# Breeding survey of Common Eiders along the west coast of Ungava Bay, in summer 2000, and a supplement on other nesting aquatic birds

**Gilles Falardeau, Jean-François Rail, Scott Gilliland, and Jean-Pierre L. Savard**

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Front-cover: eider nest, Ungava Bay, June 2000. Photo by Gilles Falardeau.

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# ABSTRACT

Concerns have been raised about the status of northern populations of Common Eider (*Somateria mollissima*) following recently reported declines. The *borealis* subspecies breeds in the eastern Canadian Arctic and is heavily harvested in winter in southwest Greenland. Baseline surveys of eider colonies were conducted in 1980 in Ungava Bay, northern Québec. In 2000, we resurveyed four archipelagos along the west coast of Ungava Bay to determine population trends for the 1980-2000 period and to produce population estimates for each archipelago.

In 2000, we estimated a total of 10,534 eider nests distributed as follows: 4010 on Gyrfalcon, 2403 on Payne, 3500 on Plover, and 621 on Eider Islands. The population estimates on Gyrfalcon and Payne Islands were similar to 1980, but 79% higher for Plover Islands (although not statistically significant), and 84% lower for Eider Islands (statistically significant). However, paired comparisons, made only with islands surveyed both in 1980 and 2000, show an important and significant increase on Gyrfalcon (+95%), Payne (+296%), and Plover (+103%) archipelagos, and a large and significant decline on Eider Islands (-79%).

On Gyrfalcon, Payne and Plover Islands, 80% of the increase observed with paired comparisons comes from only a few islands where the number of eider nests was sometimes more than ten times higher. Meanwhile, many colonies also showed a decrease in the number of nests reported. Changes have occurred in the distribution of eiders as they concentrated on some islands at the expense of others, especially in Gyrfalcon Islands. Paired comparisons probably reflect more those changes than a population increase. However, the interpretation of the trends is made difficult by differences observed in timing of surveys with nesting chronology between years and archipelagos and even within some archipelagos. It is also possible that the 2000 population estimates underestimated the real population levels. Therefore, we cannot completely ignore the possibility that nesting populations may have increased on those archipelagos, as believed by some Inuit met during field work and indicated by paired comparisons. We have indications that many eiders failed to breed on Eider Islands in 2000, leading the ground nest counts to underestimate the real population level. However, the 2000 count is so low that an important decrease probably has occurred. Besides, the local Inuit community believes that eiders have declined in this archipelago. Another survey should be conducted soon to confirm this trend.

The observed clutch sizes were slightly below those from other *S. m. borealis* studies, and considerably lower than *S. m. sedenteria* which is known to lay larger clutches. Except for Eider archipelago, the breeding phenology was also comparable to those reported in other studies on northern Canadian eider populations.

The aerial survey method tested yielded interesting results, but needs to be refined. A mixed protocol combining complete aerial coverage of the archipelagos with ground counts on a sample of islands could yield interesting results for future surveys.

Our results also indicate the need for a better understanding of the breeding ecology of eiders in Ungava Bay and for the development of adequate survey and monitoring techniques. Because of the importance of eiders for Inuit communities, and the harvest of eiders in Greenland and Atlantic Canada in winter, we also need to better understand the affiliations between breeding and wintering areas.

## RÉSUMÉ

Le statut des populations nordiques d'Eider à duvet (*Somateria mollissima*) est récemment devenu préoccupant suite à des déclins signalés dernièrement chez certaines de ces populations. La sous-espèce *borealis* niche dans l'est de l'Arctique canadien et est récoltée en grands nombres en hiver au sud-ouest du Groenland. En 1980, des inventaires effectués dans des colonies de la baie d'Ungava, au nord du Québec, ont permis d'y déterminer le niveau des populations nicheuses. En 2000, nous avons à nouveau fait l'inventaire de quatre importants archipels de la côte ouest de la baie d'Ungava pour déterminer les tendances des populations depuis 1980 et obtenir de nouvelles estimations de population pour chaque archipel.

En 2000, l'estimation de population globale est de 10 534 couples nicheurs distribués ainsi : 4010 aux îles Gyrfalcon, 2403 aux îles Payne, 3500 aux îles Plover et 621 aux îles Eider. Les populations estimées aux îles Gyrfalcon et Payne étaient similaires à celles de 1980, mais 79% plus élevée aux îles Plover (hausse non significative statistiquement) et en baisse significative de 84% aux îles Eider. Par contre, les comparaisons par paires faites seulement avec les îles inventoriées à la fois en 1980 et 2000 montrent une hausse importante et significative aux îles Gyrfalcon (+95%), aux îles Payne (+296%) et aux îles Plover (+103%), et une importante baisse significative aux îles Eider (-79%).

Sur les îles Gyrfalcon, Payne et Plover, environ 80% de l'augmentation notée avec les comparaisons par paires provient d'une poignée îles où le nombre de nids d'eiders a plus que décuplé dans certains cas. Pendant la même période, il y a eu une diminution du nombre de nids sur plusieurs autres îles. Il s'est produit des changements dans la distribution des eiders entre les îles et il est probable que les comparaisons par paires reflètent davantage ces changements qu'une augmentation réelle. Cependant, des différences dans l'état d'avancement de la nidification entre les années sur certains archipels – et même à l'intérieur de certains archipels – lors des inventaires rendent plus difficiles l'interprétation des tendances observées. Il est aussi possible que les estimations de population de l'année 2000 soient sous les niveaux réels de population. On ne peut donc rejeter complètement la possibilité qu'il y ait vraiment eu une augmentation du nombre d'eiders nicheurs sur les archipels Gyrfalcon, Payne et Plover, tel que nous l'ont dit certains Inuits rencontrés sur le terrain et comme l'indiquent les comparaisons par paires. Nous avons des indications qu'une proportion importante d'eiders n'a pu nicher aux îles Eider en 2000 et que le décompte du nombre de nids sous-estimerait le niveau réel de la population de cet archipel. Cependant, le décompte de 2000 est si faible qu'il est quand même très probable qu'il y ait eu une véritable et importante baisse. Les Inuits de la région croient d'ailleurs qu'il y a une baisse du nombre d'eiders nicheurs dans cet archipel. Un autre inventaire serait cependant nécessaire le plus tôt possible pour confirmer cette tendance.

Les tailles moyennes des couvées étaient légèrement inférieures à celles rapportées dans d'autres études de la sous-espèce *S. m. borealis*, et encore plus faibles que celles de la sous-espèce *S. m. sedentaria* qui produit de plus grandes couvées. À l'exception des îles Eider, la chronologie de la reproduction était aussi comparable à celles signalées par d'autres études portant sur les populations d'eiders nordiques au Canada.

La méthode d'inventaire aérien mise à l'essai a donné des résultats intéressants, mais demande encore à être raffinée. Un protocole mixte qui comprendrait des inventaires aériens complets des archipels combinés à des inventaires au sol d'un échantillon pourrait constituer une avenue intéressante pour de futurs inventaires.

Notre étude démontre la nécessité d'acquérir une meilleure connaissance de l'écologie de reproduction des eiders dans la baie d'Ungava et de développer des méthodes d'inventaire et de suivi plus précises. Étant donné l'importance des eiders pour les Inuits et l'importante récolte de ces canards au Groenland et dans les provinces Atlantiques, il serait nécessaire de mieux comprendre où hiverne exactement la population nicheuse de la baie d'Ungava.

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# INTRODUCTION

The northern subspecies of the Common Eider *Somateria mollissima borealis* nests in Ungava Bay and Hudson Strait and winters along the coast of the Gulf of St. Lawrence, Newfoundland and southwest Greenland. An aerial survey conducted in 1978 combined with ground censuses in 1980 produced an estimate of 48,700 pairs of *S. m. borealis* breeding in Ungava Bay and Québec's coast of the Hudson Strait (Chapdelaine *et al.* 1986), making it the most important known breeding concentration of northern eiders in Canadian Arctic. Eiders are of great importance to the Inuit economy and culture. Inuit harvest eggs and eider down in spring and occasionally hunt adult birds in summer and fall.

There has been concern with the status of *S. m. borealis* due to recent declines reported in Arctic eider populations of Hudson Strait, western Arctic, and Hudson Bay (Cooch 1986; Suydam *et al.* 1997; Robertson and Gilchrist 1998). Eiders are sensitive to disturbance on their breeding grounds and are also highly vulnerable to oil spills because they form large concentrations on their moulting and wintering grounds. Furthermore, this population is heavily harvested on its wintering grounds with a mean annual harvest estimate around 60,000 birds in Greenland and 13,000 in Newfoundland (Gilliland *et al.* submitted). There is also some indication of a decline in wintering populations of Newfoundland (Gilliland *et al.* submitted).

Eiders breeding in Ungava Bay have been surveyed only once, in 1980 (Chapdelaine *et al.* 1986). Therefore, there was no trend recorded for this population. In 2000, three CWS regions (Prairie and Northern, Atlantic, and Québec) and the Inuit community, through the Makivik Corporation, collaborated in a second survey of the nesting eiders in Ungava Bay to determine the population trend and status of eiders breeding in western Ungava Bay, and determine if management adjustments (through changes in hunting regulations, for example) would be necessary to help the population recover if a decline was to be found.

Our objectives were: 1) to determine the trend of the eider breeding population of four archipelagos of the western side of Ungava Bay; 2) to determine the size of this breeding population; 3) to evaluate aerial survey as an alternate survey technique; and 4) to establish a baseline for future monitoring and trend assessment.

# METHODS

## STUDY AREA

Figure 1 shows the location of the archipelagos surveyed on the west coast of Ungava Bay. The Ungava peninsula is located in the low Arctic ecoclimatic region (Groupe de travail sur les écorégions 1989) and is above the tree line, but south of the Arctic Circle. The climate is cold and dry compared to southern Québec. In Kuujjuaq, at the southern end of the Bay, daily July maximum and minimum temperature average 17 and 6º C, and mean annual precipitation is 504 mm. Quaqtaq, located at the northwestern tip of Ungava Bay, is even colder and dryer with mean daily maximum and minimum temperature around 10 and 2º C in July, and mean annual precipitation of 334 mm (Environment Canada 1982).

Geologically, the western shore of Ungava Bay is located in the Churchill Province and the subsoil is mostly characterized by granite, gneiss, and migmatite from the Archean era (Gouvernement du Québec 1983). The bare and rocky shore of the islands is the result of exposure to wind and ice carried by currents. Tundra is the main vegetation type. Arctic Willow (*Salix arctica*), Black Crowberry (*Empetrum nigrum*), Bigelow's Sedge (*Carex Bigelowii*), lichens (*Alectoria, orchreuleuca, A. nigricans, Cetraria cuculaga, C. islandica*), and mosses (*Dicranum elongatum, Polytrichum commune* var. *Yukonse*) are the dominant species in this region.

An important hydrographical characteristic of Ungava Bay is the tidal amplitude reaching maximums of 14 to 16 m at the mouth of the Koksoak and Leaf River (Dunbar 1966). High tides cause strong tidal currents between islands separated by narrow channels.

The archipelagos surveyed are different in size and shape. The Gyrfalcon Islands form the largest archipelago with 204 clustered islands (figure 2). Payne Islands is a smaller archipelago composed of 73 islands dispersed along the mainland shore (figure 3). Plover Islands is also a smaller archipelago with 65 islands dispersed over a large area (figure 4). Finally, Eider Islands form a large archipelago of 158 islands (figure 5) gathered over a smaller area than Gyrfalcon Islands.

Islands range from 0.07 to 250 ha in size, but most are small. In fact, nearly 50% are smaller than 1 ha. Gyrfalcon (median=1.27 ha) and Payne (1.25 ha) archipelagos are composed of larger islands than Plover (1.09 ha) and Eider (0.84 ha). Gyrfalcon's island no. 23 (250 ha) and Payne's islands nos. 93 (101 ha) and 10 (74 ha) are the three largest islands.

According to the Canadian Ice Service of Environment Canada, the ice starts to break up, on average, around May 22$^{nd}$ in Payne, Plover and Eider Islands areas, but only around June 7$^{th}$ in Gyrfalcon Islands area because this archipelago is located in a deeper water area. However, the two southernmost archipelagos (Gyrfalcon and Payne) normally get completely ice free around July 15$^{th}$, a week on average before Plover and Eider Islands.


