Census of breeding seabirds on the northwest coast of Svalbard 1973 and 1978

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The western coast of Svalbard is one of the world's most important seabird regions (Belopol'skij 1961; Løvenskiold 1964; Norderhaug et al. 1977), due to the favourable water temperatures, light regime and amounts of mineral salts (Norderhaug et al. 1977).

Seabirds have been censused several times in this area (Kristoffersen 1962; Larsen 1965; Dhondt et al. 1969; Voisin 1970; Norderhaug 1974; Sendstad 1978; Alendal et al. 1982).

Except for Larsen (1965), there is no comprehensive and quantitative survey of any part of northwestern Svalbard. Further east, Jepsen & Mobæk (1983) surveyed the area between Gråhuken and Nordaustlandet.

Recent concern about the potentially detrimental effects of planned oil exploration and increased human activities in the high Arctic has emphasized the need for more information on the ecology in these regions. This paper provides more comprehensive data on seabird populations in northwestern Svalbard, between southern Prins Karls Forland and Verlegenhuken. The results supplement the studies carried out in 1978 and 1979 by Jepsen & Mobæk (1983) between Verlegenhuken and Kong Karls Land.

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General area description

The northwest coast of Svalbard is deeply indented, with rocky peninsulas rising to 300–800 m a.s.l. alternating with fjords and islands. East of Biskayerhuken the north coast is less rugged, with few cliffs, especially around Reinsdyrflya. The sea is usually free from ice from June to October (Hisdal 1985). The average air temperature in July-August is approximately 5°C, with small daily variations (3°C at Isfjord Radio). During summer, the weather of this high Arctic is characterized by a predominance of rain and fog (347 mm precipitation per year at Isfjord Radio, Steffensen 1969). Within our study periods, we had 39 days of fog (out of a total of 106) in July and August 1973 and 1978.

Methods and surveyed area

In 1973, data were collected by a group of 9 people based at Ny-Ålesund from 5 to 27 July (Kongsfjorden 5–15 July, Krossfjorden-Mitrahalvøya 15–20 July, Forlandsundet from Kvadehuken to St. Jonsfjorden 21–25 July). In addition, a party of three persons investigated Prins Karls Forland from 25 July to 2 August.

In 1978, a party of 9 people with base camp at Sørgattet (between Magdalenefjorden and Smeerenburgfjorden) conducted surveys in Kongsfjorden and Albert I Land (9–13 July), Liefdefjorden, Bockfjorden and Woodfjorden (24–26 July and 12–13 August) and Raudfjorden (16 July). The remaining areas (Hoelhalvøya to Flathuken, Velkomstpynten and Moffen) were surveyed at least three times. Only Nordvestøyane could not be investigated in this study. Additional data were provided in 1975 by a party of four persons who surveyed Brøggerhalvøya from 19–27 July, and from observations made during a voyage in July 1981 between Longyearbyen and Smeerenburgfjorden.

According to the methods proposed by Brown et al. (1975) and mainly Nettleship (1976) for seabird-colonies, counts were generally made by two or three persons between 0900 and 1600 hours local time. Colonies or single pairs were recorded from boat or adjacent slopes within 1–3 hours. The large bird cliffs (1,000–2,000 birds) were photographed, although no photographic atlas was made.

Apart from a few exceptions (Prins Karls Forland and Krossfjorden 1973, Kongsfjorden, Raudfjorden and Woodfjorden 1978), the breeding grounds were surveyed at least 3 times (early,

Table 1. Breeding birds in north-western Svalbard – a summary.

