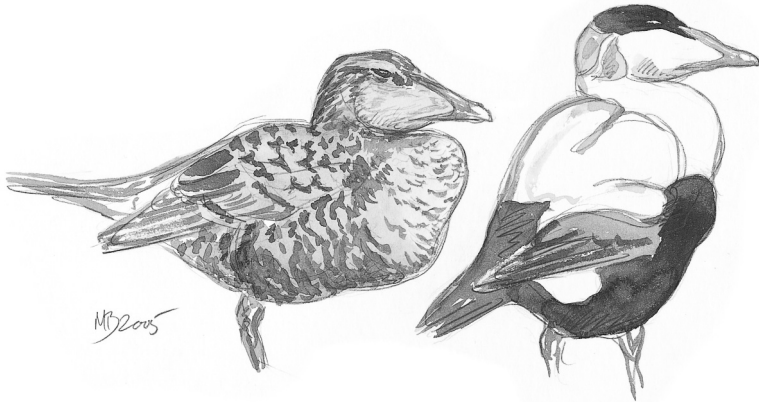


Past and present assessments of bird life in Uummannaq District, West Greenland

WILLIAM BURNHAM, KURT K. BURNHAM and TOM J. CADE



(Med et dansk resumé: Fuglelivet i Uummannaq fjord: en sammenligning mellem årene 1905-20 og 2000)

Abstract From 1905 to 1920 Alfred Bertelsen documented 210 avian breeding sites for 32 species in the Uummannaq District, Greenland, between 70°03' and 72°03' N and 50°20' and 55°40' W, a land area of about 12 000 km². In 2000 we re-surveyed 207 of those sites and the remainder of the coastal area, providing results for 25 species, our aim being to determine presence/absence and density of coastal nesting species. For 10 species reported by Bertelsen as common and with quantified numbers (breeding sites and population) at his locations, we found the number of occupied sites was the same for one species (Northern Fulmar *Fulmarus glacialis*) while nine others had declined. Assuming some species may have relocated breeding sites over time and including all locations where we found those species, when compared to Bertelsen's results, the number of sites remained the same for two species and declined for eight. Comparing the total observed population numbers (birds present) between Bertelsen's and our 2000 survey, one species remained about the same or slightly increased (Northern Fulmar) and nine decreased. The species with the most dramatic declines were the Thick-billed Murre *Uria lomvia* (from 8 sites and over 500 000 pairs to zero), Black-legged Kittiwake *Rissa tridactyla* (27 sites and 268 000 birds to 7 sites and c. 1100 birds), Razorbill *Alca torda* (17 sites to 3), Common Eider *Somateria mollissima* (26 sites to 16), and Gyrfalcon *Falco rusticolus* (28 sites to 7). The Great Cormorant *Phalacrocorax carbo* and Great Black-backed Gull *Larus marinus* are the only species we could determine with certainty that had increased in number of breeding sites (1 to 12 and 0 to 4 sites, respectively). Population declines appear to be a combination of human persecution and human-caused reduction in prey and habitat quality. Unless further conservation measures are taken, continued avian declines are probable.

Introduction

Alfred Bertelsen (AB) was a Danish medical doctor who lived in Uummannaq, Greenland. In 1903 and 1904 he traveled through the area, becoming the first resident doctor in 1905. For the years 1905 through 1920, Bertelsen documented nesting sites and areas and provided comments on population numbers for 57 species of birds in the Uummannaq District. In 1921 he published his findings, *Fuglene i Umánaq Distrikt*, with maps identifying 210 breeding locations (Bertelsen 1921). He listed 21 species of birds as "breeding annually" and 11 more as "steadily breeding species, which occur in

a very limited way, both in distribution and numbers" (translation by William Mattox). Two species were common non-breeding visitors, and an additional 23 species he considered rare and uncommon visitors to the area.

We re-visited 207 of Bertelsen's bird sites and searched other locations from 3 through 20 July 2000, almost a century after Bertelsen began his observations on the bird life of the Uummannaq District. Jack Stephens and Tim Gallagher also participated in the survey. The goal of the survey was to determine presence/absence and density of coastal nesting species. In this paper we compare

the results of our survey with Bertelsen's earlier assessment of bird life in the Uummannaq District.

Finn Salomonsen carried out partial surveys of the AB sites and generally within the Uummannaq area in 1949 and 1975 by boat, as did David Boertmann and Anders Mosbech in 1998 using an aircraft and by boat in 1994 (D. Boertmann, National Environmental Research Institute, Denmark), and Kaj Kampp surveyed certain alcid nesting sites by boat in 1984 (Kampp 1984). Results from these surveys are reported here and referenced by use of the above-mentioned years.

Study area and methods

The study area as described by Bertelsen is between 70° 03' and 72° 03' N latitude and 50° 20' and 55° 40' W longitude, a land area of about 12 000 km². It is a system of fjords, bays, and islands bordered by the Greenland Icecap to the east and Baffin Bay to the west. Several glaciers birth icebergs that can prevent boat travel during the avian breeding period in the Qarajaqs Isfjord and connecting Qarassap Imaa and the inland portion of Sermillip Kangerlua. For a detailed account of the geology and flora of the region see Escher & Watt (1976) and Fredskild (1996), respectively.

The study area includes eight human communities ranging in population from less than 100 to about 1400 people. The total population for the Uummannaq District is about 2785 (Statistics Greenland 2003). Just over half of the population lives in the town of Uummannaq while the remainder are scattered between seven villages widely dispersed through the area. The Maarmorilik Mine (lead and zinc) is also located in the area and was opened in 1972 and closed in 1990, during which time about 100 to 250 people lived and worked at the now deserted mine. The main occupation in the Uummannaq District was hunting and fishing; but beginning in the 1980s fishing (Greenland halibut *Reinhardtius hippoglossoides*) became much more important, and the local fishing fleet trebled in size (Berthelsen et al. 1993).

In Bertelsen's 1921 publication, sites are plotted on maps by species and described in the text making location of many nesting locations possible with limited guessing. In the field, sites with concentrations of seabirds and gulls were recognizable due to the presence of excrement and/or nesting material even if no longer occupied. Gyrfalcon nest sites with long term use were well marked with excrement, as were some Raven nesting sites, which also frequently had stick nests. To detect new or shifted breeding sites in the study area

since the earlier research, we surveyed all ice-free land within view from the water. At Bertelsen sites where no birds were detected and at other likely looking sites, a rifle was fired to flush any unseen birds.