Figure 1. Location of islands surveyed in Ungava Bay

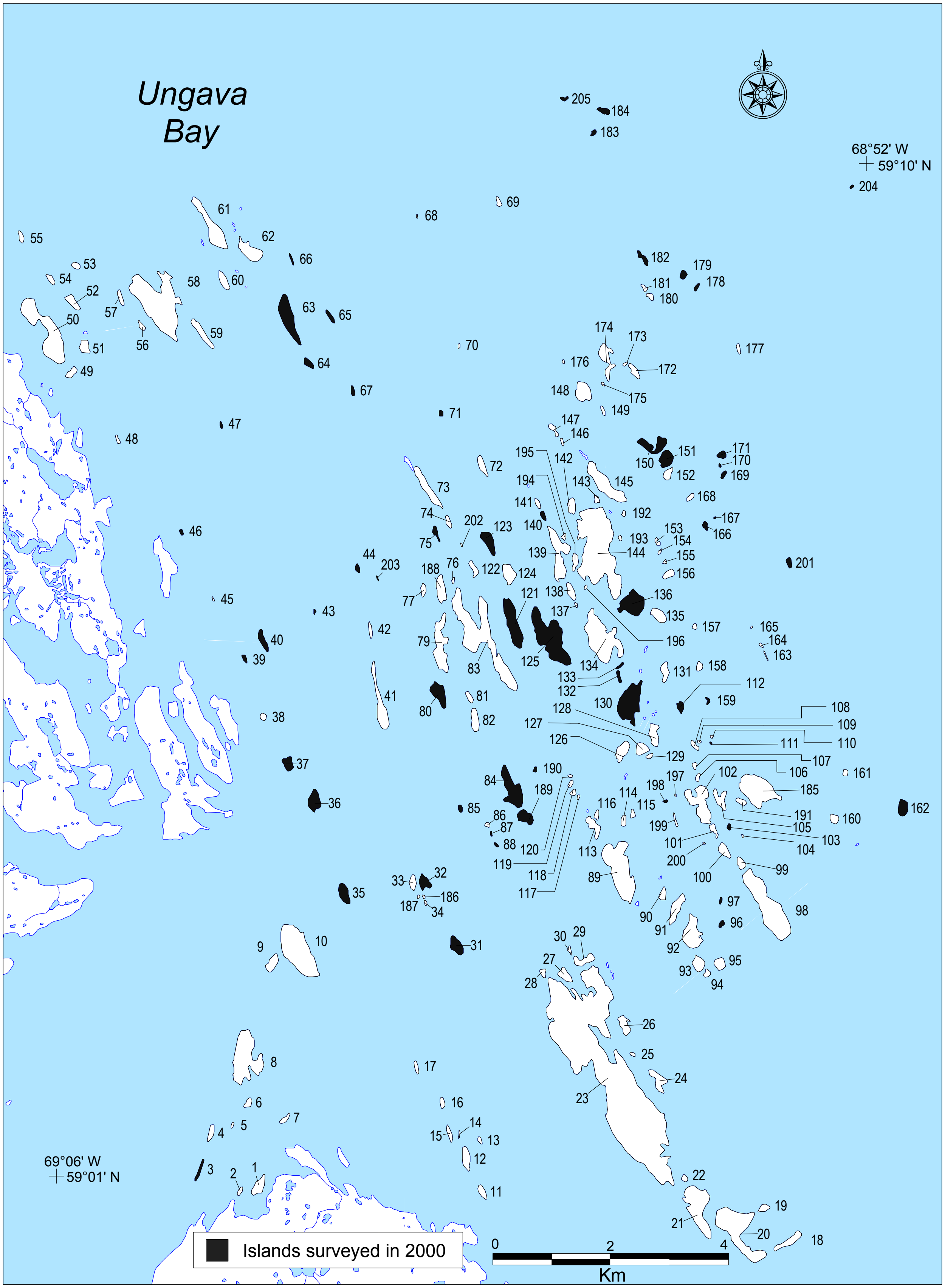


Figure 2. Gyrfalcon Islands

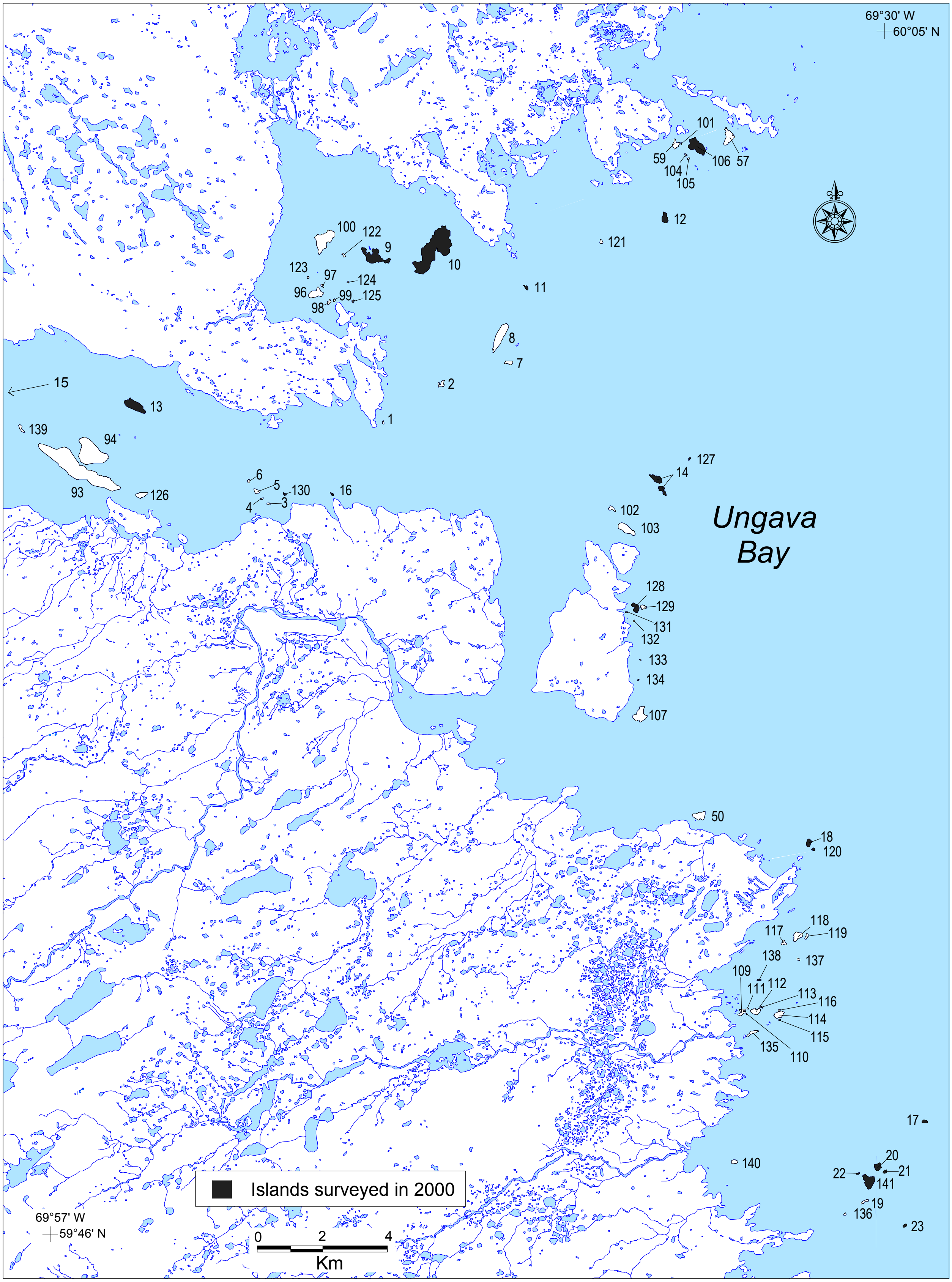


Figure 3. Payne Islands

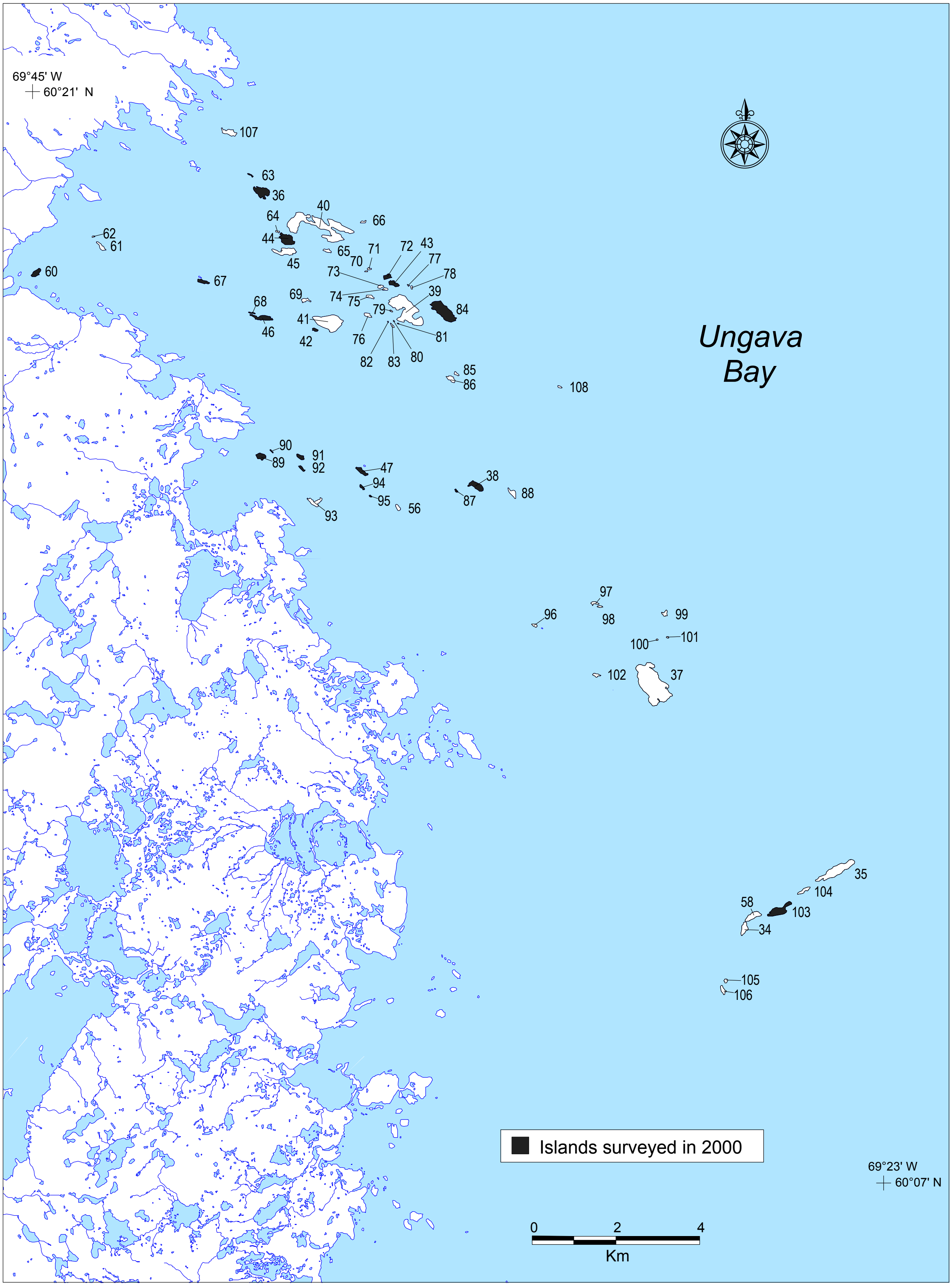


Figure 4. Plover Islands

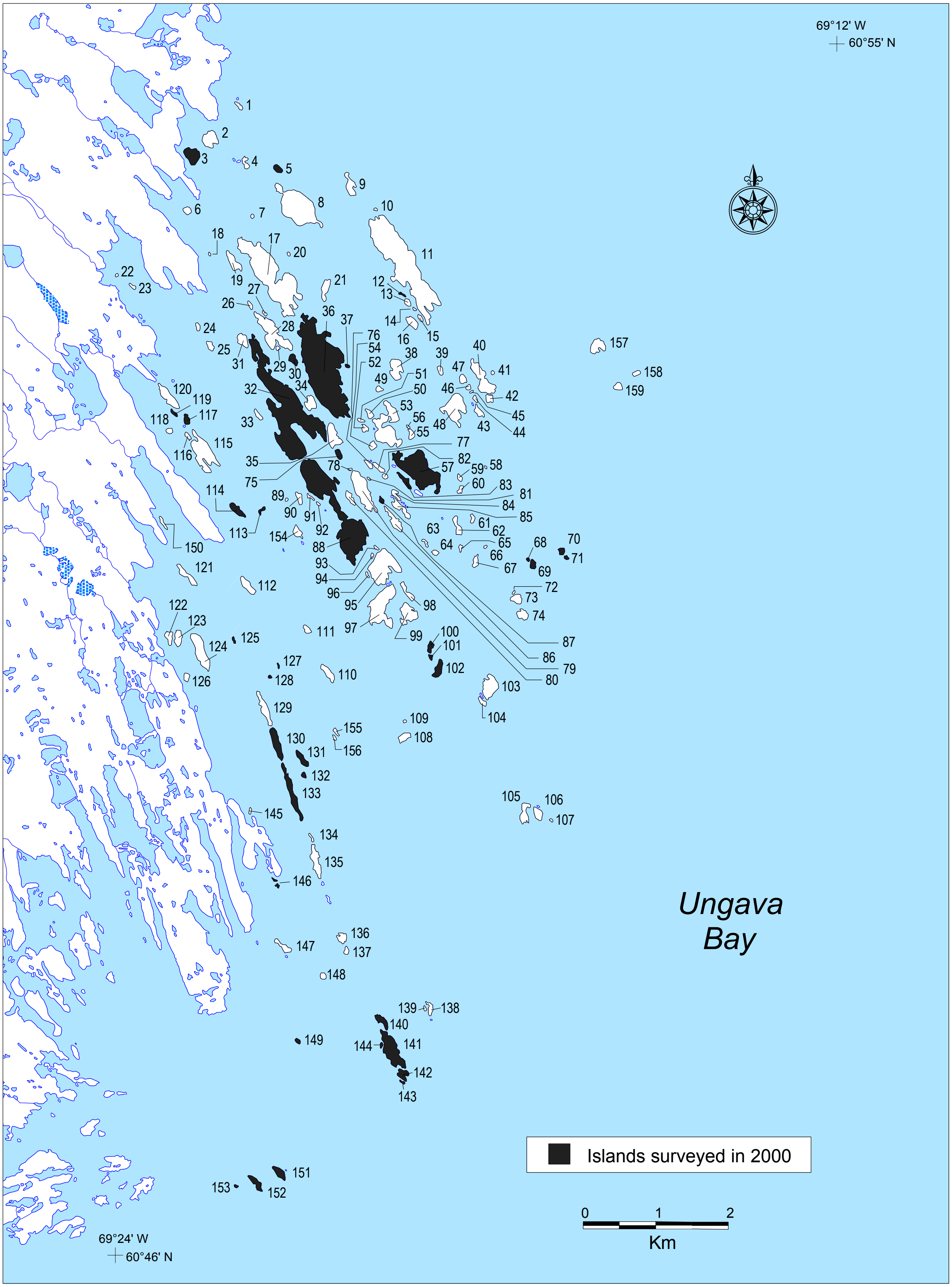


Figure 5. Eider Islands

## Ground survey

### Sampling design

In 1980, 92 randomly selected islands were surveyed in Gyrfalcon Islands, 15 in Payne Islands, 20 in Plover Islands, and 44 in Eider Islands for a total of 171 islands (Chapdelaine *et al.* 1986). We tried to optimize the sampling design for the 2000 survey by using data from the 1980 survey to plot the expected confidence limits on the population estimates vs. sample size. The confidence limits improved steadily with sample size. Hence, we set the sample size to the maximum llimit within the project budget (*n*=140 islands). This was allocated to each archipelago in proportion to its total number of islands.

