# Three Centuries of Whaling and Walrus Hunting in Svalbard and its Impact on the Arctic Ecosystem

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## ABSTRACT

During the 17th, 18th and 19th centuries tens of thousands of Greenland right whales and thousands of Atlantic walruses were killed as a result of extensive whaling and walrus hunting in the waters of Svalbard. In this article whaling and walrus hunting and their impact on the environment is reconstructed. Annual catch records and shipping logs made it possible to calculate the original size of the populations and to reconstruct their original migration in the Greenland Sea. Their ultimate elimination made huge quantities of plankton and shellfish available for other marine mammals, polar cod and plankton-feeding birds.

## KEY WORDS

Greenland right whales, Atlantic walrus, whaling, walrus hunting, Svalbard

## INTRODUCTION

Four centuries ago England and the Netherlands started walrus hunting and whaling in the waters around Spitsbergen.[1] The whaling trade began in 1611 and lasted about three hundred years (Figure 1). Its success was very dependent on ice and weather conditions.[2] By around 1850, whaling in Spitsbergen had led to a complete removal of the Greenland right whale or bowhead (*Balaena mysticetus*) from the marine ecosystem.[3] Atlantic walruses (*Odobaenus rosmarus rosmarus*) were hunted first by English and Dutch whalers and later by Russian and Norwegian fur hunters (Figure 2). The walrus hunt started in 1604 on Bear Island and lasted till the end of the nineteenth century when the species was depleted in Svalbard. The extermination of the whale and the walrus are good examples of the impact of a historical long-distance fishery or trade on natural local ecosystems, in this case the marine ecosystem of Svalbard.

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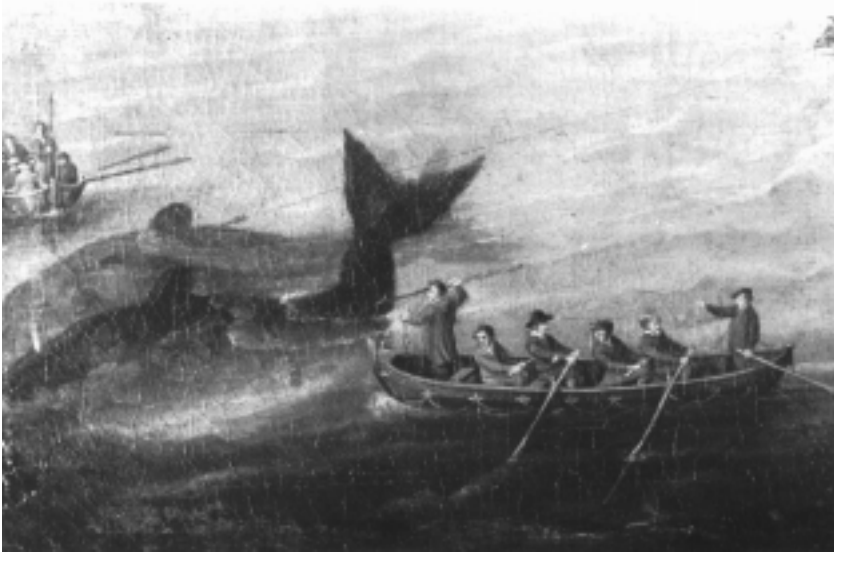

FIGURE 1. Hunting of the Greenland right whale by Dutch and Basque whalers in the seventeenth century. Detail of an oil painting by Cornelis Claesz. Van Wieringen (ca. 1620). Courtesy Kendall Whaling Museum, Sharon, Mass., USA.

FIGURE 2. Walruses on the beach at Moffen, north of Spitsbergen.
Photo: Ben Bekooi

During twenty years of archaeological field research on Spitsbergen many traces have been found from the whaling period. Remains of whaling stations were discovered and studied on the beaches of the west coast of Spitsbergen. On almost every suitable place along the west coast, the 17th century European whalers had built stations to boil the blubber of the whales into oil.[4] At these places many bones and sometimes even complete skeletons of Greenland right whales have been found.[5] The many remains indicate an intensive hunt of the whales in the coastal waters of Spitsbergen. It also proves the existence of a large whale stock in this area before the European whaling period started. Nowadays, between the islands of Franz Jozef Land Greenland right whales are sometimes sighted.[6] In the waters of Spitsbergen sightings of Greenland right whales have been very rare ever since the 19th century.[7]