Survey by boat was accomplished from an open 8 m outboard motorboat (Safeboat). For areas that could not be accessed by boat because of ice, a Bell 212 helicopter was used. Locations of all occupied seabird, gull, duck, shorebird, Raven, and falcon nest sites were identified using a GPS adjacent to the site on the water or in the air.

In this paper all site numbers used are those assigned by Bertelsen (1921). Within the tables we refer to geographic locations reported by Bertelsen for specific species as "AB (name of species) Sites." For locations identified by Bertelsen for a species but with one or more other species he did not report we use "AB Non-(name of species) Sites." All Bertelsen locations where any species was located are designated as "Total AB Sites." "Non-AB Sites" are locations where a species was seen that was never reported in the Bertelsen paper. The numbers of birds reported in this paper are individual birds unless otherwise indicated as pairs (p).

Results

We traveled about 2900 km by boat and 350 km by helicopter during the 18-day survey. We visited 207 of the 210 sites reported by Bertelsen. We report results on 25 species of birds that Bertelsen studied. We do not report on 32 other species that Bertelsen considered uncommon or rare visitors and that we did not observe, and common species of small passerines and shorebirds that our survey by boat did not allow us to quantify.

We were unable to survey three AB sites because of boat motor problems. They are on the northwest periphery of the area and were reported having three pairs of Glaucous Gulls *Larus hyperboreus* and 10 pairs of Black Guillemots *Cephus grylle* (AB No. 206), a Common Raven *Corvus corax* nest site (AB No. 209), and 30 pairs of gulls (both Glaucous Gulls and Iceland Gulls *Larus glaucoides*) (AB No. 210). Only AB No. 206 had been re-surveyed: in 1994 D. Boertmann and A. Mosbech saw 35 Black Guillemots and two pairs of Glaucous Gulls.

Red-throated Diver *Gavia stellata*

Great Northern Diver *G. immer*

Bertelsen reported Red-throated Diver as a common breeder, while Great Northern Diver was an accidental visitor. We saw divers at two AB sites,

Table 1. Numbers of Northern Fulmars seen at AB sites. Individuals unless pairs (p) indicated. *Anslæede størrelser af Mallekuk-kolonierne i Uummannaq fjord som angivet af Bertelsen (AB) eller fundet ved senere undersøgelser. Individuer med mindre par er angivet (p).*

| Site No. | AB | 1949 ¹ | 1975 ¹ | 1994 ² | 2000 |
|-----------------|---------|-------------------|-------------------|-------------------|--------|
| 86 ³ | 0 p | 10000 p | 15000 p | 10000 | 100s |
| 87 ³ | 5000 p | – | – | – | 10000s |
| 114 | 25000 p | 8000 p | – | – | 10000s |
| 128 | 25000 p | 20000 p | 45000 p | 10000 | 10000s |
| 161 | 50000 p | – | 0 p | 15000 | 10000s |

¹ There is uncertainty whether F. Salomonsen reported individual birds or pairs. D. Boertmann believes pairs to be correct.

² Pers. comm., "educated minimum guesses."

³ D. Boertmann reports sites 86 and 87 as a single breeding location.

Table 2. Total sites reported occupied by Great Cormorants in all years. *Antallet af Skarv-kolonier kendt før 2000 hhv. fundet under forfatterens besøg. Søjljerne viser Bertelsen-lokaliteter (AB sites) med og uden Skarver ved hans undersøgelser; summen af disse, samt andre lokaliteter fundet senere.*

| | AB Cormorant sites | AB non- Cormorant sites | Total AB sites | Non-AB sites |
|----------------|-----------------------|----------------------------|-------------------|-----------------|
| Occupied <2000 | 1 | 1 | 2 | 0 |
| 2000 Survey | 0 | 11 | 11 | 1 |

six at one and two at the other. We did not determine which species they were, but Boertmann (1994) reported that both of the above should occur in the area.

Northern Fulmar *Fulmarus glacialis*

Bertelsen reported four locations with Northern Fulmars. In 1949 F. Salomonsen reported another location (No. 86) near Bertelsen's No. 87 with large numbers of Northern Fulmars. Since then, Boertmann et al. (1996) have combined these sites. Bertelsen reported the Northern Fulmar as numerous in the Uummannaq District. The presence or absence of Northern Fulmars is not difficult to determine, but the number of birds is, as the species nests high on cliffs and with nests frequently scattered over a large area. Nesting sites may extend for more than a kilometer. Other researchers have found this same difficulty (Boertmann et al. 1996). All of the previously observed breeding sites for Northern Fulmars were occupied in 2000 (Table 1). No new sites were found. It was by far the most common seabird observed, and must have numbered in the many tens of thousands.

Great Cormorant *Phalacrocorax carbo*

Bertelsen reported only one location (No. 9) with five pairs of Great Cormorants. In 1980, from an

aircraft, a single bird was reported at another Bertelsen site (No. 17) and in 1994, from a boat, eight Great Cormorant nests were observed at the same location. We found no Great Cormorants at the original Bertelsen site but saw 30 Great Cormorants and 16 nests at the 1980/1994 reported location. We also found Great Cormorants at an additional 10 AB sites plus one new location (Table 2). Great Cormorant nests were seen at 10 of the 11 sites with cormorants present. The total population was >500 birds.

Canada Goose *Branta canadensis*

A flock of Canada Geese (12) was seen in Vaigat at an AB site (No. 9), and a pair 6 km northwest hereof. Bertelsen reported only one observation of a Canada Goose but populations have greatly increased in range and density in West Greenland since the 1970s (Bennike 1990, Fox et al. 1996).