Since we expected this population to be phylopatric, as in the St. Lawrence estuary, we wanted to resurvey the islands that had the largest numbers of nesting eiders in 1980. We stratified the sample within each archipelago. We used three strata: 1) islands with the highest nest count in 1980 (see below); 2) random sample of the remaining islands surveyed in 1980; and 3) random sample of islands not surveyed in 1980. The island with the highest nest count in a given archipelago in 1980 was first added to stratum 1 for this archipelago, then the second most numerous, then the third, and so on until we totaled up 75% of the total nest counts within this archipelago in 1980. This summed up to 55 islands for the four archipelagos (table I). In strata 2 and 3, 52 islands were drawn randomly and allocated proportionally to the number of islands available to the draw in each stratum and archipelago. We added 33 islands to these two strata. These islands were chosen for comparison with the aerial surveys (see the “Aerial survey” section for more details) and were allocated to stratum 2 if they had been surveyed in 1980 and to stratum 3 if they had not. Therefore, the sample size of the archipelagos differs slightly from perfect proportional allocation (table I). The islands surveyed in 2000 are identified on figures 2 to 5.

While planning the surveys, we realized that a few dozen islands in Payne and Plover archipelagos had not been considered for the drawing of the 1980 survey. We included them to the 2000 survey, increasing the total number of islands (*N*) in Payne archipelago from 55 to 73 and from 45 to 65 islands in Plover Islands. Minor changes were also made in Gyrfalcon (from 201 to 204) and Eider (from 159 to 158) archipelagos.

### Survey method

The surveys took place from June 21$^{st}$ to June 26$^{th}$, with an additional visit on July 8$^{th}$, on Gyrfalcon islands, from June 27$^{th}$ to June 29$^{th}$ on Payne islands, from June 30$^{th}$ to July 1$^{st}$ on Plover islands, and from July 5$^{th}$ to July 7$^{th}$ on Eider islands. Transportation from the mainland to the archipelagos and from island to island was made with a Bell 206 Long Ranger helicopter of the Canadian Coast Guard. Each island was systematically covered following a methodology developed by Chapdelaine *et al.* (1986). Observers walked side by side and made successive transects until the entire island area was covered. Distance between observers was adjusted to eider nests density, ranging from approximately 5 m in areas with high bird density to 25 m in areas where there was no sign of nesting eiders. Crews of three observers covered smaller islands, while the entire crew, composed of six observers, surveyed the larger islands. We minimized potential nest losses due to exposure, or gull depredation, by not conducting surveys during periods of inclement weather, and by covering exposed eggs with eiderdown.

Table I. Sampling design for the 2000 survey

| Archipelago | Stratum 1 | Stratum 2 | Stratum 3 | Total |
|---|---|---|---|---|
| Gyrfalcon | 28 / 28 | 12 (5) / 64 * | 18 (6) / 112 | 58 / 204 |
| Payne | 10 / 10 | 3 (1) / 5 | 9 (3) / 58 | 22 / 73 |
| Plover | 7 / 7 | 3 (0) / 13 | 11 (6) / 45 | 21 / 65 |
| Eider | 10 / 10 | 7 (2) / 35 | 22 (10) / 113 | 39 / 158 |
| Total | 55 / 55 | 25 (8) / 117 | 60 (25) / 328 | 140 / 500 |

* Note: sample size *n* / total number of islands *N*; number in parenthesis is the number of islands in sample size used for the air-ground comparison.

On each island, we recorded the survey date, the arrival and departure times, and the number of eider, gull, and goose nests. For each nest, we recorded clutch size and nest status (eggs, empty [no eggs but fresh down] or depredated). We also recorded the number of old nest bowls (nests with no eggs or eiderdown and filled with old debris). The stage of incubation of many clutches was estimated by candling an egg. A sample of eggs were also weighed and measured. Nest initiation dates were determined by back-dating from the day of incubation, assuming a 26-day incubation period (Guignion 1967), and a laying rate of about one egg per day (Cooch 1965). Clutches with evidence of depredation or abandonment, and obvious dump nests (clutches with more than six eggs; Robertson *et al.* 1992) were excluded from analyses of clutch size. Clutch size was also calculated only with complete clutches by excluding nests with no evidence of embryo development.

The survey was designed primarily for eiders, but we also took the opportunity to survey Black Guillemots, gulls, and Canada Geese. Since Black Guillemot nests are difficult to find, the survey method used was based on the counts of adult birds instead of nests. Visual counts of adults do not allow to estimate the actual number of breeding pairs, but can be used as indices of population changes. However, many factors influence the results from visual counts. For example, colony attendance in Black Guillemots varies during the day; numbers are usually highest and more stable early in the morning (Cairns 1979; Ewins 1985). Moreover, attendance and detectability of adults vary due to several factors (ex: wind, waves). Therefore, the mean of several counts is highly preferable to a single count (Cairns 1979; Harris 1989). However, eider nests were our target in this survey, and most islands were visited only once due to logistical constraints. Finally, it is well-known that colony attendance by adults may vary according to their breeding stage, being highest during the pre-breeding period (Ewins 1985; Harris 1989).

Gulls were censused using nest counts or adult bird counts, and sometimes both. Also, species identification was not always possible, especially with regards to gull nests. This was also the case in 1980. All “gull” data were then regrouped in our population trends analysis (by lumping data on Herring, Great Black-backed, Glaucous, Arctic, and unidentified gulls). In spite of the possible differences between breeding times among archipelagos, the mean clutch size was always close to or above two eggs per nest (see appendices 3 to 6) which allows us to be confident that by the time of the survey, a large majority of gull clutches were laid. For each island, we compiled the numbers of all adult gulls observed and all gull nests (× 2), and used the result that yielded the highest number as an estimation of the number of breeding gulls. Therefore, the text will refer to islands where gulls were observed as “colonies”.

In 1980 and 2000, all active geese nests encountered during the eider survey were recorded and nest contents were noted systematically. Active nests included nests with eggs, nests showing signs of predation (e.g. blood, broken egg shells), and freshly hatched brood near the nest. It was sometimes preferred not to disturb an adult sitting on a nest and leave the nest content as “undetermined” (appendix 2). Hereafter, a goose “nest” may refer to all of the above.

## Analysis

We calculated the annual population growth rate (Caswell 1989) for each archipelago:

$$l = e^{\left(\frac{\ln(N(T)/N(0))}{T}\right)}$$

where lambda (?) is the annual population growth rate, *ln* the natural logarithm, $e$ the base of the natural logarithm, $N(T)$ the population size at $T$ years after the first survey, and $N(0)$ the population size during the first survey. Although population growth rates are presented as a constant rate of population size change, it does not imply that changes in population size have occurred at a constant rate.

To test trends, we used a generalized linear model with the data for islands surveyed both in 1980 and 2000:

Number of nests = «archipelago» «year» «archipelago*year»

The analysis was performed with the GENMOD procedure of SAS 8.01 with Generalized Estimating Equations (GEE) estimation to take into account the repeated measurements on the same islands in both surveys (Allison 1999; Stokes *et al.* 2000). Negative binomial distribution was used with the model because it fitted the underlying distribution of the data well. We requested Type 3 analysis to test the null hypothesis that the coefficients for each effect specified in the model (archipelago, year, and archipelago*year) are equal to 0. As a measure of fit, we checked if the *deviance / degree of freedom* ratio was close to 1, indicating a well-fitted model.

Population estimates and confidence limits were calculated with a bootstrap (Manly 1997) for Canada Goose, Black Guillemot, and gulls in each archipelago. This was done by resampling (with replacement) the survey samples 1000 times by drawing *N* counts results in the sample (where *N* is the total number of islands in the archipelago). For Plover archipelago, for example, 65 counts were randomly drawn (with replacement) from the sample of 21 islands. They were summed up to get one population estimate. This was repeated 1000 times and the mean and confidence limit of the 1000 estimates were calculated. We considered the sampling to be simple random for Canada Geese, Black Guillemots, and gulls, since it was stratified for eiders only based on the 1980 eider nest counts.

The bootstrap method would have been too challenging to use with the stratified sampling used with eiders. Therefore, the population estimates and associated statistics (variance, confidence limits) for each archipelago were computed with the *SURVEYMEANS* procedure of SAS.

Appropriate weights equal to *N/n* (total number of islands / sample size) were assigned to each stratum. With Eider Islands, for example, nest counts on each island were multiplied by 1.0 (10/10) in stratum 1, by 5.0 in stratum 2 (35/7), and by 5.14 in stratum 3 (113/22).

During our initial surveys on Gyrfalcon Islands, we found that many clutches were incomplete, indicating that additionnal clutches could still have to be laid. To account for nests initiated after the initial surveys, we developed a correction factor. We estimated the correction factor with a linear regression (*REG* procedure of SAS), with no intercept, on the number of nests found on the first (June $21^{st}$-$25^{th}$) vs. subsequent surveys (June $26^{th}$ or July $8^{th}$) on some islands that were revisited. Residuals were examined for outliers and the normality of their distribution was tested with the Shapiro-Wilk test. Finally, Spearman rank correlation was performed with the 1980 and 2000 eider nest counts data to test the phylopatry hypothesis. All statistical analyses were performed with SAS 8.01 and a statistical significance level of a=0.05 was used for statistical testing.

## AERIAL SURVEY

### Sampling design

We tested how well the number of nests counted on the islands related to the number of adult male eiders counted from the air around those islands. Due to the short distance between many islands, we anticipated it could sometimes be difficult, if not impossible, to precisely assign males to a specific island. So, we grouped dense aggregations of islands into clusters and totaled all nests and males counted within each cluster. Clusters ranged from 1 to 21 islands (most were between 1 and 4 islands). A total of 64 clusters were delimited on Gyrfalcon Islands, 41 on Payne Islands, 30 on Plover Islands, and 60 on Eider Islands.

From the four archipelago combined, a total of 107 islands were chosen solely for the ground surveys (see *Sampling design* in the *Ground survey* section for more details). We identified those islands on the maps where we had delimited each cluster. Clusters where all islands had already been selected for the ground surveys were included *de facto* in the aerial surveys. We also identified clusters that would have complete coverage if only one or two additional islands were included in the ground surveys. To complete coverage of these clusters, 33 islands were added to the ground surveys, while trying to keep the total sampling size for each archipelago close to proportional allocation. This resulted in a sample of 21 clusters and 34 islands for Gyrfalcon Islands, 9 clusters and 13 islands for Payne Islands, 10 clusters and 17 islands for Plover Islands, and 15 clusters and 33 islands for Eider Islands. Appendix 8 gives the list of islands included in each cluster.

In addition to the aerial / ground comparison, we also used the helicopter to survey some inland eider colonies that were surveyed on the ground in 1980 (Chapdelaine *et al.* 1986). The first sector is on an unnamed lake 12 km east of Aupaluk, just south of *Anse de Villiers* (figure 6), where eiders were found on three islands. The second area had 11 islands with nesting eiders and is located on the large Virgin Lake, 15 to 25 km north of the Payne River mouth (figure 7). The last area is about 20 to 30 km southwest of Eider Islands on Lake Iqaluppilik and *Étangs Atanirtuut* (figure 8) and had nesting eiders on eight islands. We resurveyed from the air each of the islands that had inland eider colonies in 1980. We also surveyed the surrounding areas that were on the flight path to and from those nesting areas in search for other colonies.

## Survey method

The aerial surveys were conducted with a Bell 206 Long Ranger helicopter flown 100-150 m above sea level at a speed of 100-120 km/h. Aerial surveys were all carried out during days with good visibility. The crew consisted of the same two observers seated in the front left side and the rear right side of the aircraft. Using a cassette recorder, they recorded the number of eiders (males and females) and the island and cluster numbers. They targeted eiders, but also recorded other birds. The aerial surveys were conducted on June 23rd on Gyrfalcon Islands, June 27th on Payne Islands south of Payne River, June 29th on Payne Islands north of Payne River, June 30th on most of Plover Islands and July 1st on a remaining remote cluster (no. 1), and July 7th on Eider Islands.

We also surveyed eider colonies found on inland lakes with the helicopter. An unnamed lake south of *Anse de Villiers* in the Aupaluk area was surveyed on July 8th, the Virgin Lake on July 2nd, and the Lake Iqaluppilik and *Étangs Atanirtuut* area on July 7th.

## Analysis

We related the number of eider males to the number of nests counted on the ground within each cluster of islands. A ratio estimator (see Cochran 1977) was calculated with the *REG* procedure of SAS with no intercept and using appropriate weights (1 / number of eider males seen from the air) for each cluster. The procedure also yields helpful statistics to calculate the coefficient of variation of the ratio estimator. Some clusters were dropped and others lumped together for reasons explained in the *Results* section. The main analysis was performed only with Gyrfalcon, Payne, and Plover Islands data because of presumed low nesting on Eider Islands.