Remains of walrus haul-outs of the same period were also found on many places along the coasts of Svabard. Many bones and sometimes even complete skeletons of walruses were found. These places indicate an intensive walrus hunt that led to a complete elimination of the Atlantic walrus from the marine ecosystem around 1870. This lasted till 1970 before the Atlantic walrus reappeared in Svalbard coming from Franz Josef Land. Today close to 1000 animals can be observed.[8]

This article will focus on the following questions: what impact did whaling and walrus hunting in Svalbard have on the local ecosystem, what happened to the large quantities of plankton which became available for the other organisms in the ecosystem, and which competitors took advantage of the removal of the Greenland right whale and the Atlantic walrus from the local ecosystem?

## SOURCES AND METHODS

This multidisciplinary research was set up to find answers on the questions formulated in the introduction. The sources of information were: archaeological sources such as excavations of settlements and their houses, working platforms, ovens, middens and graveyards; historical sources such as ships' logs, itineraries, notarial acts and catch records; biological sources such as excavated animal bones and recent zoological inventories and pedological sources such as soil samples.

Archaeological excavations were carried out on several locations along the west coast of Spitsbergen: Amsterdam Island (1979–1981, 1983, 1986 and 1987) and Ytre Norsk Island (1980) in the north and Lægerneset in the Recherchefjord (1998) and Midterhuken between Van Mijenfjord and Van Keulenfjord (1999) in the south (Figure 3). Archaeological structures and material culture were studied to improve knowledge of whaling on Spitsbergen. The animal bones excavated in the middens were studied to increase our knowledge of the natural environment of the stations. In this way the avifauna

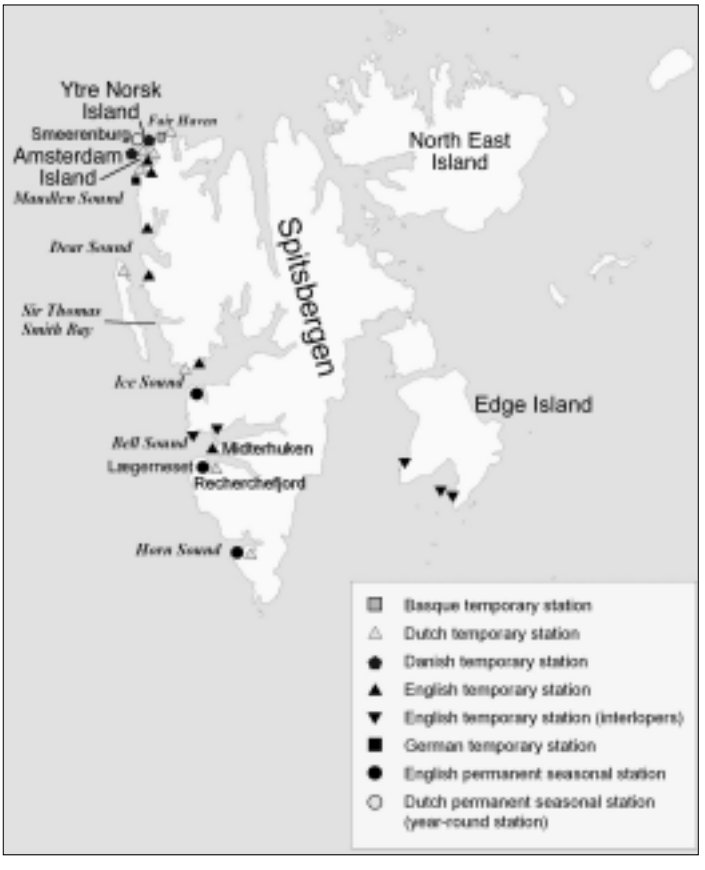


FIGURE 3. Remains of seventeenth-century whaling stations on Spitsbergen. Drawing: F. Steenhuisen

around the 17th century whaling stations was reconstructed. The same was done with soil samples around the settlements. Pollen analysis of these samples gave information of developments in the vegetation and the impact of whaling activities on the vegetation around the settlements.[9]

Written sources were used to reconstruct the whaling history and to collect more information of the ecology of the Greenland right whale, its early habitat and its former migration route. The historical-biological information is compared with the results of recent biological research north of Alaska in the Bering Sea.[10] In this way it is possible to study the life of the Greenland right whale in the North Atlantic Ocean although the species no longer exists there today.

