

Bird remains from 17th century whaling stations on Spitsbergen (Svalbard)

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Received: 24 Jan., 2002

Accepted for publication: 11 Apr., 2002

PRUMMEL W., ZEILER J. T. 2002. Bird remains from 17th century whaling stations on Spitsbergen (Svalbard). In: Proceedings of the 4th Meeting of the ICAZ Bird Working Group Kraków, Poland, 11-15 September, 2001. *Acta zoologica cracoviensia*, 45(special issue): 205-213.

Abstract. Bird remains from two 17th century whaling stations at the Bellsund on Spitsbergen (Svalbard) have been studied. Birds were fowled in summer, although presumably mainly in autumn or winter when the food supplies ran short. This seasonal fowling in autumn or winter may account for the scarcity of bones of the Little Auk, which is only on Spitsbergen during summer. Another factor that may have caused the low representation of Little Auk bones in the whalers' garbage pits is a possible preference for larger birds than the Little Auk. The scarcity of Little Auk bones in the studied whaling stations' garbage pits does not necessarily mean that the Little Auk was a rare bird in the 17th century.

Key words: whaling stations, bird remains, bowhead whale, Little Auk, food preferences, seasonality.

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I. INTRODUCTION

The west coast of Spitsbergen, the largest island of the archipelago of Svalbard (Fig. 1), was frequented by whaling ships from various countries in western Europe during the 17th century (HACQUEBORD 1984). The whalers came here to hunt for the bowhead or Greenland right whale *Balaena mysticetus* LINNAEUS, 1758. The university of Groningen executed surveys and excavations in the two whaling stations Laegerneset and Midterhuken in 1998 and 1999, respectively (Fig. 1). This fieldwork is part of a research project on the activities of Dutch and English whale hunters on Spitsbergen (HACQUEBORD 1984; 1999).

Oil was the main product of whale hunting. But also whale bones and baleen were taken home to be processed there. The whalers generally only stayed during the summer, from May to September. They lived in wooden houses or tents. The whales that were hunted at sea were brought ashore to working platforms where the whale blubber was cut from the animals. The blubber was then boiled above ovens to separate the oil from the blubber. The oil was put in barrels to take home. House and tent foundations, working platforms, ovens, graveyards for the people who died, and garbage pits are all visible at the surface and can be surveyed by fieldwalking (HACQUEBORD 1984; HACQUEBORD et al. 2000).

The finds in the garbage pits comprise well-preserved animal bones, and finds of coal, charcoal, pottery, clay pipes, pieces of leather, textile, nails and needles. The household objects in the pits confirm that the animal remains were part of the domestic garbage and are not remains of animals that died of natural causes. The animal bones from Laegerneset were studied by the first author (PRUMMEL 1998), and those from Midterhuken by the second author (ZEILER 2001).

This paper will discuss the bird remains found in the five garbage pits of Laegerneset and Midterhuken. It will examine the hypothesis of HACQUEBORD (1999) and WEŚLAWSKI et al. (2000) that the 17th century Svalbard breeding population of Little Auk was much smaller than the present one. These authors suggest that the Little Auk suffered from food competition with the bowhead whale in the 17th century. Alternative explanations for the low occurrence of Little Auk bones in the garbage pits of Laegerneset and Midterhuken will be proposed.

II. MATERIAL AND METHODS

The two whaling stations Laegerneset and Midterhuken both date to the first half of the 17th century, AD 1613 until about 1640. They are situated on the south coast of the Bellsund, which is in the south-western part of Spitsbergen (Fig. 1) and were in use by English whalers. The first successful wintering on Spitsbergen perhaps succeeded at Laegerneset in 1630 (HACQUEBORD et al. 2000).

The cold conditions on Svalbard give excellent preservation conditions for animal remains. This was already shown for the whaling station Smeerenburg on Amsterdam Island in front of the north-west coast of Spitsbergen that was used by Dutch whalers (VAN WIJNGAARDEN-BAKKER & PALS 1981; VAN WIJNGAARDEN-BAKKER 1984; 1987; HACQUEBORD 1984) (Fig. 1).



Fig. 1. Map of the archipelago of Svalbard. The 17th century whaling stations of Laegerneset and Midterhuken are situated in the Bellsund area of Spitsbergen (the large sea inlet in the southern half of Spitsbergen), the largest island of the archipelago. Smeerenburg lies on Amsterdam Island before the northwest coast of Spitsbergen (after HACQUEBORD et al. 2000: Fig. 1).