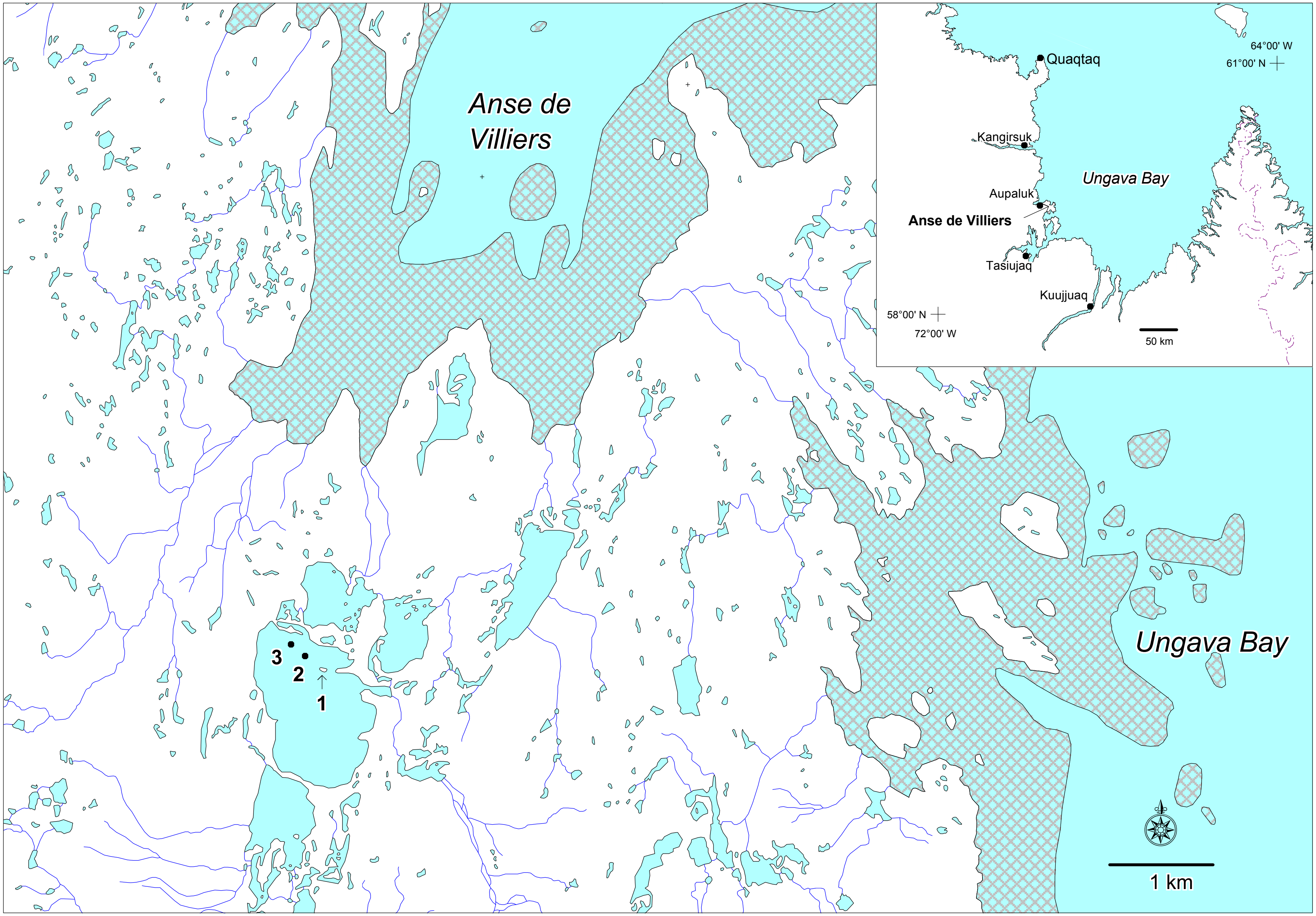


Figure 6. Location of the inland eider colonies in the Aupaluk area

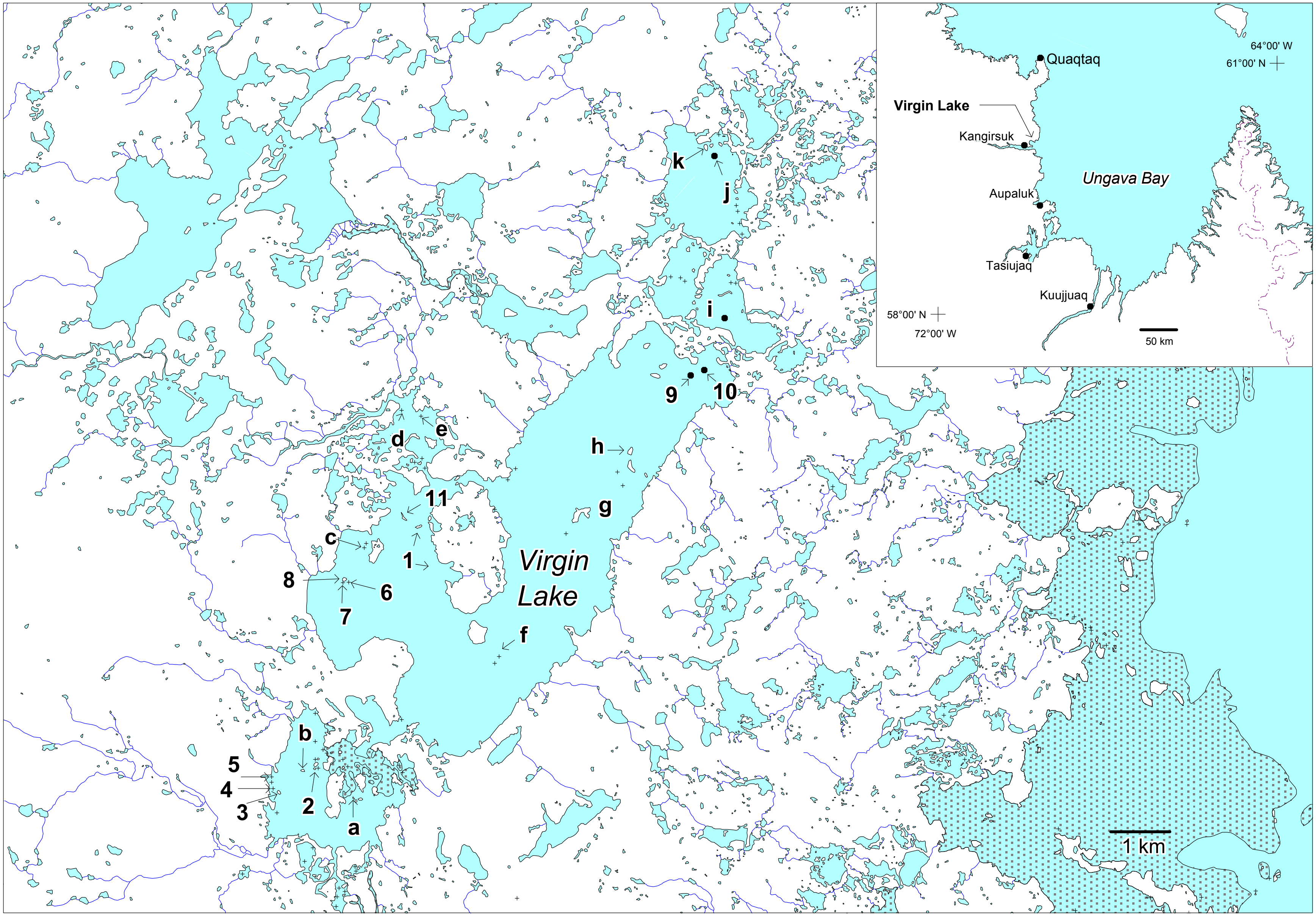


Figure 7. Location of the inland eider colonies in the Kangirsuk area

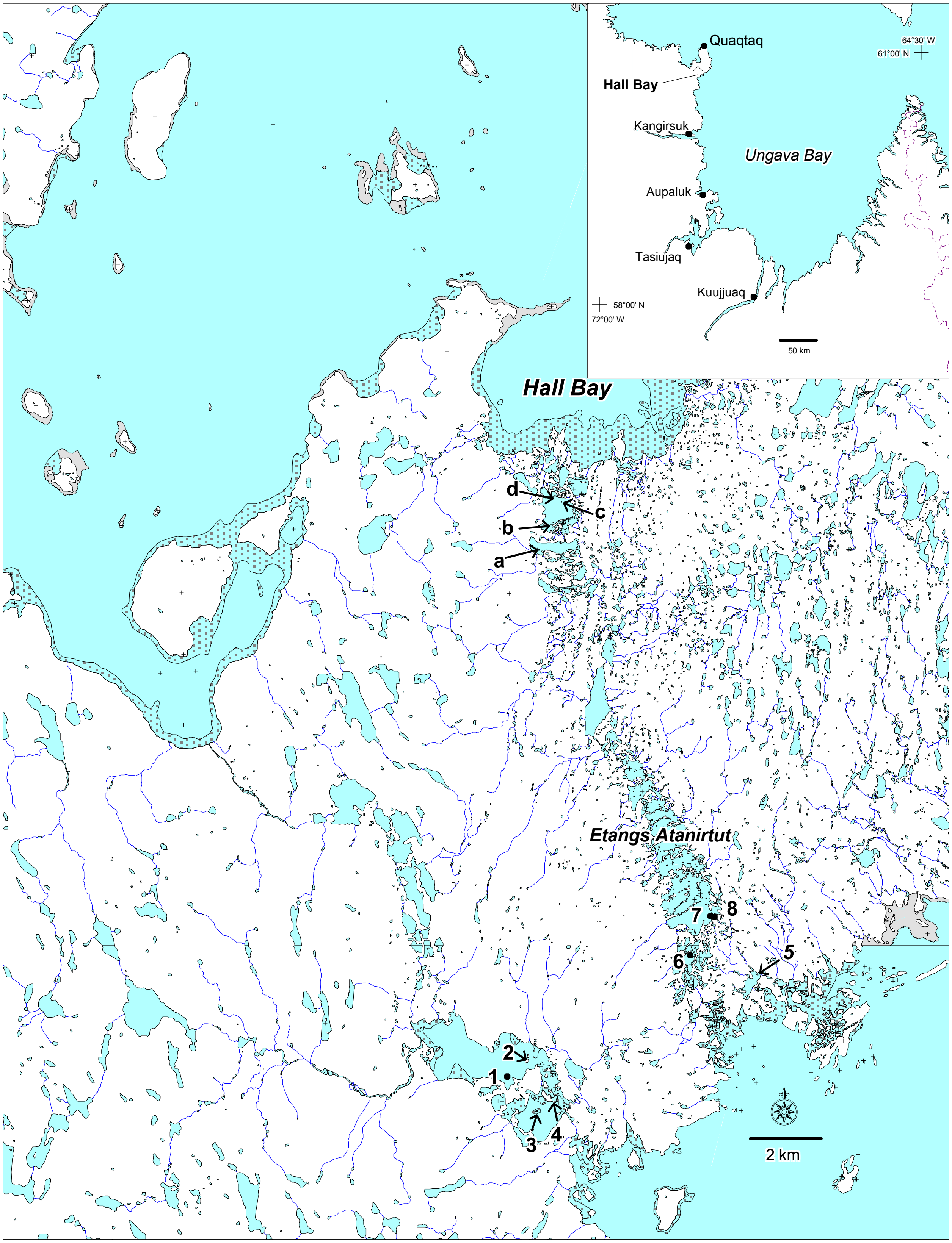


Figure 8. Location of the inland eider colonies in the Quaqtaq area

# RESULTS

## EIDERS

### Ground survey

Trends from 1980 to 2000

Good timing with breeding chronology is crucial to get a nest count that is an accurate estimate of the breeding population. There was still extensive ice coverage in the center of Gyrfalcon archipelago when we began the survey. It was apparent that eiders had only begun breeding because clutch sizes were small. We revisited some islands after having completed the surveys of Gyrfalcon islands (June 26th) and the other archipelagos (July 8th) to check how many new nests were initiated since the first surveys (table II).

Table II. Repeated surveys of some islands on Gyrfalcon archipelago

| *Island* | *First surveys (June 21st-25th)* | *Second pass (June 26th)* | *Third pass (July 8th)* |
|---|---|---|---|
| 44 | 105 (24*) | - | 238 |
| 46 | 2 (24) | - | 13 |
| 96 | 1 (21) | 8 | 23 |
| 97 | 5 (21) | 65 | 74 |
| 159 | 1 (21) | 8 | - |
| 166 | 0 (21) | 11 | - |
| 184 | 48 (25) | - | 57 |
| 203 | 280 (24) | - | 388 |

* exact date is indicated between parenthesis

We plotted the last count on each of these islands against the first count (figure 9). Since the relationship was good ($R^2$=0.94), we used the slope estimate (1.49) as a correction ratio for the nest counts, i.e. we multiplied the actual nest counts by 1.49 on the islands that were not resurveyed in Gyrfalcon Islands and used the highest count on the islands that were revisited. In the report, we give both the actual count from the first survey and the corrected count for Gyrfalcon archipelago, but we base our interpretation on the corrected count since we believe it gives a more accurate picture of the true population size.