Common Eider *Somateria mollissima*

Bertelsen reported 26 breeding locations for Common Eiders. During other surveys of Bertelsen sites prior to ours, another eight Bertelsen locations were reported to have Common Eiders for a total of 34 of the 210 sites. In 2000 we found Common Eiders at only five of Bertelsen's original locations and saw Common Eiders on the water

Table 3. Comparison of difference in total sites reported for 10 species in all years. Antal lokaliteter med given art. Første gruppe er lokaliteter angivet med arten af Bertelsen, og de tre søjler angiver antal af disse lokaliteter med arten på Bertelsens tid, i 2000, samt den procentvise tilbagegang. Anden gruppe er andre Bertelsen-lokaliteter, men uden arten på hans tid; her viser de tre søjler antallet af disse lokaliteter med arten før 2000, i 2000, samt den procentvise nedgang. Tredje gruppe omfatter alle lokaliteter fundet med arten i 2000, opdelt på Bertelsen-lokaliteter (med eller uden arten på Bertelsens tid), andre lokaliteter, samt stammen heraf. Næstsidste søjle viser antallet af samtlige lokaliteter, der har huset arten på et eller andet tidspunkt før 2000, mens sidste søjle viser nedgangen ved sammenligning med 2000 (tredjesidste søjle). Arterne er 1) Møllemuk, 2) Ederfugl, 3) Jagtflugt, 4) Hvidvinget Måge og Gråmåge, 5) Røde, 6) Havterne, 7) Polarlomvie, 8) Alk, 9) Tejst, 10) Ravn.

| | AB species specific sites | | | Other AB reported locations | | | 2000 Survey | | | Totals | |
|---------------------------|---------------------------|-------------|----------|-----------------------------|-------------|----------|--------------|-----------|-------------|-------------------|----------------|
| | AB | 2000 Survey | Decrease | Before 2000 | 2000 Survey | Decrease | All AB sites | New sites | Total sites | Total <2000 sites | Total decrease |
| 1) Northern Fulmar | 4 | 4 | 0% | 1 | 1 | 0% | 5 | 0 | 5 | 5 | 0% |
| 2) Common Eider | 26 | 5 | 81% | 8 | 4 | 50% | 9 | 7 | 16 | 34 | 53% |
| 3) Gyrfalcon | 28 | 3 | 89% | 0 | 0 | — | 3 | 4 | 7 | 28 | 75% |
| 4) Gulls | 78 | 52 | 33% | 23 | 22 | 4% | 74 | 25 | 99 | 101 | 2% |
| 5) Black-legged Kittiwake | 27 | 3 | 89% | 5 | 4 | 20% | 7 | 5 | 12 | 32 | 63% |
| 6) Arctic Tern | 17 | 10 | 41% | 2 | 2 | 0% | 12 | 2 | 14 | 19 | 26% |
| 7) Thick-billed Murre | 8 | 0 | 100% | 0 | 0 | — | 0 | 0 | 0 | 8 | 100% |
| 8) Razorbill | 17 | 1 | 94% | 5 | 2 | 60% | 3 | 0 | 3 | 22 | 86% |
| 9) Black Guillemot | 107 | 53 | 50% | 25 | 22 | 12% | 75 | 32 | 107 | 132 | 19% |
| 10) Common Raven | 41 | 9 | 78% | 0 | 14 | — | 23 | 10 | 33 | 41 | 20% |

at four of the additional AB sites. We did see Common Eiders at seven previously unreported locations; all were at the periphery of the survey area and at the maximum distance from human habitation (Table 3). Of the original 26 Bertelsen Common Eider sites, we found the number of reported ducks increased at two locations (20 to 40 and 20 to c. 100), decreased at 22 sites, and remained about the same at two. The total number had decreased (Table 4); Bertelsen reported about 775 breeding pairs of Common Eiders while we saw less than 500 individual birds (on the water and flying) in the district. Most AB Common Eider sites were islands on which we found seven occupied by free-ranging sled dogs and five with houses and/or tents. Local people frequently release their dogs on islands near villages during the months when there is no sea ice and dogs cannot escape. The dogs no doubt preclude any avian use of these islands.

Harlequin Duck *Histrionicus histrionicus*

Bertelsen reported Harlequin Ducks as well-known and occasional breeders. We saw two individuals near an AB site (No. 158) during our survey but did not search inland streams or lakes.

Long-tailed Duck *Clangula hyemalis*

Bertelsen reported seeing Long-tailed Ducks at four locations and said they were fairly common and seen yearly. During the 2000 survey we did not see ducks at those locations but saw them at two other AB sites.

Red-breasted Merganser *Mergus serrator*

Bertelsen reported mergansers at two locations, and Salomonsen (1967) reported their occurrence in the Uummanaq area, but we saw none during the 2000 survey.

Table 4. Common Eider colonies at AB Common Eider sites. Number of sites of different size categories. *Antal Ederfugle-kolonier af forskellig størrelse, dels på Bertelsens tid, dels i 2000 under forfatterens besøg. Kun Bertelsen-lokaliteter er betragtet.*

| | Size of eider colony (birds) | | | | |
|-------------|------------------------------|-------|-------|-------|-----|
| | >100 | 99-50 | 49-30 | 29-10 | <10 |
| Bertelsen | 4 | 2 | 6 | 11 | 3 |
| 2000 Survey | 2 | 0 | 1 | 2 | 0 |

Note: Bertelsen typically reported bird numbers as pairs. To facilitate comparison to 2000 where individual birds were counted, AB numbers for eiders were doubled.

Gyr Falcon *Falco rusticolus*

Bertelsen reported 28 locations for Gyrfalcons and no other sites were reported that we are aware of prior to our 2000 survey. Of the 28 AB sites, we saw individual or breeding pairs of Gyrfalcons at three but also found Gyrfalcons at an additional four locations (Table 3). No Gyrfalcons were seen near former AB seabird nesting sites where Bertelsen reported falcons. All eyries located were near heath lands where Rock Ptarmigan *Lagopus mutus*, an important prey species for the Gyrfalcon, were likely to occur.

Peregrine Falcon *Falco peregrinus*

Bertelsen reported Peregrine Falcons for two general locations but identified no specific eyries. Both reported areas have suitable cliffs/habitat and could have breeding Peregrine Falcons present, but none were seen during our survey. We did locate a territorial pair at a non-AB site and saw another adult flying during the helicopter survey in the upper part of Amitsuaq Fjord.

Pomarine Skua *Stercorarius pomarinus*

Arctic Skua *S. parasiticus*

Long-tailed Skua *S. longicaudus*

Bertelsen reported Pomarine Skuas breeding limitedly, Arctic Skuas at a few places, and Long-tailed Skuas as being only occasional visitors and quite uncommon. He listed four locations for Pomarine Skuas, but no birds were seen at these sites during our survey. Two of the sites are on the periphery of the survey area and far from humans, while another is near a village, and the fourth on an island where free-ranging dogs and cabins exist. Salomonsen (1967) questioned whether Pomarine Skuas breed in the Uummannaq District; breeding Pomarine Skuas primarily feed on lemmings which do not occur in West Greenland (Boertmann 1994). We did see a single flying *Stercorarius* at a distance at a non-AB location but could not determine the species.