The catch records inform us about the number of whales killed per voyage and per ship from 1669 to 1800. Several lists are preserved and comparison of these lists made it clear that the figures on the different lists do agree with each other rather well. We used these lists to calculate the number of Greenland right whales before exploitation and to assess the impact of whaling on the stock. Beside ship logs and catch records other written sources also provided information about whaling. Very often the place, the moment and the circumstances under which a whale was killed were noted in official notarial statements. These documents could be used to reconstruct the distribution of whales in the hunting area. Surviving trade correspondence and newspapers provided additional information about the economic aspects of whaling.

Although several historical documents exist, walrus hunting is not as well documented as whaling.[11] For Western European countries it was very often an adjunct to whaling and for the Russian and Norwegian fur hunters one of their many activities. Some incidental records are preserved but serial information about catches is not available for the walrus hunt. This makes it difficult to calculate the number of Atlantic walruses before exploitation and to assess the impact of the hunt on the Atlantic walrus stock.

Bones on the beaches were used to study the distribution of these sea mammals around the Arctic islands and this information was compared with the sightings of whales or walruses noted down in the notarial statements. The bird bones from the middens were used to reconstruct the avifauna around whaling stations and haul-out places and this reconstruction was compared with the species composition of the recent bird rookeries.

## THE GREENLAND RIGHT WHALE

One of the first biological descriptions of the Greenland right whale is given in the book *Drie Voyagien gedaen na Groenlandt...* which was written sometime in the first half of the seventeenth century and published around 1668 by Gillis Joosten Saeghman in Amsterdam.[12] This book gives an excellent picture of the level of knowledge of the biology of the Greenland right whale at that time. It demonstrates that whalers were well informed about the biology of whales in those days, probably because they were excellent observers.

According to such historical descriptions and recent biological research in Alaska we now know that the Greenland right whale is a large whale which belongs to the family of the baleen whales (*Balaenidae*). The animal received its name from the baleen plates in its mouth. With these characteristic baleen plates the animal can sift the zooplankton out of the seawater.[13] The length of the Greenland right whale varies between 12 and 18 metres.[14] The average weight of an adult whale is about 50 to 100 tonnes. The body is black and the whale has a white spot on its chin and a lighter spot on its tail stock and/or fluke plates. The head is about one-third of the total body length of the animal and the bonnet

callosities characteristic of this family are absent on the upper part of the head. The Greenland right whale has a higher arch of the upper jaw than related species, such as the northern and southern right whales. The widely separated blowholes cause a double blow, the V-shape of which is characteristic of the Greenland right whale. The eyes are placed quite low on the side of the head about 30 cm above the corner of the mouth.[15]

Greenland right whales are endemic to Arctic and sub-Arctic waters. They are usually not seen south of 68º N. In the (sub-)Arctic, the whales spend a great part of their life close to the edge of the pack ice in the waters near Arctic and sub-Arctic islands.[16] From historical sources, it appears that the 200-m depth contour is of great significance to them.[17]

*Migration of the Greenland right whale*

Historical sources in combination with the results of recent biological research in the Bering Sea have made it possible to reconstruct the life and migration of Greenland right whales in the Atlantic Arctic.[18] The Greenland right whales wintered along the edge of the pack ice east and southeast of Greenland and migrated to the north in the springtime following the ice edge. In 1634, the seven Dutch sailors who wintered on Jan Mayen observed the first whales on 28 March.[19] Because of upwelling the Greenland Sea between Jan Mayen and Spitsbergen is rich in nutrients. This availability of nutrients and the general ice thickness determines both the growth of phyto- and zooplankton. This growth of plankton shows a seasonal rhythm, with the peak coming later with increasing latitude. In the northern direction the number of species of zooplankton decreases as well. The Greenland right whale migrates to the north to feed on this zooplankton and returns south in autumn after the feeding season.[20]

The whale probably had its calving area near Jan Mayen. Pregnant females were caught and many female and young whales were seen near Jan Mayen in the first half of the 17th century. Male and non-pregnant female whales migrated directly to the feeding grounds northwest and north of Spitsbergen.[21] Under certain ice conditions – for instance when the pack ice was closed and the edge near the coast of Spitsbergen – many whales were concentrated there, making this a productive hunting area. Sometimes it was so crowded with whales that the whalers called it the Whalebay (Table 1).