The number of nests on the islands surveyed both in 1980 and 2000 increased by a factor of +95% (+1271 nests; lambda [annual growth rate]=1.034) on Gyrfalcon Islands, +296% (+1525 nests; lambda=1.071) on Payne Islands, and +103% (+506 nests; lambda=1.036) on Plover Islands, but decreased -79% (-659 nests; lambda=0.926) on Eider Islands (Tables III and IV; Figure 10). The type 3 GEE analysis found an interaction between years and archipelagos (chi-square=12.6, *df*=3, *p*=0.006), because the population trend for Eider Islands is opposite to other archipelagos' trends. We made a separate analysis for Eider archipelago and the difference between the 1980 and 2000 surveys was significant (chi-square=7.8, *df*=1, *p*=0.005). We also made a separate analysis for Gyrfalcon, Payne, and Eider archipelagos. This analysis

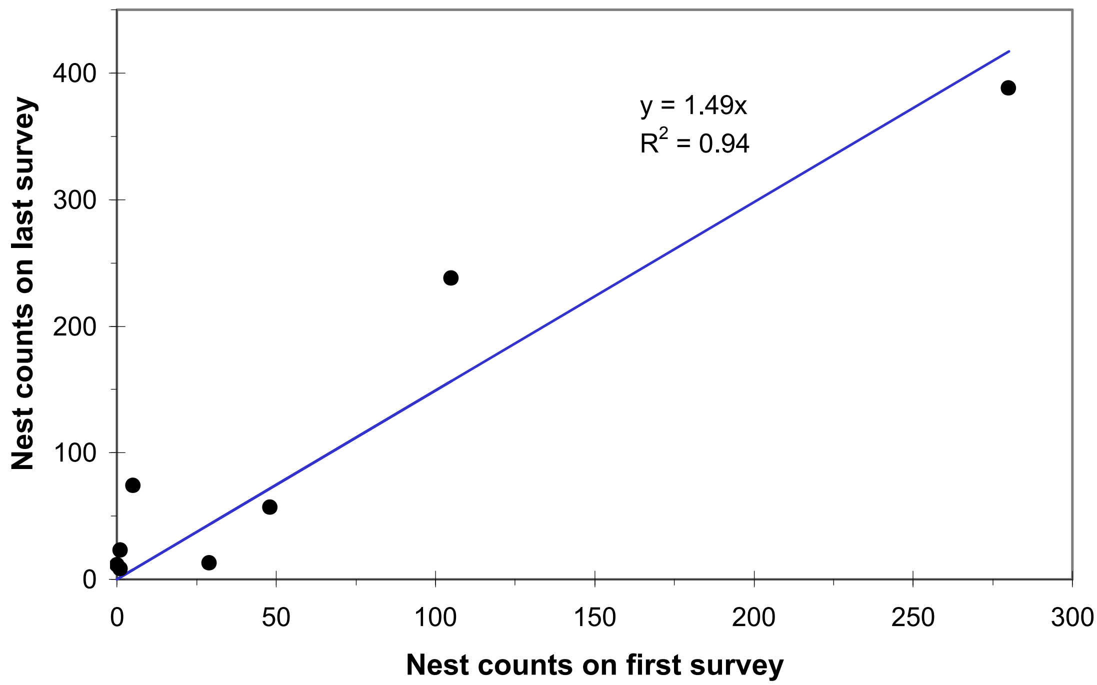


Figure 9. Relationship between the first and the last nest counts on some islands of Gyrfalcon archipelago

did not reflect significant year-archipelago interaction (chi-square=2.3, *df*=2, *p*=0.33) or significant archipelago effect (chi-square=3.3, *df*=2, *p*=0.19), but indicated a significant year effect (chi-square=6.4, *df*=1, *p*=0.01).

Changes in numbers varied considerably between islands. A few islands made up for most of the total increase in Gyrfalcon, Payne, and Plover Islands. In Gyrfalcon archipelago, changes ranged from +402 to -60 nests. The increases averaged 119.3 ± 32.8 nests (*n*=15 islands) and decreases averaged 22.6 ± 4.7 (*n*=23). As many as 9 islands with breeding eiders in 1980 were abandoned by year 2000 (table IV). On Payne archipelago, changes ranged from +663 to -14 nests. The increases averaged 170.1 ± 54.4 (*n*=9) and decreases 6.0 ± 1.8 (*n*=3). On Plover archipelago, changes ranged from +432 to -109 nests. The increases averaged 116.2 ± 41.4 (*n*=6) and decreases -47.8 ± 10.7 (*n*=4). Finally, on Eider archipelago, changes ranged from +4 to -140 nests and increases averaged 3.0 ± 0.4 (*n*=2) and decreases -47.5 ± 11.2 (*n*=14).

Table III. Annual population growth rate (lambda)

| *Archipelago* | *Gyrfalcon* | *Payne* | *Plover* | *Eider* |
|---|---|---|---|---|
| Paired comparisons | 1.034 | 1.071 | 1.036 | 0.926 |
| Total sample | 1.004 | 0.997 | 1.030 | 0.913 |

Table IV. Paired comparisons between islands surveyed in 1980 and 2000

| Gyrfalcon Islands | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Raw | | | Corrected | | | Payne Islands | | | | Plover Islands | | | | Eider Islands | | | |
| Island | 1980 | 2000 | Trend | 1980 | 2000 | Trend | Island | 1980 | 2000 | Trend | Island | 1980 | 2000 | Trend | Island | 1980 | 2000 | Trend |
| 31 | 20 | 64 | 44 | 20 | 95 | 75 | 9 | 74 | 371 | 297 | 36 | 13 | 145 | 132 | 12 | 1 | 0 | -1 |
| 32 | 52 | 12 | -40 | 52 | 18 | -34 | 10 | 38 | 46 | 8 | 38 | 27 | 72 | 45 | 32 | 24 | 5 | -19 |
| 35 | 37 | 24 | -13 | 37 | 36 | -1 | 11 | 22 | 36 | 14 | 42 | 2 | 5 | 3 | 36 | 143 | 3 | -140 |
| 36 | 78 | 12 | -66 | 78 | 18 | -60 | 12 | 39 | 142 | 103 | 43 | 18 | 0 | -18 | 57 | 81 | 0 | -81 |
| 37 | 30 | 65 | 35 | 30 | 97 | 67 | 13 | 74 | 737 | 663 | 44 | 3 | 435 | 432 | 68 | 2 | 1 | -1 |
| 39 | 2 | 27 | 25 | 2 | 40 | 38 | 14 | 102 | 286 | 184 | 46 | 46 | 14 | -32 | 69 | 87 | 7 | -80 |
| 40 | 69 | 34 | -35 | 69 | 51 | -18 | 16 | 30 | 32 | 2 | 47 | 61 | 106 | 45 | 71 | 3 | 0 | -3 |
| 43 | 30 | 290 | 260 | 30 | 432 | 402 | 17 | 16 | 76 | 60 | 60 | 114 | 5 | -109 | 102 | 116 | 3 | -113 |
| 44 | 83 | 105 | 22 | 83 | 238 | 155 | 18 | 2 | 0 | -2 | 67 | 158 | 126 | -32 | 114 | 71 | 20 | -51 |
| 46 | 28 | 2 | -26 | 28 | 13 | -15 | 20 | 73 | 59 | -14 | 84 | 50 | 90 | 40 | 130 | 49 | 8 | -41 |
| 47 | 65 | 133 | 68 | 65 | 198 | 133 | 21 | 8 | 20 | 12 | | | | | 133 | 4 | 3 | -1 |
| 63 | 22 | 216 | 194 | 22 | 322 | 300 | 22 | 3 | 1 | -2 | | | | | 14+144 | 69 | 25 | -44 |
| 65 | 33 | 18 | -15 | 33 | 27 | -6 | 23 | 35 | 235 | 200 | | | | | 142 | 82 | 32 | -50 |
| 66 | 11 | 2 | -9 | 11 | 3 | -8 | | | | | | | | | 143 | 2 | 4 | 2 |
| 71 | 28 | 12 | -16 | 28 | 18 | -10 | | | | | | | | | 149† | 1 | 1 | 0 |
| 75 | 22 | 0 | -22 | 22 | 0 | -22 | | | | | | | | | 151† | 52 | 56 | 4 |
| 85 | 27 | 15 | -12 | 27 | 22 | -5 | | | | | | | | | 152† | 52 | 12 | -40 |
| 87 | 1 | 3 | 2 | 1 | 4 | 3 | | | | | | | | | | | | |
| 96 | 81 | 1 | -80 | 81 | 23 | -58 | | | | | | | | | | | | |
| 97 | 126 | 5 | -121 | 126 | 74 | -52 | | | | | | | | | | | | |
| 112 | 27 | 0 | -27 | 27 | 0 | -27 | | | | | | | | | | | | |
| 125 | 31 | 0 | -31 | 31 | 0 | -31 | | | | | | | | | | | | |
| 130 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | |
| 150 | 13 | 0 | -13 | 13 | 0 | -13 | | | | | | | | | | | | |
| 151 | 1 | 1 | 0 | 1 | 1 | 0 | | | | | | | | | | | | |
| 159 | 26 | 1 | -25 | 26 | 8 | -18 | | | | | | | | | | | | |
| 162 | 19 | 17 | -2 | 19 | 25 | 6 | | | | | | | | | | | | |
| 166 | 45 | 0 | -45 | 45 | 11 | -34 | | | | | | | | | | | | |
| 169 | 10 | 32 | 22 | 10 | 48 | 38 | | | | | | | | | | | | |
| 171 | 16 | 28 | 12 | 16 | 42 | 26 | | | | | | | | | | | | |
| 178 | 25 | 16 | -9 | 25 | 24 | -1 | | | | | | | | | | | | |
| 179 | 45 | 65 | 20 | 45 | 97 | 52 | | | | | | | | | | | | |
| 182 | 70 | 110 | 40 | 70 | 164 | 94 | | | | | | | | | | | | |
| 183 | 9 | 0 | -9 | 9 | 0 | -9 | | | | | | | | | | | | |
| 184 | 0 | 48 | 48 | 0 | 57 | 57 | | | | | | | | | | | | |
| 190 | 31 | 8 | -23 | 31 | 12 | -19 | | | | | | | | | | | | |
| 198 | 13 | 0 | -13 | 13 | 0 | -13 | | | | | | | | | | | | |
| 203 | 44 | 280 | 236 | 44 | 388 | 344 | | | | | | | | | | | | |
| 204 | 12 | 0 | -12 | 12 | 0 | -12 | | | | | | | | | | | | |
| 205 | 53 | 0 | -53 | 53 | 0 | -53 | | | | | | | | | | | | |
| Sum | 1335 | 1646 | 311 | 1335 | 2606 | 1271 | | 516 | 2041 | 1525 | | 492 | 998 | 506 | | 839 | 180 | -659 |
| Islands with rises | | | 14 | | | 15 | | | | 10 | | | | 6 | | | | 2 |
| Islands with drops | | | 24 | | | 23 | | | | 3 | | | | 4 | | | | 14 |
| Islands even | | | 2 | | | 2 | | | | 0 | | | | 0 | | | | 1 |
| New colonies | | | 1 | | | 1 | | | | 0 | | | | 0 | | | | 0 |
| Abandoned colonies | | | 9 | | | 9 | | | | 1 | | | | 1 | | | | 3 |

† Island 149 was mistyped as 49, and islands 151 and 152 were misidentified as 160 and 161 in table 2 in Chapdelaine *et al*. (1986)