Iceland Gull *Larus glaucooides*

Glaucous Gull *L. hyperboreus*

Bertelsen reported Iceland Gulls and Glaucous Gulls as widely distributed and in significant numbers. Differentiating between Glaucous and Iceland Gulls can be difficult because of very similar plumage with the primary observable difference between the species being their size. Glaucous Gulls are larger. For this report we have combined all observations of the two species and report them only as "gulls" (Table 3). At the sites where Bertelsen reported gulls, in 2000 we found the numbers had increased at 10 sites, decreased at 56 locations, and remained about the same at 10. The greatest decreases occurred at sites where Bertelsen had reported the largest number of birds (Table 5). Large gulls were the second most common seabird seen in 2000.

Table 5. Gull colonies (Iceland and Glaucous Gull) at AB gull sites. Number of sites of different size categories. *Antal måge-kolonier af forskellig størrelse (Hvidvinget Måge og Gråmåge), dels på Bertelsens tid, dels i 2000 under forfatterens besøg. Kun Bertelsen-lokaliteter er betragtet.*

| | Size of gull colony (birds) | | | | |
|-------------|-----------------------------|---------|---------|--------|-----|
| | >500 | 499-300 | 299-150 | 149-50 | <50 |
| Bertelsen | 12 | 7 | 11 | 17 | 32 |
| 2000 Survey | 2 | 5 | 3 | 18 | 46 |

Note: Bertelsen typically reported bird numbers as pairs. To facilitate comparison to 2000 where individual birds were counted, AB numbers for gulls were doubled.

Table 6. Numbers of Great Black-backed Gulls seen at AB sites. Individuals unless pairs (p) indicated.

Antallet af Svartbage registreret i Uummannaq kommune dels af Bertelsen (AB), dels senere (p par, ellers individer).

| Site No. | AB | 1975 | 1980 | 1994 | 2000 |
|----------|----|------|------|------|------|
| 7 | 0 | – | – | – | 2 |
| 14 | 0 | – | – | 1 p | 0 |
| 19-20 | 0 | – | 0 p | 4 p | 0 |
| 21-24 | 0 | – | 1 p | 0 p | 0 |
| 25 | 0 | – | – | – | 2 |
| 26 | 0 | – | – | – | 3 |
| 32-36 | 0 | 0 | – | 1 p | 0 |
| 37 | 0 | – | – | 1 p | 0 |

Great Black-backed Gull *Larus marinus*

Bertelsen did not report specific locations for the occurrence of Great Black-backed Gulls and said they were occasional and uncommon visitors. During the 1980 aerial survey a single pair was seen while the 1994 survey located Great Black-backed Gulls at four sites (Table 6). We saw this species at three AB sites and one new location. During none of the previous surveys was this species seen at these locations. The species has primarily a low-arctic occurrence but is reported to have expanded its range northward with the modern fishery (Boertmann 1994).

Table 7. Numbers of Black-legged Kittiwakes seen at AB sites. Individuals unless pairs (p) indicated.

Antallet af Rider registreret i Uummannaq kommune dels af Bertelsen (AB), dels senere (p par, ellers individer). Kun Bertelsen-lokaliteter (med eller uden arten på Bertelsens tid) er betragtet.

| Site No. | AB | 1949 | 1975 | 1980 | 1984 | 1994 | 2000 |
|----------|---------|---------|-------|------|------|------|--------|
| 12 | 0 p | – | – | – | – | – | 40 |
| 48 | 50 p | – | – | – | – | – | 0 |
| 55 | 500 p | – | – | – | – | – | 0 |
| 59 | 40 p | – | – | – | – | – | 0 |
| 84 | 10000 p | 50000 p | – | – | 1500 | – | 0 |
| 86 | 50 p | – | – | – | – | – | 0 |
| 92 | 100 p | – | – | – | – | 0 | 0 |
| 93 | 200 p | – | – | 0 | – | 0 | 0 |
| 96 | 100 p | – | – | – | 0 | – | 0 |
| 103 | 200 p | – | – | – | – | – | 0 |
| 112 | 300 p | – | – | – | 0 | – | 0 |
| 114 | 200 p | 700 p | – | – | 0 | 0 | 0 |
| 121 | 3000 p | 0 p | – | – | 0 | 0 | 0 |
| 123 | 2000 p | 500 p | – | – | 0 | 0 | 0 |
| 124 | 100 p | 95 p | 0 p | – | 0 | 0 | 0 |
| 126 | 200 p | – | – | – | – | – | 0 |
| 128 | 25000 p | 10000 p | 800 p | – | 0 | 0 | 0 |
| 139 | 200 p | – | – | – | – | – | 0 |
| 142 | 200 p | – | – | – | – | – | 0 |
| 144 | 50 p | – | – | – | – | – | 0 |
| 148 | 0 p | – | – | – | – | – | 4 |
| 149 | 50 p | – | – | – | – | – | 0 |
| 150 | 20 p | – | – | – | – | – | 0 |
| 152 | 300 p | – | – | – | – | – | 0 |
| 153 | 10 p | – | – | – | – | – | 0 |
| 154 | 400 p | – | – | – | – | – | 4 |
| 156 | 200 p | – | – | – | – | – | 0 |
| 157 | 30 p | – | – | – | – | – | 0 |
| 161 | 500 p | 50 p | – | – | 60 | 132 | c. 300 |
| 169 | 0 p | – | – | – | – | – | 8 |
| 171 | 0 p | – | – | – | – | 56 | c. 125 |
| 200 | 0 p | – | – | – | – | 500 | c. 350 |

Table 8. Arctic Tern colonies at AB tern sites. Number of sites of different size categories. *Antal terne-kolonier af forskellig størrelse, dels på Bertelsens tid, dels i 1994 (DMU v. D. Boertmann) og i 2000 under forfatterens besøg. Kun Bertelsen-lokaliteter er betragtet.*

| | Size of tern colony (birds) | | | | | |
|-------------|-----------------------------|---------|---------|---------|---------|------|
| | >1000 | 999-500 | 499-300 | 299-200 | 199-100 | <100 |
| Bertelsen | 4 | 2 | 3 | 4 | 1 | 3 |
| 1994 Survey | 1 | 2 | – | – | – | 1 |
| 2000 Survey | 1 | 0 | 0 | 0 | 1 | 8 |

Note: Bertelsen typically reported bird numbers as pairs. To facilitate comparison to 2000 where individual birds were counted, AB numbers for terns were doubled.