The logbook of the seven winterers on Amsterdam Island (1633/1634) mentioned the first whale sighting on April 27.[22] Other written sources name the end of May or the beginning of June as the date the whales arrived in the fjords of Spitsbergen.[23] Later in the season, female and young whales were seen feeding in the fjords of Spitsbergen. In this period whales were also seen in the eastern part of Svalbard and even in the Barents Sea. Remains of whaling stations on some islands south of Edge Island demonstrate the former presence of whales in these waters.[24]

| Year | Observer | Place | Observation | Source |
|---|---|---|---|---|
| 1607: 14 July | Henry Hudson | Kingsbay, Spitsbergen | ‘ many whales’ | Conway 1906: 25 |
| 1610: 16 June | Jonas Poole | Kingsbay, Spitsbergen | ‘ I saw great store of whales’ | Purchas 1906 XIV, ch. IV:14 |
| 1612: 29 June | Jonas Poole | Kingsbay, Spitsbergen | ‘ great store of whales’ | Purchas 1906, XIV ch. IV: 42, 43 |
| 1619 | Matthys Jansz Hoepstock | Hoepstockbaai, Jan Mayen | ‘ 44 whales killed’ | GAR ONA* invnr. 91, fol. 191 |
| 1634: March/ April | Journal of the winterers | Noorderbaai, Jan Mayen | many whales | L'Honoré Naber 1930: 62e |
| 1648 | Christian Müller | Magdalenabaai, Spitsbergen | more than 1000 whales | Oesau 1955: 20 |
| ca. 1660 | Lancelott Anderson | Bell Sound, Spitsbergen | ‘ many young ones with the olds…’ | Conway 1900: 630 |

TABLE 1. Records of large concentrations of whales in the bays of Spitsbergen and Jan Mayen.

* GAR ONA: Rotterdam Municipal Archive, Old Notarial archive.

## THE ATLANTIC WALRUS

Hessel Gerritsz (1613) in his *l’Histoire du Pays nommé Spitsberghe*[25] was one of the first authors to give a description and a drawing of the Atlantic walrus. Later, Gerritsz’ very rough description was completed by Martens (1710) and Zorgdrager (1720). Recent biological research has produced much more information.[26] The Atlantic walrus belongs to the family *Odobenidae*. It received its Latin name from the 80 cm tusks in its upper jaw which are sometimes used to help the animal move about, literally the name means tooth-walker.[27] Nowadays walruses occur only in cold temperate, sub-Arctic and Arctic regions. The migratory behaviour of Atlantic walruses is poorly understood, and some local populations are non-migratory.[28] This is probably the case with the Atlantic

walrus in Svalbard. There they appear to be very tied to places like Moffen and Andretangen.

The Atlantic walrus feed on benthic organisms such as large bivalves and decapod crustaceans[29] and its daily food consumption is approximately 5.7 percent of its body mass, or about 57 kg. Adult male Atlantic walruses are, on average, 3 metres long and weigh 1000 kg: large females 2.4 metres and weigh 800 kg. Young animals are usually 1.4 metres long and weight less than 85 kg at birth. Walrus skin is extremely thick, up to 6 cm on an adult male's neck. The body colour varies from grey to reddish brown.[30]

Unlike the whale stock it is very hard to calculate the walrus stock in Svalbard before human exploitation. Weslawski et al.[31] calculated this at 25,000 by assuming that the initial walrus stock in Franz Josef Land was 6000–12,500 animals,[32] taking into account that Svalbard is much larger in area and had more haul-outs (Figure 4). From historical sources we know that the original popula-