In addition to the fieldwalking, parts of five garbage pits were excavated, two in Laegerneset and three in Midterhuken. The main object of these small excavations was to sample the mammal and wild bird remains in the five garbage pits.

The excavators carefully collected bird and other animal remains from the sandy soil of the garbage pits. Although no sieving was executed small bird phalanges, vertebrae and ribs were successfully collected. In general, however, these small bones have not been identified to save time; only in the case of Midterhuken have the phalanges been identified.

Remains of domestic and wild mammals, poultry, wild birds and fish were found. The bones of cattle, pig, sheep, poultry and fish (i.e. ling and cod) are the remains of the food supplies that were brought to the whaling stations from the home countries. The domestic mammal meat was salted or smoked. Much salted and smoked meat was presumably imported without bones. Ling and cod were brought to Svalbard as stockfish, as shows the absence of cranium elements and the scarcity of precaudal vertebrae (ZEILER 2001). Plant food, like bread, porridge, gruel and pulses, for which the ingredients were imported, will have been important for the diet too (VAN WIJNGAARDEN-BAKKER & PALS 1981).

Wild bird remains comprise the largest category of animal bones in numbers (although not in bone weight). Reindeer, polar bear and seals were hunted in small numbers. The whalers hunted wild mammals and birds to supply extra fresh meat, skins and feathers, and perhaps for pastime; the polar bear was presumably hunted for reasons of defence (ZEILER 2001).

III. WILD BIRDS

Remains of wild birds were the most numerous in each of the five pits. This does not, however, mean that the whalers' diet consisted primarily of birds. The domestic mammals, especially cattle, but also stockfish and reindeer, were presumably more important as food than the wild birds.

The identified wild bird bones represent at least twelve bird species (Table I; Figs 2-4). The category Brünnich's Guillemot/Guillemot in this table will mainly comprise Brünnich's Guillemots; the

Table I

Identified wild bird remains from two test pits in the Laegerneset whaling station (L I and L II) and from the Midterhuken whaling station (M 1, M 2 and M 4)

Taxa	L I		L II		M 1		M 2		M 4	
	NR	%	NR	%	NR	%	NR	%	NR	%
<i>Fulmarus glacialis</i> (LINNAEUS, 1761), Fulmar	9	1	34	33	1	2	1	2	75	11
<i>Branta leucopsis</i> (BECHSTEIN, 1803), Barnacle Goose	2	0	–	–	–	–	–	–	1	0
<i>Branta bernicla</i> (LINNAEUS, 1758), Brent Goose	3	0	–	–	–	–	–	–	–	–
<i>Somateria mollissima</i> (LINNAEUS, 1758)/ <i>S. spectabilis</i> (LINNAEUS, 1758), Eider/King Eider	1	0	–	–	–	–	–	–	–	–
<i>Calidris alpina</i> (LINNAEUS, 1758), Dunlin	–	–	–	–	–	–	–	–	2	0
<i>Calidris</i> sp., Sandpipers	–	–	–	–	–	–	–	–	2	0
<i>Stercorarius parasiticus</i> (LINNAEUS, 1758), Arctic Skua	–	–	–	–	–	–	–	–	3	0
<i>Larus hyperboreus</i> GUNNERUS, 1767, Glaucous Gull	24	4	1	1	–	–	–	–	30	4
<i>Rissa tridactyla</i> (LINNAEUS, 1758)/ <i>Pagophila eburnean</i> (PHIPPS, 1774), Kittiwake/Ivory Gull	3	0	13	13	5	9	6	10	40	6
<i>Uria lomvia</i> (LINNAEUS, 1758) and <i>U. aalge</i> (PONTOPPIDAN, 1763), Brünnich's Guillemot and Guillemot	583	92	52	50	51	87	53	88	534	78
<i>Cepphus grylle</i> (LINNAEUS, 1758)/ <i>Fratercula arctica</i> (LINNAEUS, 1758), Black Guillemot/Puffin	8	1	1	1	–	–	–	–	2	0
<i>Alle alle</i> (LINNAEUS, 1758), Little Auk	–	–	–	–	1	2	–	–	–	–
Total identified	634	100	103	100	58	100	60	100	689	100

Guillemot was definitely identified in Midterhuken 4, although in much smaller numbers than the Brünnich's Guillemot. The number of bird species might be larger if separate species in the categories Eider/King Eider, Sandpipers, Kittiwake/Ivory Gull and Black Guillemot/Puffin are represented in the bone material. Identification problems hampered the identification to species level in these cases (Table I). For the Midterhuken material all remains that could belong either to Black Guillemot or Puffin were definitely identified as Black Guillemot; no effort was made to distinguish the Laegerneset Black Guillemot or Puffin bones. The bird bones are more or less evenly distributed over the skeleton (PRUMMEL 1998; ZEILER 2001).