Black-legged Kittiwake *Rissa tridactyla*

Bertelsen reported 27 locations for Black-legged Kittiwakes and said they were widely distributed and in very significant numbers. Another five sites were reported with Black-legged Kittiwakes present in later surveys (Table 7). We located five additional previously unreported locations occupied by 8 to 150 kittiwakes (mean 55). Of the 27 AB Black-legged Kittiwake sites, the number of Black-legged Kittiwakes decreased at all locations and almost disappeared completely (Table 3). From a total estimated population of about 268 000 reported by Bertelsen in the Uummannaq area, we found about 1100 birds in 2000. Black-legged Kittiwakes only existed at the most remote locations from human settlements.

Arctic Tern *Sterna paradisaea*

Bertelsen reported Arctic Terns at 17 locations and said they were common nesters at about 10. We found terns present at 12 of those sites and an additional four locations, two AB previously non-Arctic Tern sites and two unreported locations (Table 3). At AB Arctic Tern sites, the number of birds decreased at 16 sites, increased at zero sites, and remained about the same at one location (Table 8). Fewer than 100 birds were seen at most of the remaining occupied Arctic Tern sites. Based on observations made in 1994 compared to 2000, the decline in Arctic Tern numbers and sites may be a recent occurrence (Table 9). Of the seven sites surveyed in 1994, when compared with AB bird numbers, sites decreased from 200 pairs to zero, 100 pairs to 15 birds, and 500 pairs to 500 birds, but bird numbers at other sites have remained the same or increased (Table 9). Bertelsen reported about 11 500 terns in the district while we observed fewer than one-third that number at the same locations. The principal causes for this decrease, we believe, are local people placing their sled dogs on islands

during the time there is no sea ice, and collection of eggs by them.

Thick-billed Murre *Uria lomvia*

Bertelsen reported between 20 to 500 000 pairs of Thick-billed Murres at eight locations. In a 1949 survey of six of these sites, Thick-billed Murres remained at four (Table 10). The decline continued, and by 1984 when the eight sites were surveyed, Thick-billed Murres were present at only one location at dramatically low numbers. No Thick-billed Murres were seen at the sites in 1994 or during our 2000 survey.

Table 9. Numbers of Arctic Terns seen at AB sites. Individuals unless pairs (p) indicated.

Antallet af Havterner registreret i Uummannaq kommune dels af Bertelsen (AB), dels senere (p par, ellers individer). Kun Bertelsen-lokaliteter (med eller uden arten på Bertelsens tid) er betragtet.

| Site No. | AB | 1975 | 1980 | 1994 | 2000 |
|----------|--------|------|------|------|-------|
| 7 | 1000 p | – | – | – | 0 |
| 14 | 200 p | – | – | 0 | 20-50 |
| 19 | 50 p | – | – | – | 20-50 |
| 20 | 100 p | – | 500 | 15 | 20-50 |
| 21 | 300 p | – | – | – | <20 |
| 22 | 500 p | – | – | – | 20-50 |
| 23 | 30 p | – | – | – | 20-50 |
| 24 | 200 p | – | 0 | 600 | 20-50 |
| 100 | 30 p | – | – | – | 0 |
| 101 | 30 p | – | – | – | 0 |
| 118 | 100 p | – | – | 0 | 0 |
| 119 | 100 p | – | – | – | 0 |
| 158 | 200 p | – | – | – | 50 |
| 179 | 300 p | – | – | – | >100 |
| 180 | 0 p | – | – | – | <20 |
| 179-180 | – | – | – | 400 | – |
| 194 | 100 p | – | – | – | 0 |
| 196 | 500 p | – | – | 500 | 0 |
| 207 | 0 p | – | – | 0 | 100s |
| 208 | 2000 p | 0 | – | 4000 | >1000 |

Razorbill *Alca torda*

Bertelsen reported Razorbills at 17 locations with between four and 30 pairs. Five more locations were

Table 10. Numbers of Thick-billed Murres seen at AB sites. None were present at any site during later visits. Individuals unless pairs (p) indicated.

Antallet af Polarlomvier registreret i Uummannaq kommune dels af Bertelsen (AB), dels senere (p par, ellers individer). Ingen er noteret ved besøg efter 1984.

| Site No. | AB | 1949 | 1975 | 1984 |
|----------|----------|-----------------------|------|------------------|
| 84 | 500 p | 50 | – | 0 |
| 93 | 20 p | – | – | 0 |
| 114 | 100 p | 0 | – | 0 |
| 121 | 1000 p | 25 | – | 0 |
| 123 | 3000 p | 100 | – | 0 |
| 124 | 200 p | 0 | 0 | 0 |
| 128 | 500000 p | 130000 p ¹ | 4500 | 125 ² |
| 161 | 200 p | – | 0 | 0 |

¹ Estimated to represent 150 000 pairs (Salomonsen 1950) because fledging had begun.

² 100-150 non-breeding birds on the sea below the cliff.

discovered with Razorbills in later surveys (Table 3). Surveys at 13 of the 22 locations in 1994 found birds at only three of these sites. In 2000 we located Razorbills at three different locations, none of which had been surveyed since Bertelsen's time. No Razorbills were seen at the 1994 reported sites. For all AB sites, Razorbills greatly declined (Table 11).

Black Guillemot *Cephus grylle*

Bertelsen reported 107 locations with Black Guillemots present. In later surveys another 25 sites were reported (Table 3). During the 2000 survey, 57% of the locations reported during all previous surveys had Black Guillemots present while 50% of the sites reported by Bertelsen had Black Guillemots. Comparing AB Black Guillemot sites to our 2000 bird numbers, the numbers of Black Guillemots increased at three locations, decreased at 86, and remained about the same at 17 sites (Table 12). The largest change was at locations with >100 birds reported. Bertelsen reported about 15 000 Black Guillemots within the district. We counted about 2100 or 14% of his total.

Table 11. Numbers of Razorbills at AB sites. Individuals unless pairs (p) indicated.