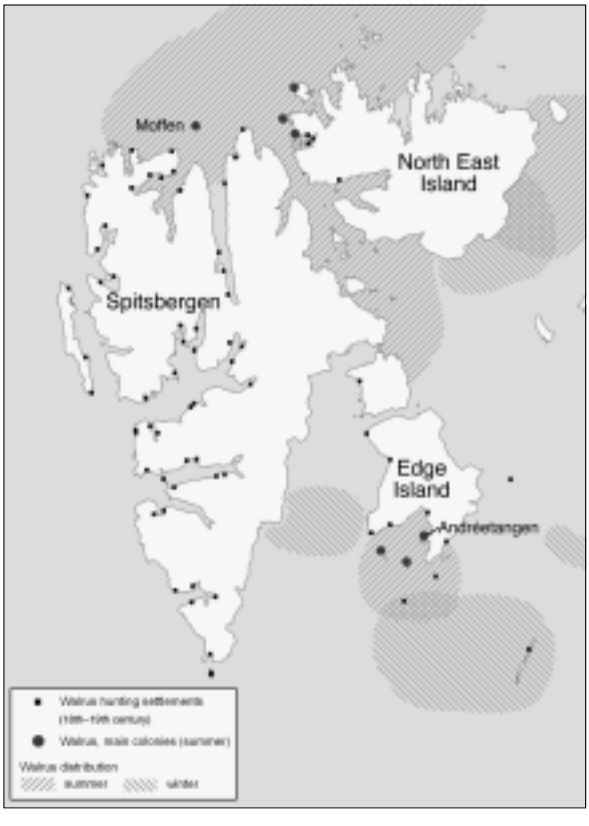


FIGURE 4. Remains of eighteenth- and nineteenth-century walrus hunting stations and recent walrus colonies on Svalbard. Drawing: F. Steenhuisen.

tion on Bear Island numbered at least 3000 animals and that the population in Svalbard still numbered about 10,000 animals after two hundred years of walrus hunting. After 1870 however, the Atlantic walrus was absent from Svalbard. In 1970 the Atlantic walrus reappeared in Spitsbergen from Franz Josef Land and today there are again about 1000 animals in the waters of Svalbard.[33]

## IMPACT OF WHALING AND WALRUS HUNTING

Many scholars have tried to estimate stock sizes prior to commercial whaling.[34] With help of these estimates and many newly collected catch records it proved to be possible to estimate the stock size before exploitation. There is only one difficulty, and that is the fact that the catch records from the first period (1610–1669) of the Spitsbergen whaling trade are not continuous. Only from some years has information been preserved. Based on this incidental information the total catch can be estimated at 15,000 whales in this first period. We are much better informed of the catch in the next period. From 1669 onwards the whalers kept catch records on a yearly base. From 1669 to 1800, 86,644 whales were killed by English, Dutch and German whalers in the seas between Jan Mayen and Spitsbergen (Figure 5). Considering these records and taking into account that 20 percent of the whales hit were lost[35] we come to a total record of about 122,000 whales killed. Assuming a yearly reproduction rate of 2 percent the pre-exploitation Greenland right whale stock size must have been 46,000.[36]

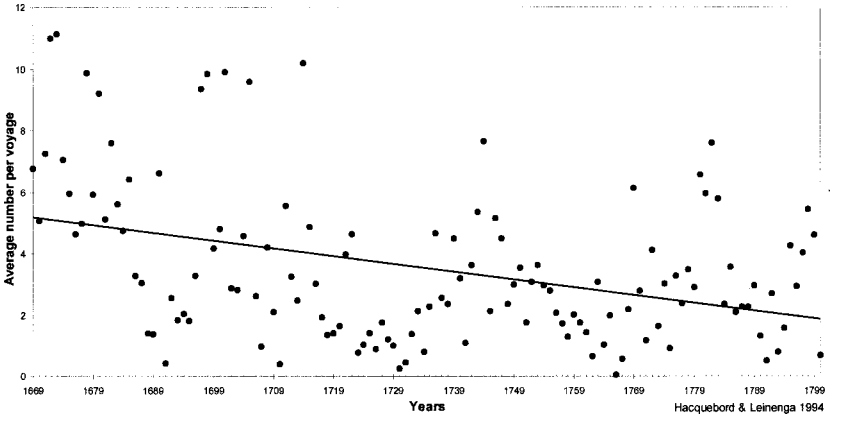


FIGURE 5. Average number of Greenland right whale caught in the Spitsbergen waters 1669–1800.