Bones of Brünnich's Guillemot (Figs 2-3) and Guillemot are by far the most numerous in each pit. Their bones constitute between 50 and 92 % of the identified bird remains. Fulmar (Fig. 3) and Kittiwake/Ivory Gull (Fig. 2) are the other species that are represented in each pit. Fulmar, however, is poorly represented in Laegerneset II, Midterhuken 1 and 2, with only 1-2 % of all identified bird remains. This species is much better represented in Midterhuken 4 (11 %) and Laegerneset II (33 %). Kittiwake and perhaps Ivory Gull are represented by 0-13 % of the identified bird bones (Table I).

Glaucous Gull (Fig. 2) occurs in three of the five samples, and accounts for up to 5 % of the identified bird remains from an individual pit. Less common are Black Guillemot and/or Puffin and Barnacle Goose, that both were found in two samples, with a maximum of 1 %. Rare are the bones of Brent Goose, Eider and/or King Eider, Dunlin and possibly other Sandpipers, Arctic Skua and the Little Auk (Fig. 4). Each of these species was only found in one of the five pits.

The Smeerenburg samples (VAN WIJNGAARDEN & PALS 1981; VAN WIJNGAARDEN 1984; 1987), that are from garbage pits of Dutch whalers, showed roughly the same bird species and the same variation in bird bone proportions as the Laegerneset and Midterhuken samples. English and Dutch whalers had thus roughly the same fowling habits.

IV. SCARCITY OF LITTLE AUK REMAINS

Table I shows that bones of the Little Auk, a species that is the most numerous breeding bird on Svalbard at present, are very rare in the Laegerneset and Midterhuken materials. A single Little Auk bone was found in garbage pit 1 of Midterhuken, which comprises 2 % of the identified bird bones. Little Auk bones were also rare in the Smeerenburg materials studied by VAN WIJNGAARDEN-BAKKER (absent, or at most 1 % of the identified bird bones) (VAN WIJNGAARDEN & PALS 1981; VAN WIJNGAARDEN 1984; 1987). SNOW & PERRINS (1998: 818) estimated about 10-15 million birds on Svalbard for the 1960ies; STEMPNIWICZ (2001) mentions ca. 1.3 million breeding pairs in the whole Barents Sea (Table II).

Three possible explanations may be proposed for the scarcity of Little Auk bones in the garbage pits of the whaling crews. These are:

1. the Little Auk was a rare bird in 17th century on the west coast of Spitsbergen because it suffered from food competition with the bowhead whale; this hypothesis has been proposed by WEŚLAWSKI et al. (2000) and HACQUEBORD (1999);
2. the Little Auk lacked attraction as a prey for the whalers because of its small size (the species is starling-sized: 17-19 cm length);
3. the whaling crews mainly fowled in autumn (or winter) when their food supplies ran short; in these seasons Little Auks are absent on Svalbard.

Bowhead whale and Little Auk: competitors for food?

Little Auk colonies are found within 5 km of the sites of Laegerneset and Midterhuken today. The present colony near Laegerneset houses Little Auk and Black Guillemot and has a size of 1,000-10,000 pairs. The colony near Midterhuken houses Fulmar, Little Auk, Black Guillemot, Brünnich's Guillemot, Puffin and Kittiwake and has a size of 10,000-100,000 pairs. Present colo-