SPECIES	AREA SURVEYED 1973 N:NAME						AREA SURVEYED 1978 N:NAME													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
APPROXIMATE NUMBERS INDIVIDUALS (*) PAIRS PRESENT (°)	PRINS KARLS FORLAND-S	PRINS KARLS FORLAND-N	FORLAND-SUNDET	KONGSFJORDEN	KROSSFJORDEN	MITRAHALVØYA	ALBERT I LAND	MAGDALENEFJORDEN	DANSKØYA	AMSTERDAMØYA	NORDVESTØYANE	SMEERENBURG-FJORDEN	SVENSKEGATTET	RAUDFJORDEN	BREIDBOGEN	REINSDYRFLYA LIEFDEFJORDEN	MOFFEN	GRÅHUKEN WOODFJORDEN	BOCKFJORDEN	MOSSELHALVØYA	TOTAL
FULMAR (°) *Fulmarus glacialis*	700	300	700	900	200	200	> ? 200	200	—	60	—	—	—	160	125	—	—	—	—	—	5,500
KITTIWAKE (°) *Rissa tridactyla*	—	3,500	500	3,000	3,200	—	2,200	800	300	2,400	? 200	—	—	350	—	1,500	—	180	—	—	18,000
BRÜNNICH'S GUILLEMOT (*) *Uria lomvia*	?	60,000	300	1,100	13,000	—	24,000	—	2,300	10,000	2,000	—	? 250	27,000	—	—	—	—	—	—	≃140,000
COMMON GUILLEMOT (*) *Uria aalge*	—	> 100	—	3	—	—	—	—	—	10—	—	—	—	—	—	—	—	—	—	—	> 113
PUFFIN (*) *Fratercula arctica*	—	1,600	360	50	530	—	> 550	100	55	200	—	—	—	> (?)50	—	—	—	—	—	—	> 3,500
BLACK GUILLEMOT (*) *Cepphus grylle*	?	300	20	140	200	—	300	—	80	50	(?) 50	(?) 50	(?) 25	110	50	—	—	13	—	—	≥ 1,400
LITTLE AUK (*) *Alle alle*	?	400,000	> 3,000	> 3,000	> 15,000	> 500	1 M	100,000	100,000	80,000	?	15,000	80,000	> 20,000	1,000	?	—	?	?	—	>1,500,000
GREAT SKUA (°) *Stercorarius skua*	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	2
ARCTIC SKUA (°) *Stercorarius parasiticus*	> 10	> 60	17	29	7	12	1	1	≥ 5	≥ 2	?	—	14	≥ 3	≥ 3	≥ 6	4	> 2	1	—	177
GLAUCOUS GULL (°) *Larus hyperboreus*	> 20	70	30	12	41	17	≥ 4	8	28	20	?	—	12	23	5	—	26	?	—	—	316
ARCTIC TERN (°) *Sterna paradisaea*	≥ 200	≥ ? 25	40	950	20	30	≥ 18	10	235	—?	?	2	≥ 14	60	> 5	≥ 20	130	?	?	—	> 1,769

RESULTS: GIVEN IN PAIRS (°) – OR INDIVIDUALS (*)

mid- and late July). We followed Nettleship's (1976) recommendations for the census of the different species, and the following units were counted:

Glaucous Gull *Larus hyperboreus*

Kittiwake *Rissa tridactyla*

Arctic Tern *Sterna paradisaea:*

Occupied nests in early and mid-July.

Fulmar *Fulmarus glacialis:*

Nests occupied by 1 or 2 individuals.

Results given in pairs.

Brünnich's Guillemot and Common Guillemot *Uria spp.*:

Adults present at the colony generally during the morning hours (9–12 a.m.).

Counts were made in sub-colonies until the two or three persons arrived at a difference of less than 5%.

For surveying such colonies, we counted approximately (mean value) 5,000 birds per hour. The activity of the colony was noted on a scale (1–4), and the census was considered as non-valuable when the colony was estimated to be 'active' or 'very active'.

Black Guillemot *Cepphus grylle*:

Early morning (0600–1000 hrs) or evening (1600–2100 hrs) census of the adults on the sea during the breeding and recording of the different places where the birds are bringing food.

Puffin *Fratercula arctica:*

Number of birds visible in the colony throughout the day for 2 or 3 consecutive days. Due to the particular breeding sites of the Puffin in northwestern Svalbard (boulders and slopes at the summit of the bird rocks), our census gives only a minimum figure of the individuals present.

Little Auk *Alle alle:*

When approaching the breeding or resting sites, flocks are starting and landing. An estimation of the flying birds was made and then a 2–3 hours count per place was implemented to have a more accurate figure of the minimum number of individuals present on the site. In the most important places, between Knoffberget and Flathuken, these counts were made 3–5 times between 28 June and 15 August, with an interval of minimum 5 days.

Some inland colonies on Losvikfjella (Albert I Land) were counted in mid-July 1978 and documented the presence of large colonies on the largely unexplored nunataks. Voisin (1970) has reported Little Auks and Fulmars breeding in inland colonies in Haakon VII Land.