This stock was totally exterminated by whaling, which means that 46,000 whales were taken out of the original ecosystem, thus making 3.5 million tons of food available yearly for seabirds and fish feeding on plankton. Since little auks (*Alle alle*), polar cod (*Boreogadus saida*) and capelin (*Mallotus villosus*) feed on the same food as the Greenland right whale they would be the first organisms that would benefit from the extermination of the Greenland right whale. Increasing populations of polar cod and capelin then stimulated the increase of fish eating birds like Brünnich's and common guillemots (*Uria lomvia* and *Cepphus grylle*) as well as Greenland seals (*Phoca groenlandica*) and minke whales (*Balaenoptera acutorostrata*).[37] The same happened with the Atlantic walrus stock: 25,000 walruses were taken out of the original ecosystem, making 0.5 millions tonnes of food available yearly for bearded seals (*Erignathus barbatus*) and diving ducks as eiders (*Somateria mollissima*).[38]

In this connection it is fascinating that research in Antarctica has shown that three of the most abundant bird species almost totally dependent on Antarctic krill – (*Euphausia superba*): Chinstrap (*Pygoscelis antarctica*), Adelie (*Pygoscelis adeliae*) and Macaroni (*Eudyptes chrysolophus*) penguins – have increased 5 to 10 percent in population after the modern whaling period.[39] The same research made clear that after the increase of the number of penguins the minke whale, crabeater seal (*Lobodon carcinophagus*) and even the Antarctic fur seal (*Arctocephalus gazella*) increased in number too.[40] If the same happened in the Arctic after the Greenland right whale hunt, plankton-feeding birds and fish will have increased, and subsequently birds and sea mammals feeding on these fish. Recent sea bird observations have shown a high (31 percent) representation of kittiwake (*Rissa tridactyla*) and little auk (34.7 percent) on the west coast of Spitsbergen. Nowadays these two species account for almost 65 percent of the total seabirds there[41] (Table 2).

Historical and archaeological sources however, give another picture. The birds mentioned in one of the surviving wintering logbooks (1633/1634) are kittiwake, fulmar (*Fulmarus glacialis*), Brünnich's guillemot, black guillemot (*Cepphus grylle*), glaucous gull (*Larus hyperboreus*) and eider (*Somateria mollissima*). Black guillemot and glaucous gull are mentioned most in the wintering logbook (Table 3). The archaeological excavations of the middens at the sites nearby the rookeries contain bones of fulmar, kittiwake, glaucous gull, Brünnich's guillemot, black guillemot, little auk, eider and barnacle goose (*Branta leucopsis*) (Table 2). In Smeerenburg fulmar bones (79.7 percent) were most frequently found but this probably was because the flensing took place on the beach instead of alongside the ship in the fjord. On the beach the carcass of the whale would have attracted many of these birds. Beside the fulmar, kittiwake (8.1 percent) and Brünnich's guillemot (4.3 percent) were well represented in the middens of Smeerenburg. Not so many fulmar bones (11.3 percent) were found

| | Smeerenburg | | Lægerneset | | Midterhuken | | Recent | |
|---|---|---|---|---|---|---|---|---|
| | no. | % | no. | % | no. | % | no. | % |
| Fulmar | 3,290 | *79.7* | 43 | *5.4* | 42 | *11.0* | 383 | *10.3* |
| Kittiwake | 333 | *8.1* | 16 | *2.0* | 21 | *5.5* | 1,151 | *31.0* |
| Glaucus gull | 114 | *2.8* | 25 | *3.1* | 15 | *3.9* | 138 | *3.7* |
| Brünnich's guillemot | 179 | *4.3* | 635 | *79.1* | 283 | *74.3* | 600 | *16.2* |
| Black guillemot | 51 | *1.2* | 9 | *1.1* | 2 | *0.5* | 65 | *1.8* |
| Little auk | 23 | *0.6* | | | | | 1,289 | *34.7* |
| Common guillemot | | | | | | | 3 | *0.1* |
| Puffin | | | | | | | 82 | *2.2* |
| Eider | 134 | *3.2* | 1 | *0.1* | | | | |
| Goose | 2 | *0.1* | 5 | *0.6* | 2 | *0.5* | | |
| Other (various) | | | 69 | *8.6* | 16 | *4.2* | | |
| | **4,126** | ***100.0*** | **803** | ***100.0*** | **381** | ***99.9*** | **3,711** | ***100.0*** |

TABLE 2. Number of bird bones from excavations of Smeerenburg (1979–1984), Lægerneset (1998) and Midterhuken (1999) on the west coast of Spitsbergen compared with recent bird inventories (1991).