Antallet af Alke registreret i Uummannaq kommune dels af Bertelsen (AB), dels senere (p par, ellers individer). Kun Bertelsen-lokaliteter (med eller uden arten på Bertelsens tid) er betragtet.

| Site No. | AB | 1949 | 1975 | 1980 | 1984 | 1994 | 1998 | 2000 |
|----------|------|-------|------|------|------|------|------|-------|
| 7 | 0 p | – | – | – | – | – | – | 15-20 |
| 9 | 10 p | – | – | – | – | – | – | 0 |
| 11 | 30 p | – | – | – | – | – | – | 3 |
| 12 | 0 p | – | – | – | – | – | – | 6 |
| 84 | 20 p | 1 p | – | – | – | 0 | – | 0 |
| 86-87 | 0 p | 2 p | 0 p | – | – | 0 | – | 0 |
| 93 | 3 p | – | – | 0 | – | 0 | – | 0 |
| 96 | 20 p | – | – | – | 0 | – | – | 0 |
| 112 | 10 p | – | – | – | 0 | – | – | 0 |
| 114 | 20 p | 30 p | – | – | 0 | – | – | 0 |
| 121 | 10 p | 0 p | – | – | 0 | 0 | – | 0 |
| 123 | 30 p | 50 p | – | – | 0 | 0 | – | 0 |
| 124 | 20 p | 250 p | 10 p | – | 0 | 0 | – | 0 |
| 128 | 20 p | 3 p | 4 p | – | 0 | 0 | – | 0 |
| 144 | 4 p | – | – | – | – | – | – | 0 |
| 156 | 4 p | – | – | – | – | – | – | 0 |
| 161 | 20 p | 4 p | – | – | 13 | 3 | – | 0 |
| 171 | 0 p | – | – | – | – | 4 | – | 0 |
| 172 | 0 p | – | – | – | – | 9 | – | 0 |
| 175 | 6 p | – | – | – | – | 0 | – | 0 |
| 205 | 5 p | – | – | – | – | 0 | 0 | 0 |
| 207 | 4 p | – | – | – | – | 0 | – | 0 |

Table 12. Black Guillemot colonies at AB guillemot sites. Number of sites of different size categories. *Antal Tejste-kolonier af forskellig størrelse, dels på Bertelsens tid, dels i 2000 under forfatterens besøg. Kun Bertelsen-lokaliteter er betragtet.*

| | Size of guillemot colony (birds) | | | | |
|-------------|----------------------------------|---------|---------|-------|-----|
| | >300 | 299-200 | 199-100 | 99-50 | <50 |
| Bertelsen | 18 | 16 | 18 | 8 | 46 |
| 2000 Survey | 1 | 1 | 3 | 5 | 53 |

Note: Bertelsen typically reported bird numbers as pairs. To facilitate comparison to 2000 where individual birds were counted, AB numbers for guillemots were doubled.

Atlantic Puffin *Fratercula arctica*

Bertelsen reported three pairs of puffins at a single site in his survey area and said they were uncommon. The site was rechecked in 1994; no Atlantic Puffins were seen, but a single bird was located at another AB site. We checked both of these locations in 2000 and saw no Atlantic Puffins.

Common Raven *Corvus corax*

Bertelsen reported Common Ravens at 41 locations. We found Common Ravens present at nine of those locations and saw Common Ravens at 14 additional AB sites for a total of 55 AB sites that Common Ravens have been known to use for all years (Table 3). Since Common Ravens nest on cliffs, build stick nests, and typically have fecal-marked roosts (whitewash), even when birds are not seen it is possible to determine presence within the last few years. Using birds, nests, and whitewash as an indication of presence, for all AB sites, 37 showed recent use by Common Ravens (Table 13). Additionally, 10 non-AB sites were located at which Common Ravens were seen for a total of 47 locations of current or recent presence by Common Ravens. Bertelsen reported that at most places there were single pairs of Common Ravens breeding but at seabird cliffs there might be up to 30 pairs, and he estimated the number of pairs at between 100 and 200. We did see 16 Common Ravens at a single location (Site No. 58), post fledging, but could not determine why they were there as no obvious food source or other attraction was present.

Discussion

Ignoring the magnitude of change in number of individuals at bird sites, we first examined only the change over time in the total number of occupied sites for 10 species emphasized by Bertelsen and for which quantifiable numbers exist;

see Table 3. As stated before and for this analysis, because of confusion differentiating between Glaucous and Iceland Gulls, we considered both species as one. Comparing sites reported by Bertelsen and the same sites surveyed in 2000 for the species Bertelsen reported at those locations (AB species specific sites), we found that the number of occupied sites had decreased for nine species (Table 14). Considering other AB sites where these 10 species were reported in surveys prior to 2000, the number of occupied sites increased for one species, decreased for four, and remained the same for five. During the 2000 survey, birds were found at a number of non-AB locations. Assuming pairs and colonial nesting species may shift breeding sites over time, we added these newly reported sites to the AB sites and compared total number of sites for each of the 10 species reported by Bertelsen and during following surveys to the number discovered in 2000 within Bertelsen's study area. In this case we found an increase for zero species, decreases for eight species, and two species for which there was no change.

Comparing change not in numbers of sites per species, but instead the total population numbers of birds present for each of the same 10 species, one species has probably remained about the same or possibly increased slightly (Northern Fulmar), and

Table 13. AB sites (Raven or non-Raven) with indication of recent Common Raven nesting recorded during the 2000 Survey.

| | |
|-----------------|----|
| Ravens seen | 23 |
| Stick nest only | 6 |
| Whitewash only | 8 |
| Total sites | 37 |

Table 14. Summary of status in number of sites occupied by the 10 species of Table 3. For three groups of sites (AB species specific, other AB, and all AB and non-AB sites) is shown the number of species that increased, decreased, or remained the same, in terms of number of sites occupied.

Sammenfatning af Tabel 3. De tre rækker viser antallet af arter, der hhv. var gået frem, gået tilbage, eller hvor ingen markant ændring sås, ved sammenligning mellem 2000 og tidligere. Frem- eller tilbagegang alene vurderet ud fra udviklingen i antal lokaliteter med arten. Søjljerne viser Bertelsen-lokaliteter 1) med og 2) uden pågældende art på Bertelsens tid, samt alle lokaliteter under ét, incl. lokaliteter ikke kendt af Bertelsen.

| Change in No. of sites with species | Sites considered | | |
|-------------------------------------|---------------------|----------|---------------|
| | AB species specific | Other AB | AB and non-AB |
| Increased | – | 1 | 0 |
| Decreased | 9 | 4 | 8 |
| Remained the same | 1 | 5 | 2 |

nine have decreased. There was an apparent increase in numbers of breeding sites and total population for two species within the Bertelsen survey area, the Great Cormorant and Great Black-backed Gull.