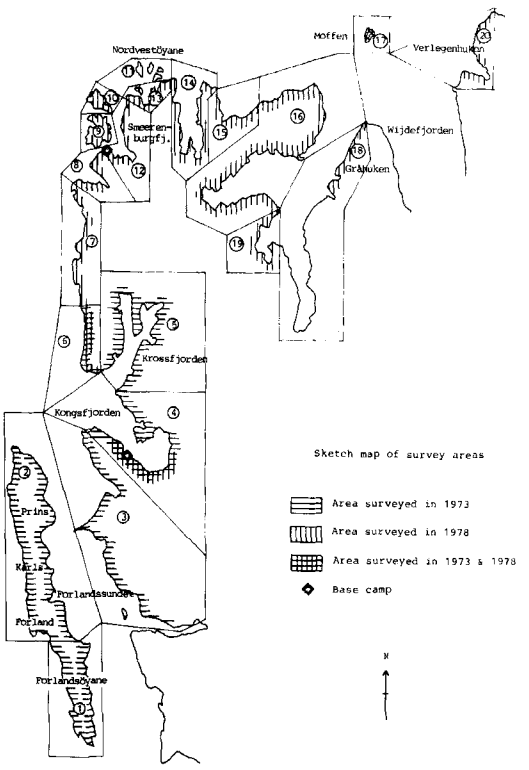

Fig. 1. Surveyed areas.

The number of birds present at bird cliffs varies considerably according to the time of day, the date and the weather conditions. No 'correction factors' (Nettleship 1976) were calculated for the colonies. It is also difficult to estimate the percentage of non-breeding birds present at the colonies. Finally, only the coastline up to 1–3 km inland was generally investigated, thereby excluding many of the nunataks. The results should therefore be considered as indices only, or minimum figures (providing, however, baseline population estimates for comparison with future surveys), and be interpreted accordingly.

Results

Species account and distribution maps

Fulmar Fulmarus glacialis. – 5,000 to 10,000 pairs, breeding mainly in monospecific colonies on large

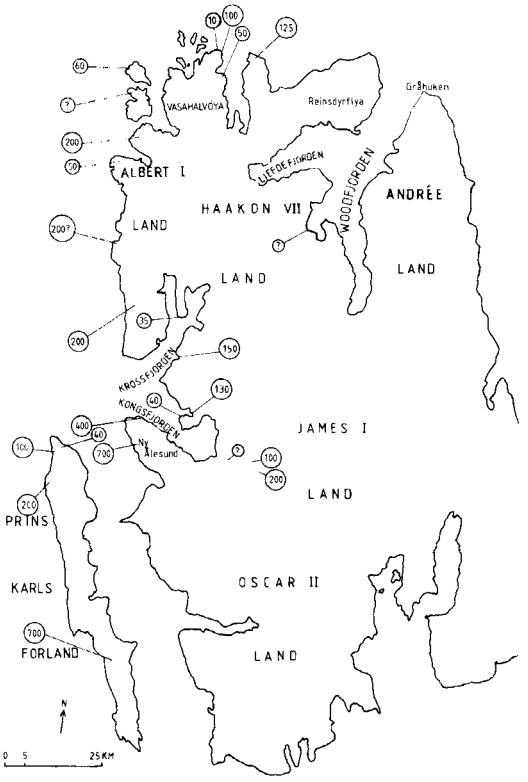

Fig. 2. Fulmarus glacialis.

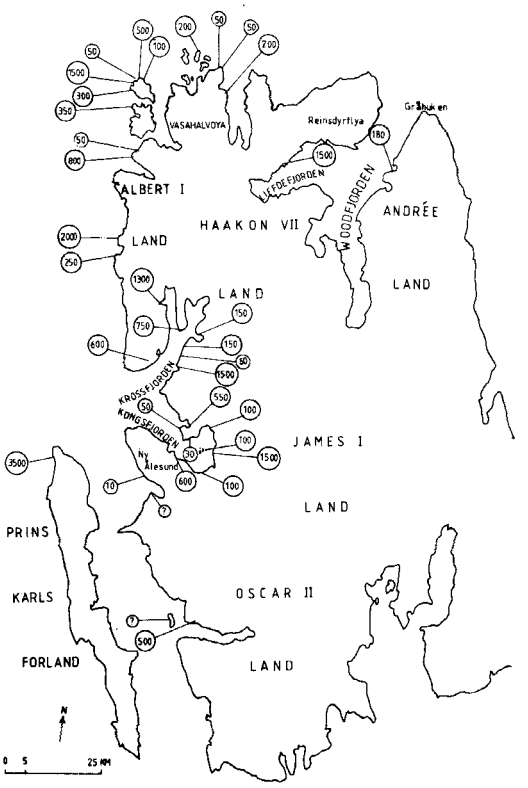

Fig. 3. Rissa tridactyla.