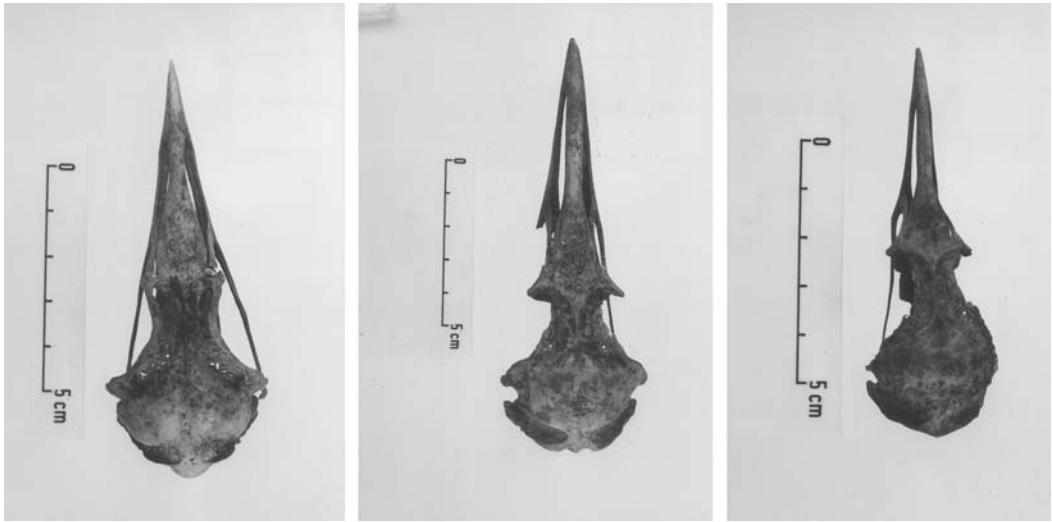


Fig. 2. Skulls of (from left to right) Brünnich's Guillemot *Uria lomvia*, Glaucous Gull *Larus hyperboreus*, and Kittiwake *Rissa tridactyla* from the 17th century whaling station of Midterhuken, garbage pits 2 (Kittiwake) and 4 (Brünnich's Guillemot and Glaucous Gull), on Spitsbergen (photo R. J. KOSTERS).



Fig. 3. Proximal ends of right humeri of (from left to right) Brünnich's Guillemot *Uria lomvia*, and Fulmar *Fulmarus glacialis*, from the 17th century whaling station of Laegerneset, garbage pit II, on Spitsbergen (photo R. J. KOSTERS).



Fig. 4. The only bone of Little Auk *Alle alle*, from the 17th century whaling stations Laegerneset and Midterhuken on Spitsbergen, i.e. a sternum fragment from Midterhuken 1 (photo R. J. KOSTERS).

Table II

Present breeding populations in numbers of animals and seasonal presence on the mainland of Spitsbergen (after SNOW & PERRINS 1998; STEMPNIEWICZ 2001)

Taxa	Present breeding numbers on Svalbard	Seasonal presence on Svalbard land
<i>Fulmarus glacialis</i> , Fulmar	2x10 ⁶	whole year
<i>Branta leucopsis</i> , Barnacle Goose	12x10 ³	Summer
<i>Branta bernicla</i> , Brent Goose	3-6x10 ³	Summer
<i>Somateria mollissima/S. spectabilis</i> , Eider/King Eider	30x10 ³	Summer
<i>Calidris alpina</i> , Dunlin	few	Summer
<i>Calidris</i> sp., Sandpipers	few	Summer
<i>Stercorarius parasiticus/longicaudus</i> , Arctic/Long-Tailed Skua	2-20x10 ³	Summer
<i>Larus hyperboreus</i> , Glaucous Gull	several 10 ³	whole year
<i>Rissa tridactyla/Pagophila eburnea</i> , Kittiwake, Ivory Gull	370x10 ³	whole year
<i>Uria lomvia</i> and <i>U. aalge</i> , Brünnich's Guillemot and Guillemot	1.6x10 ⁶	whole year
<i>Cephus grylle/Fratercula arctica</i> , Black Guillemot/Puffin	60x10 ³	whole year
<i>Alle alle</i> , Little Auk	2.6 x10 ⁶ (whole Barents Sea)	Summer

nies and their sizes cannot be taken as a proof that the Little Auk was a breeding bird in the Bellsund area in the 17th century. The modern colonies, however, demonstrate that suitable breeding places, mainly fissured precipices, were present in the vicinity of the whaling stations in the 17th century.

WEŚLAWSKI et al. (2000) estimate on account of historical sources that the Svalbard bowhead whale population numbered between 12,000 and 46,000 animals before commercial whaling started in the 17th century. The species became rare in the Svalbard waters after AD 1850 due to overexploitation. The Svalbard bowhead whale population became extinct at the beginning of the 20th century (WEŚLAWSKI et al. 2000).