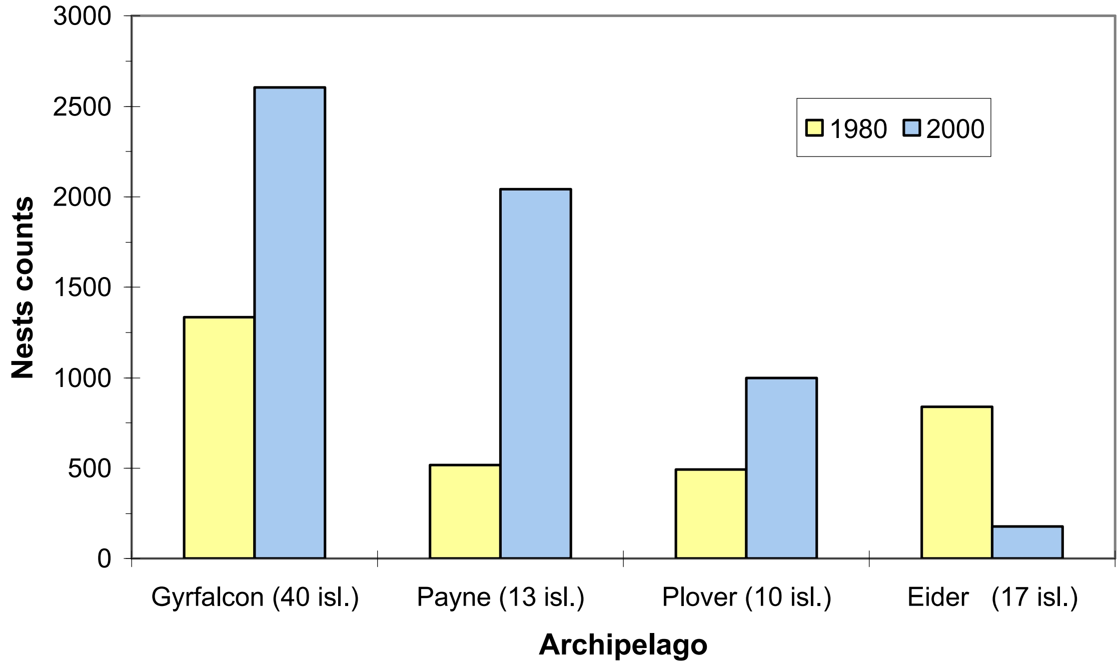


Figure 10. Total nest counts on islands surveyed both in 1980 and 2000

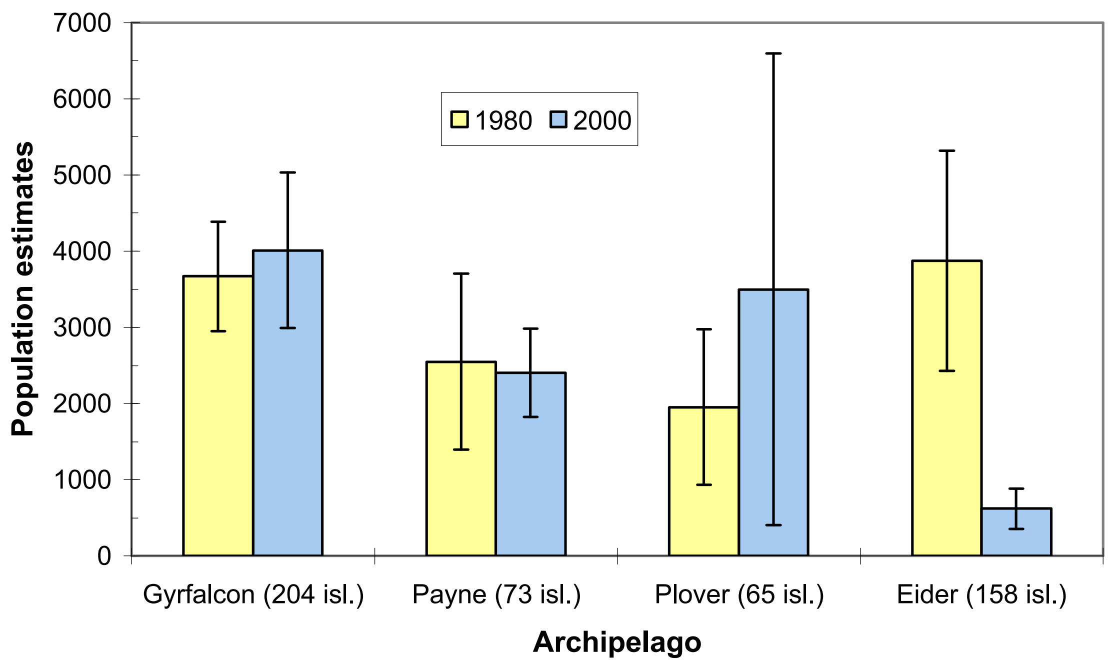


Figure 11. Population estimates for each archipelago (error bars represent 95% confidence limits)

Population estimates calculated with the complete sample gave a different picture regarding trends on Gyrfalcon and Payne Islands (figure 11; table III). The population estimate reached 4010 nests on Gyrfalcon Islands in 2000, representing a small 9.3% increase (+342 nests; lambda [annual growth rate]=1.004) compared to 1980; and totaled 2403 nests on Payne Islands, a slight -5.8% decrease (–147 nests; lambda=0.997). However, population estimates calculated for Plover and Eider archipelagos had comparable trends to those calculated only with islands surveyed both years. Population estimates were 3500 on Plover Islands in 2000, showing a 79% increase (+1547 nests; lambda=1.030), and only 621 on Eider archipelago, indicating a -84% decrease (-3254 nests; lambda=0.913) compared to 1980. The 1980 and 2000 population estimates confidence limits overlap considerably in Gyrfalcon, Payne, and Plover Islands (figure 11). The trend is clearly significant only for Eider Islands. On Plover archipelago, island 44 is responsible again for most of the increase and also the large confidence limits. Because it had only a few nests in 1980, this island was placed in the low count stratum where islands have a weight of 4.33. If island 44 had been placed in the high count stratum (weight=1), the population estimate would be 2300 nests instead of 3500!

## Eider phylopatry and spatial distribution of larger colonies

Spearman rank correlation between the number of nests in 1980 and 2000 on the 80 islands surveyed both year yielded a low but significant coefficient ($r$=0.37, $p$<0.001) due to the large number of islands. The correlation differed among archipelagos. Only Payne showed a strong correlation between the 1980 and the 2000 results ($r$=0.87, $p$<0.001), while Gyrfalcon ($r$=0.38, $p$=0.015) and Eider ($r$=0.40, $p$=0.11) had weaker correlations and Plover ($r$=0.006, $p$=0.99) no correlation at all. A closer examination of the data (table IV) reveals that while some islands had high nest counts on both years, some also had high counts in one survey and low counts in the other survey. It indicates that there has been movement in the number of nesting eiders among islands in three archipelagos from 1980 to 2000. However, this is mostly a measure of natal phylopatry, because most eiders that nested in 1980 must have died before 2000.

In Payne archipelago, islands are scattered along the coast and there is no obvious relationship between nest counts and the location of islands within the archipelago. However, on Gyrfalcon and Eider archipelagos, islands with the highest nest counts in 1980 and 2000 are almost all located at the outer margin of the archipelagos. A similar but less obivous situation seems to be prevalent in Plover Islands. When we surveyed Gyrfalcon Islands in 2000, the ice sheet was still covering the middle of the archipelago and there were almost no nests on these islands.

A weak but significant Spearman rank correlation ($r$=0.32, $p$=0.001) was found between nest counts and island areas in 2000. There was no correlation for Gyrfalcon Islands ($r$=-0.035, $p$=0.79), a weak but almost significant relationship for Eider archipelago ($r$=0.32, $p$=0.0504), and good correlations for Payne ($r$=0.63, $p$=0.002) and Plover Islands ($r$=0.78, $p$<0.001). In Payne archipelago, island area seems much more important than its location to account for the number of eider nests, but both factors seem to be important in Plover archipelago.

## Breeding biology

Clutch sizes calculated with all clutches ranged from a low 2.00 on Eider Islands to 2.91 on Payne Islands (figure 12; table V). Eider and Gyrfalcon Islands had a high proportion of single egg clutches (figure 12). It is no wonder that samples of clutches that were candled showed a very low percentage of incubated (complete) clutches in both Gyrfalcon (38%) and Eider (43%)

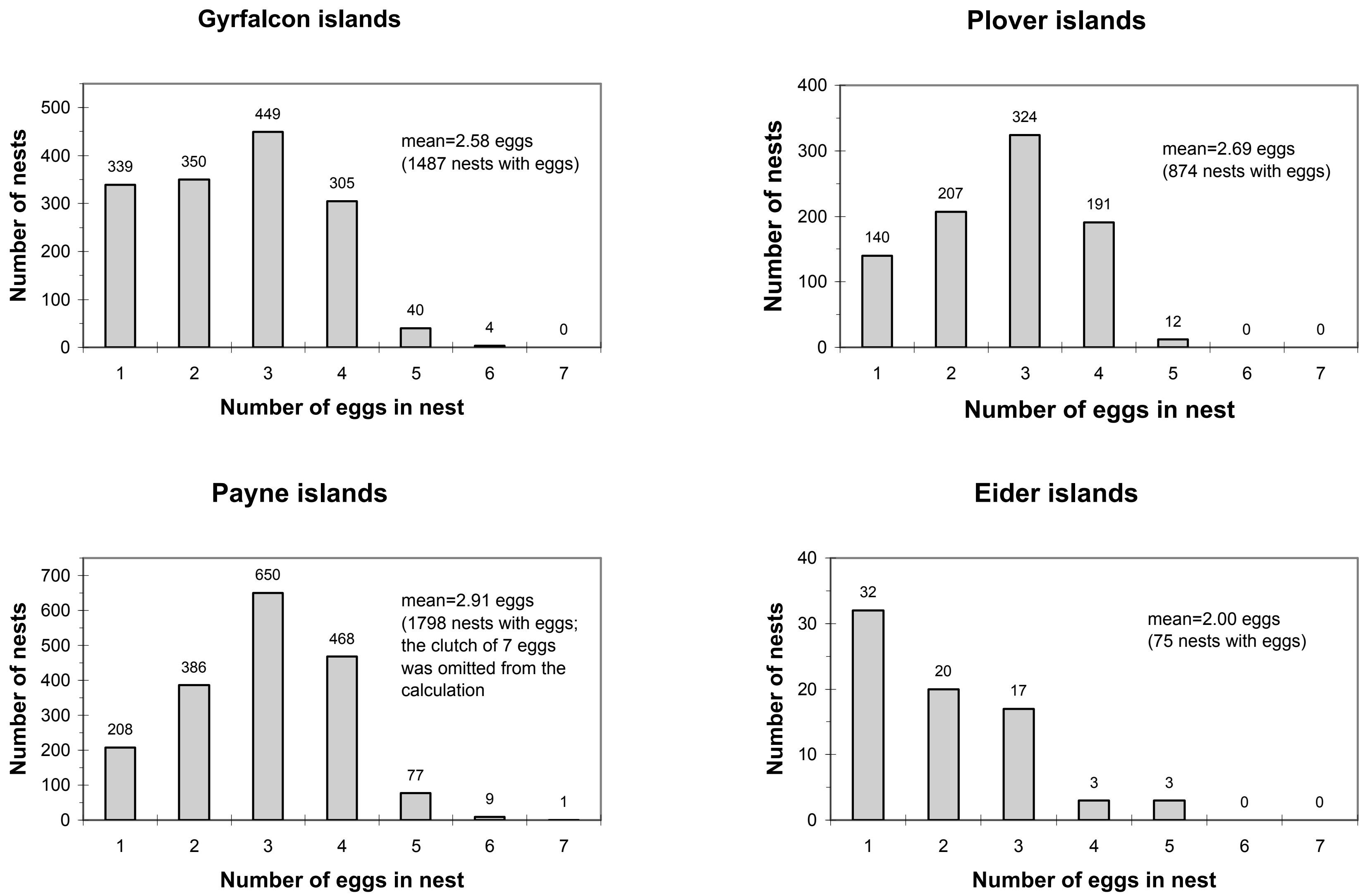


Figure 12. Clutch sizes on the four archipelagos

archipelagos (table V). This indicates once again that the surveys were run too early in these two locations. Mean size of complete clutches was still low on Eider Islands with 2.27 and ranged from 2.69 to 3.32 on the three other archipelagos (table V).

Table V. Clutch sizes among archipelagos

| Archipelago | All clutches<br>Mean ± std error (*n*) | Complete clutches only<br>Mean ± std error (*n*) | % of complete clutches* |
|---|---|---|---|
| Gyrfalcon | 2.58 ± 1.14 (1487) | 3.09 ± 0.77 (44) | 38% (44/117) |
| Payne | 2.91 ± 1.08 (1798) | 3.32 ± 0.97 (99) | 76% (99/131) |
| Plover | 2.69 ± 1.03 (874) | 2.69 ± 0.95 (42) | 72% (42/58) |
| Eider | 2.00 ± 1.09 (75) | 2.27 ± 0.70 (15) | 43% (15/35) |

* In a sub sample of clutches that were candled (complete clutches / candled clutches)

Table VI indicates the breeding phenology in each archipelago. On Gyrfalcon Islands, nests were initiated from June 3rd to June 25th and the mean date of nest initiation (June 19th) was very close to the beginning of the surveys (June 21st). Hatching occurred nearly one month later. The surveys were run about a week too early in this archipelago. Nest initiation and hatching dates on Payne and Plover archipelagos were similar to Gyrfalcon. However, breeding took place later on Eider Islands; first date of nest initiation (June 26th) being three to three and a half weeks later than on the other archipelagos. Mean date of nest initiation (July 2nd) was also too close to the beginning of the surveys for this archipelago (July 5th), indicating it was also surveyed too early. There was a very high proportion of depredated nests (70.4%) on Eider Islands, compared to Gyrfalcon (13.6%), Payne (13.3%) and Plover (22.9%) Islands.

Table VI. Estimated dates of nest initiation and hatching in the four archipelago

| Archipelago | Survey dates | *Estimated nest initiation dates** Range | Mean | *Estimated hatching dates** Range | Mean |
|---|---|---|---|---|---|
| Gyrfalcon | 21-26 June + 8 July | 3 - 25 June | 19 June | 2 - 24 July | 18 July |
| Payne | 27 - 29 June | 1 - 28 June | 16 June | 30 June- 27 July | 15 July |
| Plover | 30 June - 1 July | 5 - 30 June | 21 June | 4 - 29 July | 20 July |
| Eider | 5 - 7 July | 26 June - 5 July | 2 July | 24 July - 3 August | 31 July |

* Based on a 26 days incubation period and a laying rate of one egg / day

### Comparison of aerial and ground surveys

Occasionally, both aerial and ground surveys occurred simultaneously on some islands. We lumped a few clusters because the ground survey crew had flushed the males to neighboring clusters. We lumped clusters 4 and 5 of Payne archipelago because the ground crew was on island 141 during the aerial survey and also lumped clusters 6 and 7 of the same archipelogo because the crew was on island 9. We dropped cluster 2a of Payne archipelago due to island localization uncertainty and cluster 1 of Plover archipelago because the ground crew was on island 103 and it could not be lumped it with neighboring clusters because they were not surveyed. Moreover, cluster 2 of Eider Islands was dropped because no ground survey was done on island 8. The Eider Islands aerial survey was not included in the global regression due to the presumed low nesting that "biased" the ground / aerial ratio.

Calculations of Gyrfalcon, Payne, and Plover Islands data yielded a ratio of 1.19 (ground nest counts / aerial male counts) with $R^2$=0.70 and coefficient of variation (*cv*) =11.9%. Although the predicted and actual nest counts fitted generally well, there were a few exceptions (figure 13). For example, 254 males were counted from the air on cluster 1 (island 13) in Payne islands, leading to a prediction of 303 nests while there were actually 737 nests on that island! This island is located on Payne River near the Kangirsuk village. This discrepancy could be explained by the fact that Inuit regularly harvest down on that island possibly causing males to leave the island. It is also possible that many males could have been feeding away in Payne Bay while the aerial survey was conducted. Cluster 6 (islands 46+68) in Plover archipelago was also an outlier. We counted 119 males from the air, the predicted nest number was 142, but there were only 14 nests on this cluster. We have no explanation for this discrepancy.