calcareous cliffs facing SSW, located somewhat inland 1–1.5 km and up to 4 km from the coast in the Kongsfjorden area (Fig. 2). Usually in small colonies of 50–200 pairs. Isolated pairs occasionally found in Kittiwake and Guillemot colonies (3 cases). All the localities found were quoted by Løvenskiold (1964), who also noted two colonies on the nunataks in Magdalenefjorden and on the western side of Bockfjorden. Several unknown colonies may exist on the nunataks, e.g. in Abrahamsendal (Woodfjorden) where Voisin (1970) described 2 colonies at 600 and 900 m a.s.l.

Great skua Stercorarius skua. – 1–3 breeding pairs. 11 individuals between Kvadehuken and Mitrahalvøya in mid-July 1973, and one bird seen on Prins Karls Forland. No breeding evidence in the area in 1973. 8–15 individuals between Mitrahalvøya, Moffen and Verlegenhuken, July and August 1978 (in groups of maximum 3 individuals). One pair with 1 egg 4 July 1978 on Moseøya, near Danskøya. One broken egg found on Amsterdamøya 13 July 1978. This species has expanded recently and the first breeding in Svalbard was recorded in 1976 (Larsen 1977).

Arctic skua Stercorarius parasiticus. – Approximately 200 pairs (150–300), including 10–20 on Reinsdyrflya, 50–80 on Prins Karls Forland and 20–30 in Kongsfjorden. Breeding in different biotopes mainly along the coast. Voisin (1970) observed a bird far inland at 900 m a.s.l.

Glaucous gull Larus hyperboreus. – Approximately 300 breeding pairs in small specific colonies of 3–5 pairs or along the top of the bird cliffs (up to 60 pairs on Fuglehuken). Resting places on Prins Karls Forland: 120 individuals in 1973 on Carmichaelpynten and 300 near Salpynten.

Kittiwake Rissa tridactyla. – 15,000 to 25,000 pairs, mainly in cliffs close to the sea, usually in colonies ranging from 100 to 500 pairs (maximum 3,500 pairs) (Fig. 3). Also found 1 to 2 km inland near Knatten (400 m a.s.l.), between Mag-

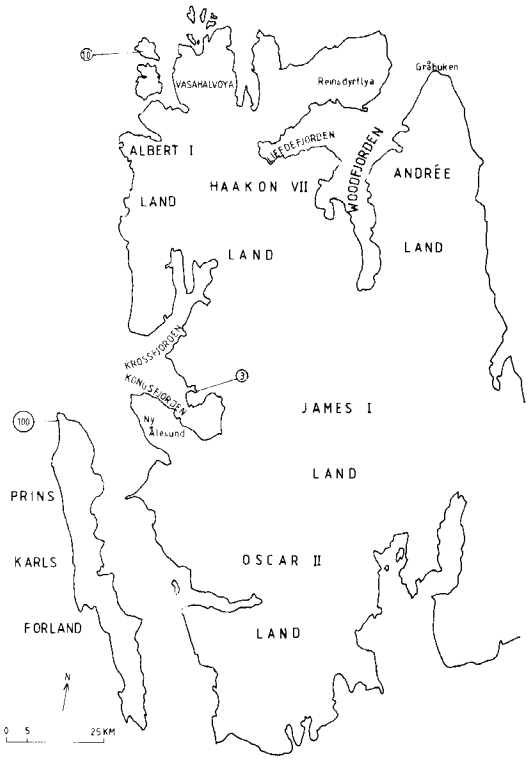

Fig. 4. Uria aalge.