In the early 20th Century, and presumably before, many avian species flourished in the Uummanaq area. This was particularly true for the Thick-billed Murre, Black-legged Kittiwake, and Northern Fulmar, as large numbers of each were described by Bertelsen and seen in 1949 by F. Salomonsen (1967). Black Guillemots, Arctic Terns, Common Eiders, Iceland and Glaucous Gulls, and Common Ravens were also common (Bertelsen 1921). Today the Thick-billed Murre is totally extirpated and Black-legged Kittiwake numbers are below 0.5% of what existed and can only be found at the maximum distance from humans within the survey area. Only the Northern Fulmar exists in very large numbers, and Black Guillemots, Iceland and Glaucous Gulls, and Common Ravens can still be considered common. The only species that have increased since Bertelsen's time are Great Cormorants and Great Black-backed Gulls.

Because of the difficulty in counting Northern Fulmar numbers, it is not possible to be certain about change in numbers over time, but there has been no obvious decrease. In the North Sea Northern Fulmars and Black-legged Kittiwakes, along with several species of *Larus*, have been shown to benefit by consuming offal and non-target fish resulting from commercial fishing (Camphuysen et al. 1995). We observed large numbers of Northern Fulmars feeding on waste dumped in the Uummanaq District from commercial fishing boats and fish processing plants. Glaucous Gulls were also

present. This abundant food source became available in the 1980s (Berthelsen et al. 1993) with the greatly expanded fishing in the district, and scavenging species should have benefited. Prior to this additional food source Black-legged Kittiwakes dramatically declined (Table 9), and human persecution probably prevented any positive population change that might have resulted. Great Black-backed Gulls are more common now than in Bertelsen's time and are known to feed on waste from fishing. However, the locations where this species was seen are not close to regular fishing operations, and although an increase has occurred, the bird is still uncommon throughout most of the area.

There appears to be no relationship between the increase in Great Cormorants and fishing waste. Cormorants do not typically feed on discards and the population is in the southern portion of the survey area where large-scale commercial fishing and fish processing are limited. Boertmann et al. (1996) reported a population expansion in West Greenland and believed it was a result of reduced hunting of cormorants in recent decades. Cormorants had been exterminated from much of southwestern Greenland at the beginning of the 20th century (Salomonsen 1967).

Climate change may be a factor affecting some avian species (Burton 1995). An ameliorating climate could result in a northern range expansion and increased density of typically more southern breeding species. Simultaneously, a warming trend could result in a retreat of certain higher latitude species northward. Published climate change information for Greenland is inconclusive and does not support this idea. Hanna (2002) analyzed the meteorological data for the Kangerlussuaq area from 1976 to 1999 and reported no significant change in either temperature or precipitation during that period, and a cooling off in southern Greenland since 1958 (Hanna & Cappelen 2002). All of these analyses are from several hundred kilometers to the south of Uummanaq, and climatic variation may differ to the north. However, Stern & Heide-Jørgensen (2003) found a significant increase in sea ice between 1953 and 2001 for Baffin Bay and Davis Strait. Measurements were from three overlapping study regions centered on Disko Bay. Their findings would seem to suggest at least no identifiable amelioration of temperate is likely during the past 50 years in the Uummanaq District.

Why have avian populations declined in the Uummannaq District? We believe the declines are all human caused, although the exact reason varies somewhat among species. The Thick-billed Murre was one of the most important avian species for hunters in Greenland (Kapel & Petersen 1982). Adults were shot throughout the year (Kampp et al. 1994). Hundreds of thousands of birds were also caught annually in salmon drift nets in the 1960s off West Greenland until 1975 when fish regulations were changed (Tull et al. 1972, Christensen & Lear 1977). Falk & Kampp (1997) reported the main reason for Thick-billed Murre declines to be summer hunting, which was legal until 1988. The impact was not only from direct collection of eggs, young, and killing of breeders, but the repeated disturbance at the breeding colonies and the additive loss of eggs and young thrown from cliffs by the startled fleeing breeders. A local resident reported that at the largest Thick-billed Murre breeding site in the Uummannaq District, in the 1960s coastal tourist ships used to blow their horns at the cliff to see the birds fly and speculated it may have caused the Thick-billed Murres to abandon the site (Gallagher 2001). Whatever the cause, the result is dramatic. The excrement-stained cliffs still stand, but not a single bird remains where hundreds of thousands once thrived.

Next in importance to hunters are Common Eiders, and although they have been protected during the summer since 1924, the regulations are reportedly not generally observed (Boertmann et al. 1996). Eggs are also collected. Shooting and egg collecting combined with the practice of placing sled dogs on islands, many of which were formerly used by Common Eiders for breeding, have probably combined to produce the decline in Common Eiders in the Uummannaq area. Although there were still about half the total number of sites with Common Eiders as reported by Bertelsen, they were all at the maximum distance from humans and on the periphery of the area.

Black-legged Kittiwakes are also hunted in Greenland, and eggs and chicks are collected (Boertmann et al. 1996). Black-legged Kittiwakes and Thick-billed Murres frequently nest in mixed colonies. Unlike Thick-billed Murres, Black-legged Kittiwakes do build nests, which may reduce the proportion of eggs and young that are lost when adults are startled by gunfire. The only Black-legged Kittiwakes seen near human population centers were in Uummannaq harbour where three recently killed birds had been shoved into the corner of a

boat windshield and remained for over a week. The former nest sites are easily identified by abandoned nests, which remain in very large numbers and various states of condition.

Both Glaucous and Iceland Gull eggs and nestlings are opportunistically collected, and juveniles are shot (Boertmann et al. 1996). Eating adults of these species is not common. Both species may have benefited in the Uummannaq District from fishing waste as a food source. For Glaucous Gulls which also regularly prey on other birds, this food source may have compensated for the reduced prey (eggs and young) resulting from the disappearance of Thick-billed Murres and Black-legged Kittiwakes. Although it is difficult to quantify, there was a clear trend of more AB gull sites abandoned and/or fewer gulls present near the more human-populated portion of the survey area. One-third of the breeding sites reported by Bertelsen were no longer found to have gulls, but when the more recently discovered sites are added, the total number of sites is the same, but the total number of birds present appears to have declined.