Planktonic crustaceans are important food for the bowhead whale (AGUILAR 1995: 676-677) and the Little Auk WEŚLAWSKI et al. (1999a; 1999b) (Table III). WEŚLAWSKI et al. (2000) suggest that after the extinction of the Svalbard bowhead whale population in the 20th century, more food became available for the Little Auk. The Svalbard Little Auk breeding population should consequently have increased in numbers.

It is, however, important to realise that food, feeding waters and habits of the bowhead whale and the Little Auk are not fully identical. Both species eat pelagic food, but subadult bowhead whales eat benthic food as well. Bowhead whales filter 3-30 mm large food particles with the fine fringes of their baleen from the medium and upper water levels during summer. They do this while swimming around with their mouths open. The Little Auk mainly collects 3-7 mm large planktonic crustaceans by sight during dives in the surface sea layer (0-10 m) (WEŚLAWSKI et al. 1999b, Fig 6 and p. 399) (Table III), although 7-30 mm size food may be eaten as well (J.M. WEŚLAWSKI personal communication). Because of the differences in the water levels used for feeding by the two species, the differences in the main food size classes and in the food collecting methods, it is uncertain whether the two species were heavy competitors for food.

WEŚLAWSKI et al. (2000) compare the energy flow in the pelagic coastal food webs of Svalbard in the 16th century, i.e. before the period of whaling activities in the Svalbard waters, to that at the present day, i.e. after the extinction of the Svalbard bowhead whale. Their Figure 2 suggests that the population of Little Auks in Svalbard multiplied three to tenfold from the pre-whaling period in the 16th century to the present day. They, however, did not consider the benthic part of the bowhead whale food. Neither did they consider the differences in food size classes and feeding habits between the bowhead whale and the Little Auk: the 7-30 mm large planktonic crustaceans were eaten less often by Little Auks and the medium water levels are not feeding waters for Little Auks.

Table III

Comparison of food eaten by bowhead whale *Balaena mysticetus*, and Little Auk *Alle alle*

Taxa	Eaten by <i>Balaena mysticetus</i> (AGUILAR 1995)	Eaten by <i>Alle alle</i> (WEŚLAWSKI <i>et al.</i> 1999); as % of stomach content
Copepoda (phylum Arthropoda, class Crustacea, subclass Copepoda):		
<i>Calanus hyperboreus</i>	+	17
<i>Calanus glacialis</i>	+	52
<i>Calanus cristatus</i>	+	–
<i>Calanus finmarchicus</i>	–	3
<i>Euchaeta glacialis</i>	+	–
Euphausiacea (phylum Arthropoda, class Crustacea, subclass Malacostraca, order Euphausiacea) (krill):		
<i>Thassanoessa raschii</i>	+	1
Pteropoda (phylum Mollusca, class Gastropoda) (sea butterflies):		
<i>Limacina helicina</i>	+	–
Amphipoda (phylum Arthropoda, class Crustacea, order Amphipoda):		
<i>Parathemisto libellula</i>	+	1
<i>Parathemisto abyssorum</i>	+	1
<i>Onisimus glacialis</i>	+	–
Pisces (small fishes)	+	<1 (larva)
Polychaeta (phylum Annelida, class Polychaeta)	+	–
Mysidacea (phylum Arthropoda, class Crustacea, order Mysidacea (opossum shrimps))	+	–
Crabs (phylum Arthropoda, class Crustacea, order Decapoda)	+	11 (<i>Eupagurus pubescens</i> larva)
Prawns/shrimps (phylum Arthropoda, class Crustacea, order Decapoda)	+	10 (<i>Pandalus borealis</i> larva)
Mollusca	+	<1 (<i>Bivalvia veliger</i>)
Echinodermata (phylum Echinodermata)	+	–

Moreover, plankton concentrations are highly variable from area to area and from year to year (WEŚLAWSKI *et al.* 1999b: 396-397), and the estimates of daily food intake by Little Auks range considerably, from 40 to 131 g wet weight per feeding animal during the chick-feeding period (WEŚLAWSKI *et al.* 1999b: 399 and Table 3). This means that calculations of the plankton predation pressure by Little Auks (WEŚLAWSKI *et al.* 1999b: 400: 2 to 4 % of the yearly zooplankton production) are only rough estimates. Since Little Auks can fly up to 150 nautical miles daily to reach rich feeding grounds at the pack ice edge (WEŚLAWSKI *et al.* 1999b: 399), they might easily avoid any waters that had been cleared of plankton by the bowhead whales, and reach waters rich in food. The estimate of the ‘original’ Svalbard bowhead whale population is with 12,000-46,000 animals (WEŚLAWSKI *et al.* 2000) so wide, that the estimate of the food eaten by these animals, can only be very broad.