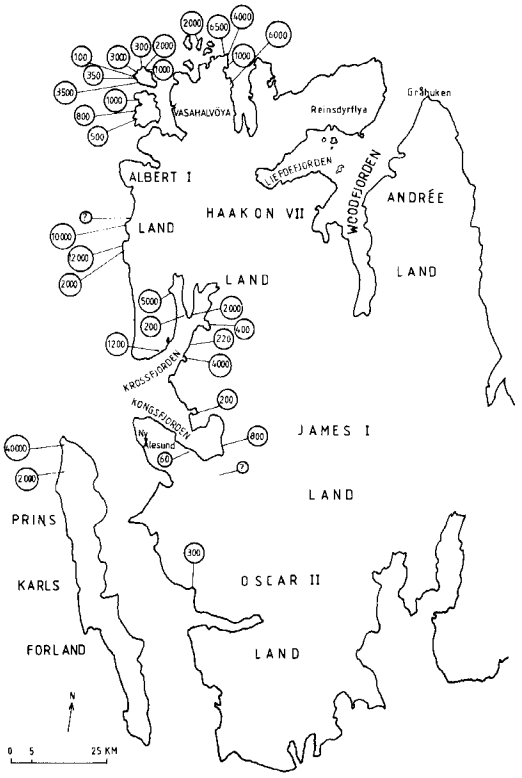

Fig. 5. Uria lomvia.

dalenefjorden and Danskøya. Voisin (1970) reports of a colony of 500 pairs in Woodfjorden, at Kronprinshøgda 900 m a.s.l. In addition to the colonies described by Løvenskiold (1964), we found 9 in Kongsfjorden/Krossfjorden and 11 along the coast further north (Fig. 8). One or two of Løvenskiold's (1964) colonies in Magdalenefjorden were no longer occupied at the time of our survey.

Kittiwakes were often seen feeding intensively near glacier fronts at the emergence of the subglacial meltwater. The maximum numbers recorded were seen in front of Kongsbreen (600 individuals), Magdalenebreen (1,500 individuals), Smeerenburgbreen (5,000 individuals), Svitjodbreen (300 individuals) and Idabreen (500 individuals).

Similar concentrations are described and discussed in Mehlum (1984). Dhondt et al. (1969) also described '850 Kittiwakes feeding immediately under the glaciers in Magdalenefjorden and Smeerenburgfjorden'. Hundreds of resting and 'bathing' Kittiwakes were recorded in and around lagoons and fresh water lakes, e.g. at Carmichaelpynten, Aberdeenflya and Richardlaguna on Prins Karls Forland in 1973, and Mitrahalvøya, Danskøya, Amsterdamøya, Jermaktangen, Richardvatnet, Arlaneset and Reinsdyrflya in 1978.

Arctic Tern Sterna paradisaea. – Probably 2–3,000 breeding pairs in the area, mainly on islands (colonies of 5–250 pairs), near human settlements at Ny-Ålesund (100 pairs) and in small colonies (2–20 pairs) scattered along the gravel shores (up to 180 pairs between Ny-Ålesund and Kongsbreen in 1973).

Common Guillemot Uria aalge. – Prior to our survey, only Fuglehuken (Fig. 4) was known as a breeding site for this species and 50–100 individuals were recorded in 1966 (Norderhaug 1968). Norderhaug (1974) counted 35 (12 bridled) and 33 (15 bridled) Common Guillemots in 1970 and 1971, respectively, and he considered the colony to be the northernmost in the world.

At the end of July 1973, we observed 100–150 Common Guillemots in the cliffs of Fuglehuken

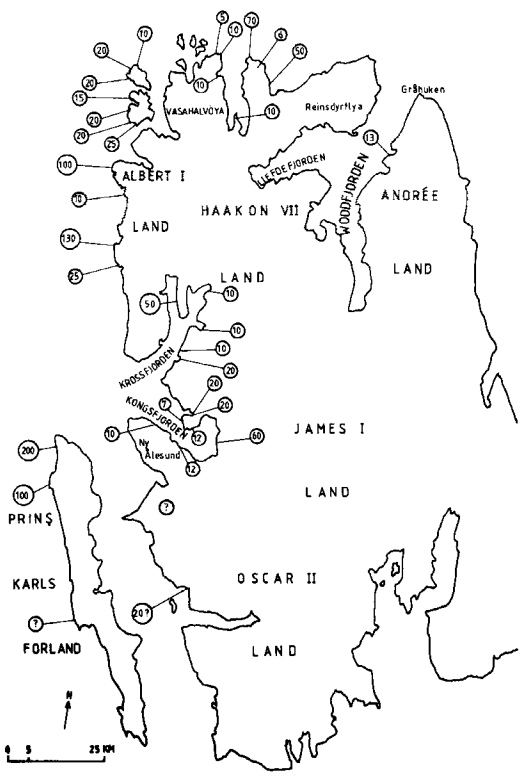

Fig. 6. Cepphus grylle.