The reduced prey has potentially affected other predatory avian species, both opportunistic (skuas and Ravens) and specialist (Gyrfalcons). We saw no skuas at AB sites and only a single bird during the entire survey. Two of the AB sites were in locations where skuas are likely to have preyed on Common Eider young, and one site was near Thick-billed Murre and Black-legged Kittiwake breeding sites where their young could have been taken. No clear correlation can be made. Bertelsen reported up to 30 pairs of Common Ravens breeding at a seabird cliff and between 100 to 200 pairs annually breeding within the survey area. We suspect the 30 pairs may have been individuals or larger groupings of Common Ravens responding to a possible food source or other factor as the species is not known to breed colonially. We saw Common Ravens at only 22% of the sites where Bertelsen reported them ($n = 41$), but saw birds, Common Raven nests, and/or whitewash suggesting recent use at a total of 47 locations. There seems little doubt that the decline in seabirds and Common Eiders has affected the Common Raven population, but as opportunistic feeders they have also probably taken advantage of edible waste associated with humans. Common Ravens are frequently shot near hunting camps and other locations where meat is dried, but they are seldom eaten. Data from a single survey of the Common Raven population are probably insufficient to predict possible change in numbers accurately.

Gyrfalcons may not breed when Rock Ptarmigan and hare populations are low, and it is unlikely all known nest sites would be occupied in a year (Cade 1960, Burnham & Mattox 1984). In the Kangerlussuaq area in 1998 through 2003, 19% (range 10-30%) of the known Gyrfalcon nest sites were occupied (Burnham 2003). Only 11% of the Gyrfalcon eyries reported by Bertelsen ($n = 28$) were occupied in 2000, and no falcons were seen at reported nest sites near former seabird colonies or where humans frequent, although whitewash of unknown age remained at several previous sites. We saw Gyrfalcons at only four other locations during the survey for a total of seven occupied sites. Since Gyrfalcons are not scavengers but capture only live prey (birds and small terrestrial mammals), there is no likely potential benefit for that species from the increased human activities in the Uummannaq District. Although falcons are not commonly eaten they are shot and frequently considered to compete for wildlife hunted by humans. Peregrine Falcons are less likely to have been negatively affected by declines in seabird populations because most of their diet is small passerines (Burnham & Mattox 1984). Although only one occupied Peregrine Falcon site was located, if searches had occurred further inland in some areas additional breeding pairs likely would have been found.

Arctic Terns are seldom shot for food although eggs are collected, and that practice is possibly increasing and may have contributed to the decline in the Uummannaq District (Boertmann et al. 1996). We located Arctic Terns only at the periphery of the area and far from humans. Four of 17 islands where Bertelsen reported the species breeding had free-ranging dogs and/or tents or cabins and no Arctic Terns in 2000.

Black Guillemots are widely dispersed throughout the area, and it is difficult to know how much they have declined. We saw Black Guillemots at only about half of the sites where Bertelsen reported them and at 22 of 25 sites reported later, but before 2000. We observed Black Guillemots at 32 unreported locations and at 75 AB sites for a total of 107, the same number of sites as Bertelsen reported. Comparing change in number of Black Guillemots reported (birds present) by Bertelsen to what we found at his locations, only those where he reported <100 birds remained about the same. The number of sites with >100 guillemots declined. Black Guillemots are hunted in Greenland, juveniles in particular (Boertmann et al. 1996). Since they nest in cavities and small colonies they are far less vulnerable to collection of eggs, young,

and shooting. Still, near human population centers Black Guillemots were few, and larger numbers of birds were far away.

All Razorbills we saw were far from human settlements and at the periphery of the survey area. Bertelsen reported 17 locations with Razorbills, and five more were reported since then by others, but we observed them at only three of these locations. There seems no doubt the population has declined. Boertmann et al. (1996) reported that Razorbills are shot opportunistically during Black Guillemot hunting.

All waterfowl and seabirds are no doubt opportunistically hunted. Improved and affordable firearms and transportation (powerboats) have probably affected those species as they have others (Evans 1984, Hansen 2002). Greenland has also experienced a four-fold human population increase since Bertelsen began collecting his information.

There seems little doubt that direct human persecution and resulting related influences are the primary causes for the decline in both number of avian species and their density in the Bertelsen study area. A similar situation has been reported for wildlife in other human-dominated areas in Greenland (Hansen 2002). Unless additional conservation measures are implemented and enforced, declines in avian species in the Uummannaq District are likely to continue. Although the rugged scenic beauty of Greenland remains, it is much poorer without the magnitude of birdlife that once thrived there.

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Resumé**Fuglelivet i Uummannaq fjord: en sammenligning mellem årene 1905-20 og 2000**

Lægen Alfred Bertelsen (1921) beskrev 210 lokaliteter for 32 ynglende fuglearter i hvad der stort set svarer til vore dages Uummannaq kommune i Grønland. Siden er dele af området enkelte år besøgt af ornitologer, og i 2000 dækkede forfatterne alle de kystnære områder, incl. 207 af Bertelsens lokaliteter.

For 10 arter, der på Bertelsens tid var almindelige, var bestanden på hans lokaliteter, og antallet af disse, uændret for én (Mallebuk), men de øvrige ni arter var gået tilbage. Indregnes alle lokaliteter (ikke blot Bertelsens), hvor ynglende fugle fandtes i 2000, var antallet af lokaliteter uændret for to og reduceret for otte arter, mens bestandsstørrelsen var uændret eller lidt forøget for én art (igen Mallebuk) og reduceret for ni. Arterne med de mest dramatiske bestandsnedgange var Polarlomvie (fra 100000'er af fugle til ingen), Ride (268000 til 1100 fugle), Alk (fra 17 til 3 lokaliteter), Ederfugl (26 til 16 lokaliteter), og Jagtfalk (28 til 7 lokaliteter). Skarv og Svartbag var de eneste arter, der med sikkerhed var gået frem, henholdsvis fra 1 til 12 og fra 0 til 4 lokaliteter. De udbredte og omfattende bestandsnedgange skyldes utvivlsomt menneskelig aktivitet, især et alt for højt jagttryk, der direkte har reduceret/udryddet nogle bestande og fjernet fødegrundlaget for andre. Dertil kommer uhenigtsmæssig arealudnyttelse, fx den lokale skik at lade slædehunde oversomre på småøer, ofte sådanne der tidligere har huset ynglende Ederfugle, terner eller andre arter.

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Corresponding author

William Burnham (burnham@peregrinefund.org)
The Peregrine Fund, 5668 West Flying Hawk Lane, Boise, Idaho 83709, USA