6,235			
22	1	245	3,470	156	4	
23		39	990			
24	2	405	1,585	8		
25	1	6	860		14	
26-30	1	232	2,502	60	9	
31-35	8	78	1,297	2	20	75
North of main colony	6		157	121	36	1
Total	49	3,149	131,192	1,074	88	77

1) Breeding pairs

2) Apparently occupied nest sites

3) Adult birds present on the breeding ledges

4) Adult birds present at the colony

Appendix 2. Colony counts in the Zelenaya River colony in Vil'kitski Bay 1996.

Section	Glaucous Gull ¹⁾	Kittiwake ¹⁾	Brünnich's Guillemot ²⁾
1	2	1,878	2,844
2		1,198	2,377
Total	2	3,076	5,221

1) Apparently occupied nest sites

2) Adult birds present on the breeding ledges



The participants of the field work in Arkhangel'skaya Bay and Vil'kitski Bay 1996. From left: Ingar Jostein Øien, Vadim Kuklin, Jon Opheim, Hallvard Strøm, Sergey N. Cheltsov and Gennady V. Khakhin. Photo: Hallvard Strøm.

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