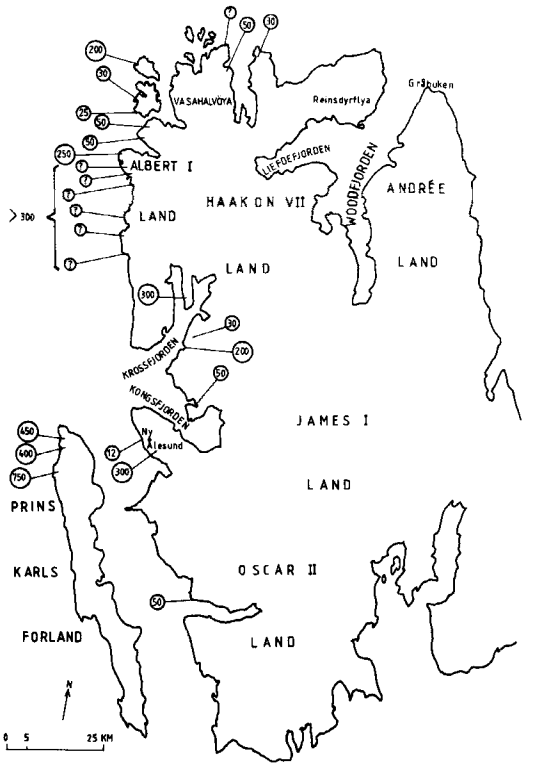

Fig. 7. Fratercula arctica.

and Sutorfjella (Fig. 4). We also recorded 3 individuals 13 July 1973 on Blomstrandhalvøya, Kongsfjorden, and 10 in Danskegattet on Amsterdamøya in July 1978 in mixed Kittiwake/Brünnich's Guillemot colonies.

Brünnich's Guillemot Uria lomvia. – Approximately 140,000 individuals, occurs normally in mixed colonies with Kittiwakes (Fig. 5). We found colonies not recorded by Løvenskiold (1964). On Albert I Land, which was not surveyed by Løvenskiold, we found 3 colonies.

Black Guillemot Cepphus grylle. – 1,500–2,500 breeding pairs (Fig. 6) found in two types of biotope:
– Small monospecific colonies (10–15 pairs) on small cliffs (10–30 m. a.s.l.) falling straight into the sea (21 cases).
– Mixed Kittiwake/Brünnich's Guillemot colonies (20 cases).

Generally feeds near glacier fronts where concentrations may number 80–110 birds (Smeerenburgbreen, Kongsbreen).

Puffin Fratercula arctica. – Minimum of 3,500 individuals surveyed, mainly among boulders and on cliffs facing south or west, in association with other birds (Fig. 7). No breeding records on islands like on Nordaustlandet (Jepsen & Mobæk 1983) or in Billefjorden near Longyearbyen. Approximately 500 non-breeders in July 1973 on Sutorfjella.

Little Auk Alle alle. – The Little Auk is the most common bird in the area and breeds along the whole coast. The population is particularly difficult to estimate, but figures of 1–2 million pairs seem reasonable.

Breeding grounds were mainly along the fjords, but also on the nunataks. We sometimes found the birds breeding inland, e.g. on Losvikfjella

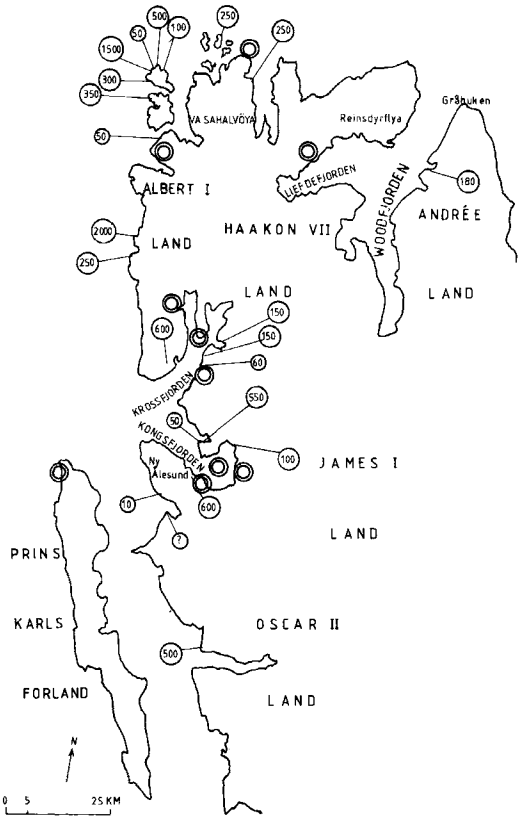

Fig. 8. Kittiwake colonies reported by Løvenskiold (1964) (◎) and 'new' colonies (⑩).