Even if the breeding populations of the Little Auk increased after the extinction of the Svalbard bowhead whale population (WEŚLAWSKI *et al.* 2000), the Little Auk was presumably a common breeding bird in Svalbard in the 17th century. The possible increase in numbers after the extinction

of the Svalbard bowhead whale therefore cannot explain the scarcity of Little Auk remains in the garbage pits of the 17th century whaling stations of Laegerneset and Midterhuken (Table I).

A l t e r n a t i v e e x p l a n a t i o n s f o r r a r e n e s s o f L i t t l e A u k r e m a i n s

The first alternative explanation is that the Little Auk was an unattractive bird species for the whaling crews because of its small size (WINTERHALDER 1981). All other bird species demonstrated in the Laegerneset and Midterhuken garbage pits, with the exception of Dunlin and perhaps other Sandpipers, are much larger than the Little Auk. The Sandpipers, small species (17-19 cm length) like the Little Auk, are represented in as low percentages as the Little Auk. The other bird species, which measured between 38 and 78 cm length, gave much more meat per head than the Little Auk, and therefore were more attractive species to hunt. Because the excavators recovered even very tiny bird phalanges and ribs, the scarcity of Little Auk bones cannot be an excavation artefact.

Archaeozoological material is never a direct representation of a wild bird fauna because of the selection by man and other taphonomic factors (REITZ & WING 1999: 110-113). It is striking that the most frequently found bird species are not the most tasty ones. Historical sources consider the meat of Brünnich's Guillemot as very dry and tough, and that of gulls and Fulmar, apart from being tough, as whale-oily. They esteem the meat of Eider and Sandpipers as much more tasty. The same applies to the meat of the Little Auk: "*They are very good food, and the best next to the Strandrunner; are fleshy and fattish; we boyl and then roast them*" (MARTENS 1671, VOYAGE TO SPITSBERGEN, AS CITED IN WHITE 1855). Therefore one can wonder why the whalers did not more frequently catch much tastier birds, such as geese, ducks, Little Auk and Sandpipers.

This brings us to the second alternative explanation the scarcity for Little Auk bones: Fowling was mainly done in autumn, at the end of the whaling season, or in winter by wintering whalers. The Little Auk is absent from the mainland of Spitsbergen in these seasons. It leaves the breeding grounds on the west coast of Spitsbergen in August (SNOW & PERRINS 1998). The most common bird species in the five garbage pits of the whaling stations Laegerneset and Midterhuken, i.e. Brünnich's Guillemot and/or Guillemot, Fulmar and Kittiwake, are present on Spitsbergen during the whole year. Glaucous Gull and Black Guillemot and/or Puffin, that occur in three and two garbage pits, respectively (Table I), are also present on Spitsbergen during the whole year (Table II).

The bird species that are rare in the Laegerneset and Midterhuken garbage pits are only present on Spitsbergen during summer (Table II). These are Barnacle and Brent Goose, Eider/King Eider, Dunlin/other Sandpipers, Arctic Skua and Little Auk. These species only occur in one garbage pit and account for 1-2 % of the identified bird remains at most. These species and the bones of juvenile Kittiwakes found in Midterhuken 4 demonstrate that at least some fowling occurred during summer. These summer visiting species are presumably so poorly represented in the garbage pits because the Laegerneset and Midterhuken whalers did not much fowling during summer.

V. CONCLUSION

Wild birds were an important additional, fresh food for the whalers in Svalbard, perhaps during autumn and winter when the food supplies from home were depleted.

The bird bones from the 17th century whaling stations of Laegerneset and Midterhuken proved to be unsuitable to test the hypothesis that the Little Auk increased in numbers since the extinction of the Svalbard bowhead whale in the beginning of the 20th century. The whalers presumably had a preference for larger bird species than the Little Auk. Fowling during autumn and winter excluded the capture of Little Auk, because the species is not present in these seasons on Spitsbergen. These human factors will complicate any interpretation of the possibly lower numbers of Little Auks on Spitsbergen in the 17th century in the composition of the bird remains in the garbage pits of these whaling stations.

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