If we use the corrected data for Gyrfalcon islands, we end up with a different ratio of 1.48 for the three archipelagos pooled together. We also get a better relationship with $R^2$=0.78 and *cv*=9.6%. However, we must add the variation associated with the model used to correct the data for Gyrfalcon (*cv*=10.2%), which yields a *cv*=14.0% for the three archipelagos.

We observed a better relationship for Gyrfalcon archipelago where breeding occurred earlier (figure 13). We also found a lower ratio=0.90 with raw data as opposed to 1.39 with corrected data and a *cv*=12.4% (9.9% with corrected data). The relationship was also good for Payne Islands, except for cluster 1, but not as good for Plover Islands. The ratios were higher (1.69 for Payne and 1.28 for Plover) and the *cv* were much higher (24.8% for Payne and 31.3% for Plover). The response was very different on Eider Islands with a much lower ratio of 0.57 and poor $R^2$=0.36 and *cv*=43.1%. Clusters 10 and 11 were mainly responsibles for the poor results.

The low ratio of 0.57 for Eider Islands indicates that there were 1.75 times more males around the islands than nests on the islands. That is also indicative of a bad nesting season. The 0.57 ratio is also 2.60 times lower than the mean ratio of 1.48 calculated for the other three archipelagos. It is possible that the real population level in Eider archipelago was 1.75 to 2.60 times higher than the calculated population estimate.

### Inland eider colonies

Most colonies of the three inland areas show a decline from 1980 to 2000 and the total decline for each area is important (table VII). Overall, 864 nests were counted in 1980 compared to 261 eider males in the same colonies in 2000. However, new colonies were found and surveyed in the Virgin Lake and *Étangs Atanirtuut* area with respectively 249 and 69 males. It is difficult to determine if those were new colonies or if they were simply undetected by the 1980 surveyors. Even the total 2000 count of 579 males (including new colonies) is still much lower than the 1980 count of 864 nests. Strangely, more females than males were counted in the *Étangs Atanirtuut* area (table VII), even if females are less conspicuous. Trends calculated with female counts, when higher than male counts, also fall short of the 1980 count (table VII).

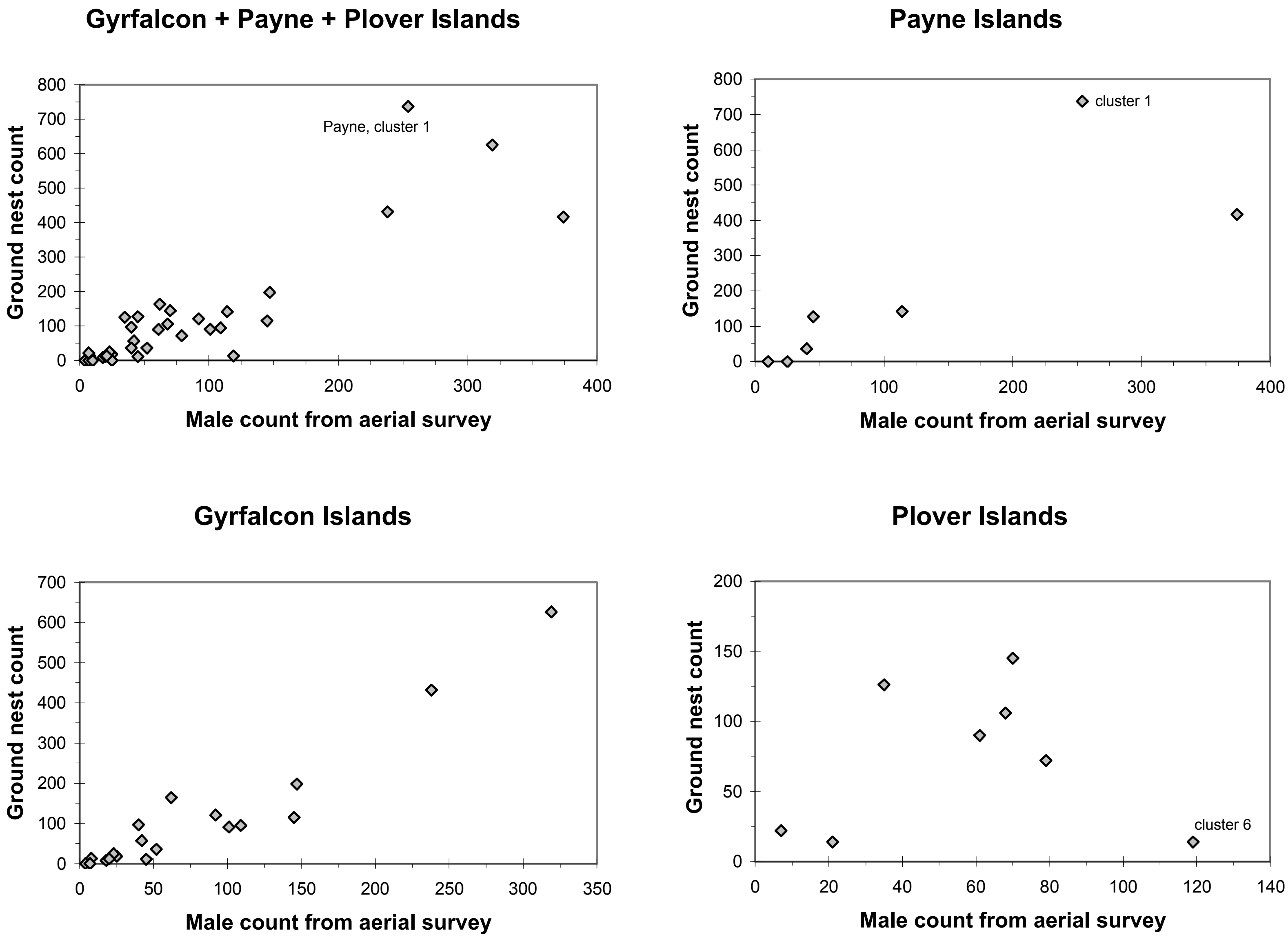


Figure 13. Relationships between aerial and ground surveys

Table VII. Inland colonies survey results in 1980 and 2000

| *Anse de Villiers* area<br>Colonies surveyed both years | 1980<br>Nests | 2000<br>Males | <br>Females | <br>Trend † |
|---|---|---|---|---|
| 1 | 151 | 15 | | -136 |
| 2 | 63 | 28 | 6? | -35 |
| 3 | 24 | 21 | | -3 |
| Total | 238 | 64 | 6? | -174 |

| Virgin Lake area<br>Colonies surveyed both years | 1980<br>Nests | 2000<br>Males | <br>Females | <br>Trend |
|---|---|---|---|---|
| 1 | 92 | 27 | ? | -65 |
| 2 | 9 | 5 | 1 | -4 |
| 3 + 4 + 5 | 36 | 34 | 4 | -2 |
| 6 + 7 + 8 | 78 | 13 | 4 | -65 |
| 9 + 10 | 18 | 30 | 42 | 12 (24) |
| 11 | 70 | 16 | | -54 |
| Total | 303 | 125 | 51 | - 178 (-166) |

| Virgin Lake area<br>“New” colonies | 1980<br>Nests | 2000<br>Males | <br>Females |
|---|---|---|---|
| a * | | 5 | 2 |
| b | | 20 | 12 |
| c | | 25 | |
| d | | 30 | 15 |
| e | | 5 | |
| f | | 2 | 1 |
| g | | 7 | 1 |
| h | | 130 | 2 |
| i | | 7 | 4 |
| j | | 16 | 10 |
| k | | 2 | |
| Total | | 249 | 47 |

| *Étangs Atanirtuut* area<br>Colonies surveyed both years | 1980<br>Nests | 2000<br>Males | <br>Females | <br>Trend |
|---|---|---|---|---|
| 1 | 198 | 0 | 0 | -198 |
| 2 | 0 | 54 | 54 | 54 |
| 3 | 62 | 0 | 0 | -62 |
| 4 | 10 | 0 | 0 | -10 |
| 5 | 13 | 15 | 45 | 2 (32) |
| 6 | 30 | 0 | 15 | -30 (-15) |
| 7 + 8 | 10 | 3 | 12 | -7 (-2) |
| Total | 323 | 72 | 126 | -251 (-197) |

| *Étangs Atanirtuut* area<br>“New” colonies | 1980<br>Nests | 2000<br>Males | <br>Females |
|---|---|---|---|
| a | | 35 | 50 |
| b | | 3 | 5 |
| c | | 21 | 50 |
| d | | 10 | 10 |
| Total | | 69 | 115 |

* New 2000 colonies are identified with a letter while colonies surveyed both years kept the number they had for the 1980 surveys

† Trend is the difference between the 1980 ground nest counts and the 2000 male aerial counts. Between parentheses is the trend calculated with the female count when higher than the male count.

## BLACK GUILLEMOTS

### Results in 2000

We collected very little information about Black Guillemot breeding chronology in Ungava Bay, but the three nests found (one on Payne Islands, two on Eider Islands) contained two eggs each, which is indicative of the incubation stage because it is the maximum clutch size. On Gyrfalcon Islands, six islands were resurveyed on July 8th, approximately 15 days after the first visit (table VIII). On the last visit, 226 guillemots were seen around these islands, which is slightly less than the 234 individuals counted on the first visit. Thus, it was not justified to use a correction ratio for counts of adult Black Guillemots as we did for eider nests. However, adult counts are very variable; the correlation between the two counts for islands surveyed twice in 2000 on Gyrfalcon Islands ($n$=6) was weak ($r$=0.48) and not significant ($p$=0.33).

Table VIII. Repeated surveys of some islands in Gyrfalcon archipelago

| Island | First Survey (June 21st-25th) | Last Survey (July 8th) |
|---|---|---|
| 44 | 18 (24*) | 7 |
| 46 | 0 (24) | 4 |
| 96 | 163 (21) | 80 |
| 97 | 30 (21) | 22 |
| 159 | 0 (21) | - |
| 166 | 0 (21) | - |
| 184 | 22 (25) | 23 |
| 203 | 1 (24) | 90 |
| Total | 234 | 226 |

* exact date is indicated between parenthesis

The Black Guillemot was undeniably the second most abundant bird observed on each archipelago (Common Eider being the most abundant). A total of 2771 birds were noted in 2000 (table IX). The mean number of individuals observed per island varied between 15 (Gyrfalcon Islands) and 30 (Plover Islands). The other two archipelagos (Payne and Eider) had an average of 21 guillemots observed per island. Black Guillemot distribution was widespread on Gyrfalcon Islands, the species being observed around more than half (53%) of the islands that were visited (28 individuals per occupied island, on average). In contrast, the distribution was more clumped at the other three archipelagos, where guillemots were seen around only 24-28% of the islands, but were more numerous on occupied islands (74-125 birds per occupied island).

### Population estimates

It is important to note that while visual counts of adults can be used as population indices and indicate year-to-year population changes, they do not provide accurate estimates of the actual number of breeding pairs. Colony attendance may vary a lot between colonies/areas and it would be risky to use a correction factor ($k$ = number of breeding pairs / visual count of birds) taken from the literature (range 0.10 - 2.70) to estimate true colony size (Cairns 1977, 1979; Ewins 1985; Harris 1989).

Table IX. Distribution patterns of Black Guillemots on the four archipelagos

| | Year | GYRFALCON | PAYNE | PLOVER | EIDER | TOTAL |
|---|---|---|---|---|---|---|
| nb islands visited | 1980 | 98 | 0 | 0 | 43 | 141 |
| | 2000 | 58 | 22 | 21 | 39 | 140 |
| nb occupied islands | 1980 | 36 (36.73%) | - | - | 7 (16.28%) | 43 (30.50%) |
| | 2000 | 31 (53.45%) | 6 (27.27%) | 5 (23.81%) | 11 (28.21%) | 53 (37.86%) |
| nb individuals | 1980 | 2201 | - | - | 1526 | 3727 |
| | 2000 | 858 | 475 | 625 | 813 | 2771 |
| mean nb individuals/ island | 1980 | 22.46 | - | - | 35.49 | 26.43 |
| | 2000 | 14.79 | 21.59 | 29.76 | 20.85 | 19.79 |
| mean nb individuals/ occupied island | 1980 | 61.14 | - | - | 218.00 | 86.67 |
| | 2000 | 27.68 | 79.17 | 125.00 | 73.91 | 52.28 |

We used the Bootstrap method (1000 resampling) to produce population estimate indices (from visual counts) with confidence limits for each archipelago. Estimates for Gyrfalcon and Eider Islands Black Guillemots populations in 2000 are both close to 3000 birds (2988 and 3279, respectively). Population estimates appear to be lower for Payne (1586 individuals) and Plover (1965 birds) archipelagos, which include smaller numbers of islands, but confidence limits are large (figure 14).