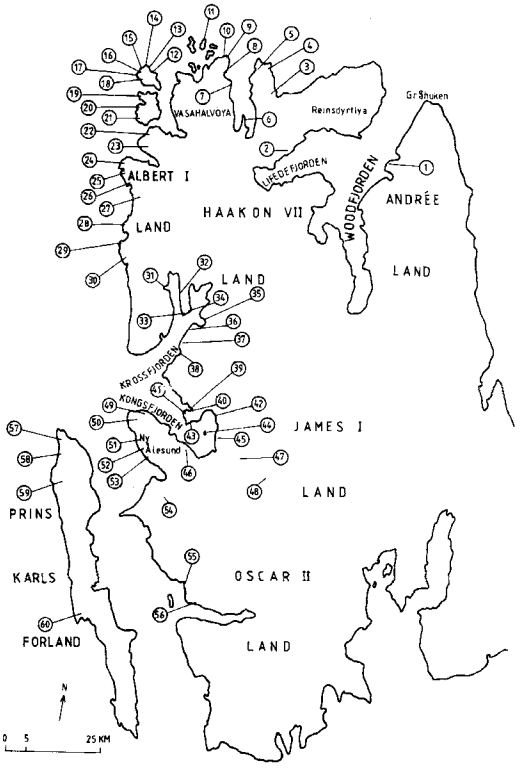

Fig. 9. Colonies surveyed.

1 Andrée Land
2 Wulffberget
3 Botnehaugen
4 Biskayerhuken
5 Jermaktangen
6 Buchananhalvøya
7 Hamiltonbreen S
8 Hamiltonbreen N
9 Flathuken E
10 Flathuken W
11 Klovningen N
12 Nordgrunnen
13 Hakluytodden E
14 Hakluytodden S
15 Hakluythovden
16 Astrupneset
17 Bikuben
18 Salatberg
19 Kapp De Geer
20 Kobbefjorden
21 Ballonkollen
22 Bjørnhamna
23 Knatten
24 Kvalryggpynten
25 Aasefjellet N
26 Aasefjellet S
27 Sjubreen
28 Nissenfjella
29 Knoffberget
30 Diggersknatten
31 Signehamna
32 Kong Haakons Halvøy W
33 Cadiopynten W
34 Cadiopynten E
35 Tinaybukta
36 Flakbreen
37 Generalfjella
38 Fjortende Julibreen
39 Sørvågen E
40 Sørvågen W
41 Hansneset
42 Kongsbreen
43 Gorillaheimen
44 Lovénøyane
45 Ossian Sarsfjellet
46 Lovénbreen
47 Colletthøgda
48 Dronningfjella
49 Kongsfjordneset
50 Stuphallet
51 Kiærfjellet
52 Brøggerfjellet
53 Engelskbukta
54 Alexanderfjellet
55 St. Jonsfjorden
56 Ankerfjella
57 Fuglehuken
58 Taylorfjellet
59 Sutorfjella
60 Tvihyrningen

(Magdalenefjorden) and Bouvierfjella (Krossfjorden), but some colonies are probably located even further from the coast. Dhondt et al. (1969) noted 20 breeding pairs near the summit of Zeppelinfjellet in Kongsfjorden. Little Auks were especially abundant along the west coast, where they feed in the open sea. They sometimes feed in Smeerenburgfjorden, where more than 50,000 birds were seen feeding mainly on krill *Thysanoessa inermis*. Large groups regularly cross the ice cap between Liefdefjorden and Magdalenefjorden.

Discussion

It is difficult to analyse the population trends in the north-western Svalbard seabird populations due to the scarcity of old quantitative data and the uncertainty connected with the colony estimates. Despite these shortcomings, we consider it valu-

Table 2. Breeding seabirds in northern Svalbard 1963–1979 (round figures).