Sources: van Wijngaarden-Bakker (1987); Joiris (1996); Prummel (1998 and 1999).

in the middens of Lægerneset. In the middens at this site in the Recherchefjord near Bell Sound most were Brünnich's guillemots (79.1 percent) and the same pattern was found in the middens at Midterhuken, a whaling station on a spit of land between Van Mijenfjord and Van Keulenfjord with 74.3 percent Brünnich's guillemot. The middens of Smeerenburg contained only a few bones of the little auk (0.6 percent) and those of Lægerneset and Midterhuken did not contain any bone of the little auk at all, whereas this bird is very well represented today in a neighbouring bird cliff. According to the written sources the little auk was eaten by the whalers as much as any other species, so it certainly is not because of the taste that the bones of this bird are almost absent from the middens. It was probably more a question of rarity. The same is true for the eider duck. This bird is found in the middens of Smeerenburg (3.2 percent) but is almost absent from the middens of Lægerneset (0.1 percent) and Midterhuken (0 percent), whereas many eiders are found in this region nowadays.

| Bird Species | Abundance 1633/4* | Abundance Recent | Ease of catching | Taste | Quotation from F. Martens, Voyage to Spitzbergen, 1671** |
|---|---|---|---|---|---|
| Kittiwake | +++ | +++ | ++ | 0 | There is but little meat upon them. We eat but the legs and the breast, for the wings are nothing but skin and bone |
| Glaucous gull | + | + | ++ | 0 | |
| Brünnich's guillemot | + | ++ | 0 | 0 | The old ones are full of flesh, but it is very dry and tough and therefore unpleasant to eat. They boil them like the pigeons and scum off the fat when they boil, then they fry them in batter. |
| Black guillemot | +++ | + | 0 | + | Their flesh is good to eat when the fat is taken away from it, if afterwards it be fryed in butter. |
| Little auk | 0 | +++ | ++ | ++ | They are very good food, and the best next the Strandrunner; are fleshy and fattish; we boyl and then roast them. |
| Common guillemot | 0 | + | 0 | 0 | |
| Puffin | 0 | + | 0 | ++ | He hath more flesh upon him than the diving pigeon and is very good to eat |
| Fulmar | + | +++ | ++ | 0 | His breast and legs are only to be eaten; they are tough and taste strong of train oyl. |
| Eider | +++ | +++ | + | + | These ducks have a very good flesh. We boyl'd and roasted them as we did the other birds, but the fat of them we flung away for it tasted of train-oyl (and made us vomit). |

TABLE 3. Bird information from written historical sources.

+++ very good ++ good + fair 0 poor

* Recorded in the wintering logbook of 1633/4 (l'Honoré Naber 1930).

** Adam White 1855.

## CONCLUSIONS

This study demonstrates that with the help of historical, archaeological and biological sources, it is possible to reconstruct the ecology of animals that were exterminated more than 100 years ago in the North Atlantic. Using surviving catch records, it is possible to calculate the number of Greenland right whales before and during the first years of exploitation as about 46,000. Although more difficult and less certain, an estimate of the original Atlantic walrus stock was possible, at about 25,000. Both animals were eliminated from the marine ecosystem of Svalbard, which made large quantities of zooplankton available for other organism in the system. This surplus of pelagic zooplankton is now almost certainly consumed by planktonivorous seabirds like the little auk and by fish, while eiders and probably also bearded seal benefited from the extinction of the Atlantic walrus. Archaeological and historical research show an enormous increase of little auk and eider since the elimination of the whale and the walrus from the ecosystem. The increased amount of pelagic fish in turn provided food for piscivorous alcids and gulls. In this way whaling and walrus hunting may have caused the great increase of present-day seabird colonies on the west coast of Spitsbergen.

## NOTES

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[3] Hacquebord and Leinenga 1994.
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