	PRINS KARLS FORLAND (present study) 1973*	NORTH-WESTERN SPITSBERGEN (present study) 1973* & 1978* (Larsen 1965) 1963* (Voisin 1970) 1969*	WIJDEFJORDEN (Løvenskiold 1964)	NORDAUSTLANDET (Jepsen & Mobæk 1983) 1978* & 1979* (Birkenmajer & Skreslet 1963)	KONG KARLS LAND (Jepsen & Mobæk 1983) 1979*	MINIMUM FIGURES FOR THE WHOLE AREA	RESULTS GIVEN IN PAIRS ° IN INDIVIDUALS *
FULMAR *Fulmarus glacialis*	1,000	2,800	1,000 ?	600	—	> 5,400	°
GLAUCOUS GULL *Larus hyperboreus*	90	226	100 ?	40	?	> 456	°
KITTIWAKE *Rissa tridactyla*	3,500	14,500	3,000 ?	2,200	2,000	> 25,000	°
IVORY GULL *Pagophila eburnea*	—	—	—	10–50	50	> 60	°
ROSS' GULL *Rhodostetia rosea*	—	—	—	—	—	—	°
ARCTIC TERN *Sterna paradisaea*	> 225	1,600	500 ?	?	?	> 2,325	°
COMMON GUILLEMOT *Uria aalge*	> 100	13	—	—	—	> 113	*
BRÜNNICH'S GUILLEMOT *Uria lomvia*	60,000	80,000	—	1,300	—	> 141,300	*
BLACK GUILLEMOT *Cepphus grylle*	300	1,100	100 ?	1,100	40	2,400–4,900	°
PUFFIN *Fratercula arctica*	1,600	1,100	— ?	700–3,000	—	3,200–6,500	*
LITTLE AUK *Alle alle*	400,000	> 1,000,000	2,000 ?	600–2,400	—	> 1,500,000	°

* Year of survey

able to analyse and comment on the population trends since the area is of particular interest in regard of future economic development and the ecological consequences that go with it (Norderhaug 1979). The analysis of these trends is also relevant in a biogeographical respect (Vibe 1982; Salomonsen 1972). Comments on some important species are given below.

Fulmar. – In addition to the colonies described by Løvenskiold (1964), we found 1 colony in Kiærfjellet, 2 in Krossfjorden, and 1 on Amsterdamøya. Dhondt et al. (1969) counted 500 pairs on Stuphallet (Kongsfjorden) and 1,000 pairs on Kiærfjellet (in 1965), where we in 1973 counted 400 pairs and 700 pairs, respectively.

Brünnich's Guillemot. – Comparing our data with those of Larsen (1965), the population of NW Svalbard does not show any marked trend over the last 15 years.

Glaucous Gull. – Some colonies on Prins Karls Forland and on Nordvestøyane reported by Løvenskiold (1964) are no longer present.

Kittiwake. – Løvenskiold (1964) surveyed only 10 colonies in our area. We found 33, 10 in areas well surveyed by Løvenskiold. It appears that Kittiwakes have spread, mainly in small colonies (10–200 pairs) during the last 20 years. This is consistent with the increase of the Kittiwake population in Europe (Yeatman 1976; Cramp &

Table 3. Population of Brünnich's Guillemot in north-western Svalbard. Comparison of Larsen's (1965) data with this study (1978).

SPECIES	LOCALITY	YEARS & SOURCES 1963 (Larsen 1965)	1978 (this study)
Brünnich's Guillemot	RAUDFJORDEN		
Uria lomvia	Flathuken	4,000–6,000	6,500
(no. of individuals present)	Birgerfjellet	300–400	5,000
	Hamiltonbukta	10,000–15,000	16,000
	AMSTERDAMØYA		
	North-western part	600	6,300
	South-western part	1,000–1,400	4,000

Simmons 1983). Larsen (1965) counted the colonies between Amsterdamøya and Raudfjorden in 1963. Since then, one colony of 50 pairs has disappeared and one appeared. But Kittiwakes are renowned opportunists and may well leave one area and settle in another over a very short period of time. Further surveys in the whole of Svalbard may confirm this trend. Although additional and more accurate surveys, especially inland, are required to evaluate the population sizes and trends, this study gives us some idea of the sizes of Svalbard's northernmost seabird populations and underlines the large number of breeding Little Auks, which is the most characteristic feature of the area.

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