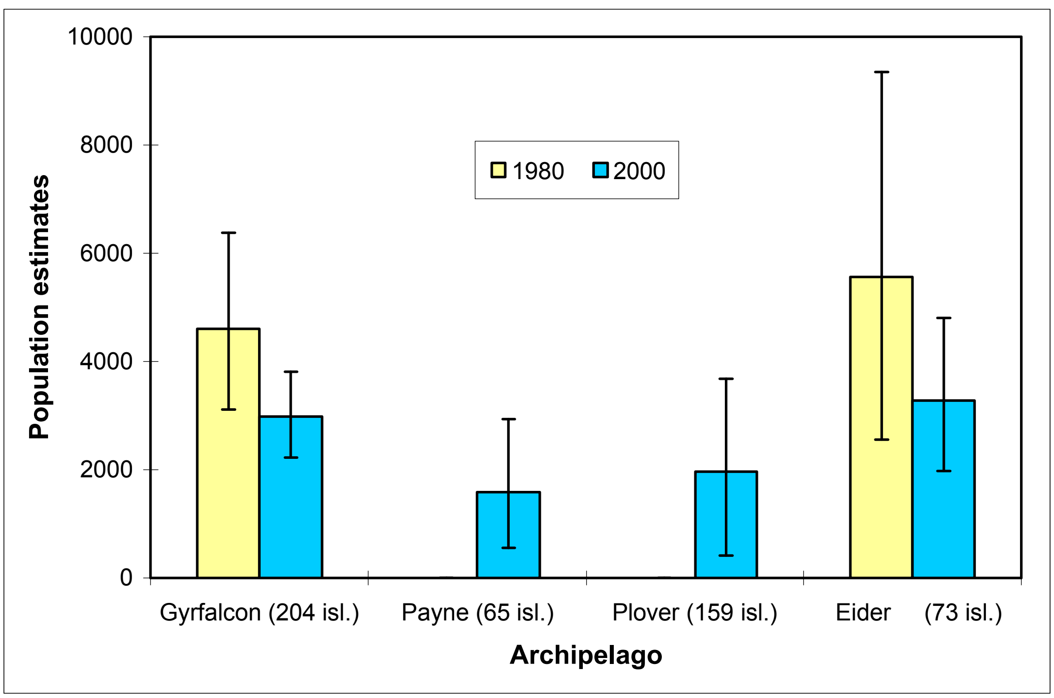


Figure 14. Black Guillemot population estimates for each archipelago

### Trends from 1980 to 2000

In 1980, guillemot counts were not conducted on Payne and Plover archipelagos. Therefore, we can only derive population trends for Gyrfalcon and Eider Islands. Compared to our data taken in 2000, the species appeared more abundant in 1980 with an average of 22 individuals per island (vs. 15 in 2000) on Gyrfalcon Islands, and 35 birds per island on Eider Islands (vs. 21 in 2000). However, the distribution of Black Guillemots seemed more clumped in 1980, with birds being present on a smaller number of islands, but in much larger aggregations (table IX).

If we compare population estimates produced with the Bootstrap method (shown in figure 14), we observe similar declining trends in Black Guillemot numbers on Gyrfalcon and Eider archipelagos between 1980 and 2000. However, due to the large confidence intervals, further analysis is required to clarify if the trends are significant or not.

#### Islands surveyed both in 1980 and 2000

Table X shows that for islands surveyed both in 1980 and 2000, the total number of individuals declined by 56% (from 1679 to 728) and 63% (from 1452 to 541) on Gyrfalcon and Eider Islands respectively. However, Black Guillemot distribution is highly clumped, and the large decreases observed on a few islands between 1980 and 2000 are mostly responsible for the overall trends. In fact, on Gyrfalcon Islands, results from the three islands with the largest number of birds in 1980 (islands #32, 65 and 203) account for 85% of the overall decline between 1980-2000 in this archipelago. The results are even more striking on Eider Islands: 88% of guillemots were gathered around islands #142 and 143 in 1980, and with the exception of the huge drop observed on these islands (from 1282 to 144 individuals), the number of birds seen in the rest of the sample rose from 170 in 1980 to 397 in 2000. On Gyrfalcon Islands, more islands showed declines ($n$=19) than increases ($n$=10) in the number of guillemots between 1980 and 2000, while the opposite was observed on Eider Islands (3 islands with declines vs. 5 islands with increases).

In 2000, Black Guillemots were observed around 22 of the 27 islands where their presence had been noted in 1980 (table X), although with large variations in numbers. After a period of 20 years, this indicates that either natal phylopatry (across generations) is strong, or these islands are more suitable than others for guillemot nesting. Concerning colonization trends, 10 new colonies were noted in 2000 while 5 islands were apparently abandoned between 1980 and 2000.

Results from the generalized linear model showed a significant year effect (chi-square=4.26, $df$=1, $p$=0.039), but no archipelago effect (chi-square=0.98, $df$=1, $p$=0.32) or of the term of interaction (which was therefore excluded from the model). We used the deviance (107.12) divided by the degree of freedom (111) as a measure of fit: the result (0.97), close to one, indicates a well-fitted model.

## GULLS

### Results in 2000

The gulls were mainly represented by the Herring Gull, which constituted 85-90% of the gull community at each archipelago, except maybe on Eider Islands where Great Black-backed and Glaucous Gulls were a little more common (approximately 10% each). An estimated 1582 breeding gulls were distributed rather unevenly, with numbers of gulls per island being a lot

Table X. Paired comparisons between numbers of Black Guillemots observed on islands surveyed in 1980 and 2000

| Gyrfalcon Islands | | | | Eider Islands | | | |
|---|---|---|---|---|---|---|---|
| Island | 1980 | 2000 | Trend | Island | 1980 | 2000 | Trend |
| 31 | 8 | 32 | 24 | 12 | 0 | 0 | 0 |
| 32 | 416 | 1 | -415 | 32 | 0 | 0 | 0 |
| 35 | 84 | 122 | 38 | 36 | 0 | 0 | 0 |
| 36 | 34 | 0 | -34 | 57 | 0 | 0 | 0 |
| 37 | 43 | 37 | -6 | 68 | 0 | 0 | 0 |
| 39 | 0 | 23 | 23 | 69 | 0 | 11 | 11 |
| 40 | 102 | 64 | -38 | 71 | 0 | 0 | 0 |
| 43 | 30 | 10 | -20 | 102 | 0 | 0 | 0 |
| 44 | 96 | 18 | -78 | 114 | 0 | 0 | 0 |
| 46 | 0 | 0 | 0 | 130 | 0 | 18 | 18 |
| 47 | 0 | 12 | 12 | 133 | 2 | 11 | 9 |
| 63 | 0 | 0 | 0 | 142 | 850 | 81 | -769 |
| 65 | 239 | 62 | -177 | 143 | 432 | 63 | -369 |
| 66 | 68 | 26 | -42 | 149 | 0 | 0 | 0 |
| 71 | 35 | 21 | -14 | 141+144 | 74 | 200 | 126 |
| 75 | 0 | 0 | 0 | 151 | 81 | 156 | 75 |
| 85 | 2 | 0 | -2 | 152 | 13 | 1 | -12 |
| 87 | 2 | 1 | -1 | | | | |
| 96 | 195 | 163 | -32 | | | | |
| 97 | 0 | 30 | 30 | | | | |
| 112 | 0 | 12 | 12 | | | | |
| 125 | 0 | 0 | 0 | | | | |
| 130 | 0 | 0 | 0 | | | | |
| 150 | 25 | 3 | -22 | | | | |
| 151 | 0 | 0 | 0 | | | | |
| 159 | 0 | 0 | 0 | | | | |
| 162 | 0 | 12 | 12 | | | | |
| 166 | 0 | 0 | 0 | | | | |
| 169 | 0 | 8 | 8 | | | | |
| 171 | 41 | 37 | -4 | | | | |
| 178 | 6 | 0 | -6 | | | | |
| 179 | 0 | 1 | 1 | | | | |
| 182 | 23 | 10 | -13 | | | | |
| 183 | 8 | 0 | -8 | | | | |
| 184 | 0 | 22 | 22 | | | | |
| 190 | 0 | 0 | 0 | | | | |
| 198 | 0 | 0 | 0 | | | | |
| 203 | 216 | 1 | -215 | | | | |
| 204 | 6 | 0 | -6 | | | | |
| 205 | 0 | 0 | 0 | | | | |
| Sum | 1679 | 728 | -951 | | 1452 | 541 | -911 |
| Islands with rises | | | 10 | | | | 5 |
| Islands with drops | | | 19 | | | | 3 |
| Islands even | | | 11 | | | | 9 |
| Islands re-used | | | 16 | | | | 6 |
| Islands abandoned | | | 5 | | | | 0 |
| New colonies | | | 8 | | | | 2 |

higher on Payne (mean=30) and Plover (mean=20) archipelagos than on Gyrfalcon and Eider Islands (mean of 5 birds per islands at both places). On all four archipelagos, gulls were observed on 50-59% of islands visited. The apparent variation in gull abundance between archipelagos is therefore the result of differences in colony size (the number of gulls per island), colonies being larger (on average) on Payne and Plover Islands (table XI).

Table XI. Distribution patterns of the gulls (*Larus sp.*) on four Ungava Bay archipelagos

| | Year | GYRFALCON | PAYNE | PLOVER | EIDER | TOTAL |
|---|---|---|---|---|---|---|
| nb islands visited | 1980 | 98 | 0 | 0 | 43 | 141 |
| | 2000 | 58 | 22 | 21 | 39 | 140 |
| nb occupied islands | 1980 | 23 (23.47%) | - | - | 11 (25.58%) | 34 (24.11%) |
| | 2000 | 29 (50.00%) | 13 (59.09%) | 12 (57.14%) | 20 (51.28%) | 74 (52.86%) |
| nb individuals | 1980 | 338 | - | - | 171 | 510 |
| | 2000 | 280 | 668 | 420 | 194 | 1562 |
| mean nb individuals/ island | 1980 | 3.45 | - | - | 4.00 | 3.62 |
| | 2000 | 4.83 | 30.36 | 20.00 | 4.97 | 11.16 |
| mean nb individuals/ occupied island | 1980 | 14.70 | - | - | 15.64 | 15.00 |
| | 2000 | 9.66 | 51.38 | 35.00 | 9.70 | 21.11 |

Population estimates with confidence intervals were calculated for each archipelago with the Bootstrap method (1000 resampling). Estimates for Gyrfalcon and Eider Islands gull populations in 2000 are 987 and 777 birds respectively. Even though the other two archipelagos have smaller numbers of islands, population estimates appear slightly higher for Plover Islands (1290 individuals), and much larger for Plover archipelago (2216 birds) (figure 15).

### Trends from 1980 to 2000

The proportion of islands with the presence of gulls doubled between 1980 and 2000 on both Gyrfalcon (23.5% in 1980 vs. 50% in 2000) and Eider Islands (25.6% in 1980 vs. 51.3% in 2000). However, the number of gulls per colony declined at the same time. As a result, gull distribution appears less clumped in 2000, but the mean number of gulls per island (unoccupied islands included) was almost similar in 1980 and 2000 (table XI).

Population estimates are higher in 2000 than in 1980 on both Gyrfalcon and Eider Islands. However, these increases do not appear to be significant considering the range of the confidence intervals, and further analysis is required to clarify the trends.

#### Islands surveyed both in 1980 and 2000

On the 40 islands surveyed in 1980 and 2000 on Gyrfalcon archipelago, more gulls (+55%) and more colonies (+8) were recorded in 2000 (table XII). On Eider Islands, the total number of gulls observed was slightly lower in 2000, even though the number of colonies had increased. More islands showed rises rather than declines in the number of gulls between 1980 and 2000 at both archipelagos. On Gyrfalcon Islands, twelve new colonies were found in 2000 while four islands hosting a colony in 1980 were deserted. The same trend was observed on Eider Islands where four new colonies were noted in 2000, whereas no island featuring gulls in 1980 was abandoned 20 years later.

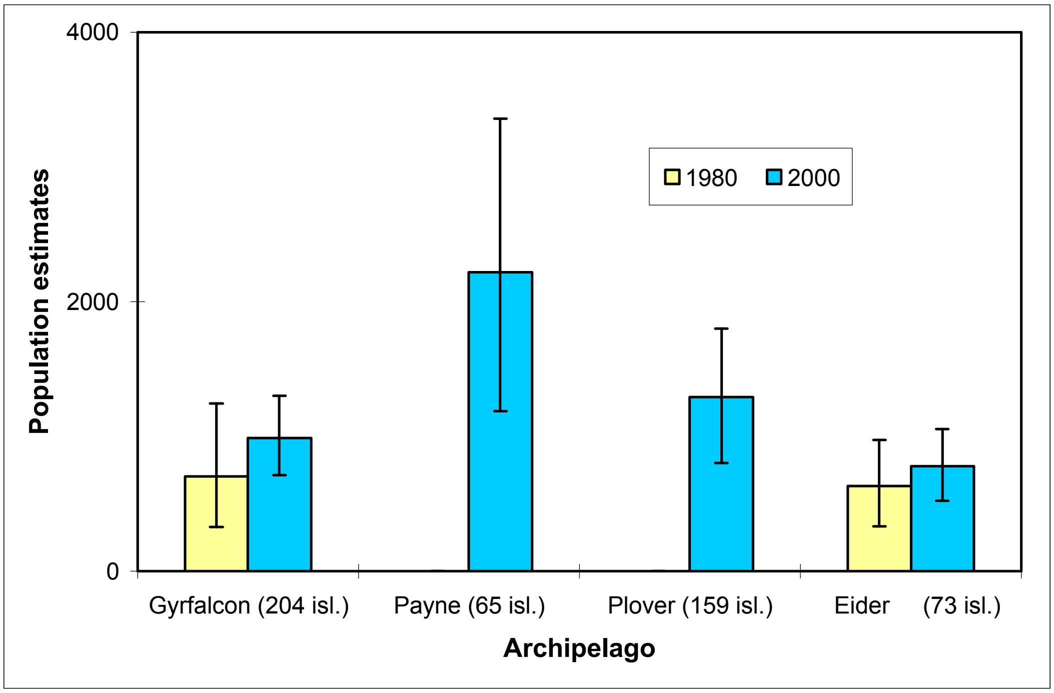


Figure 15. Population estimates of gulls (*Larus sp.*) for each archipelago

As for site fidelity, 11 of the 15 colonies revisited in 2000 on Gyrfalcon Islands were still active. On Eider Islands, gulls were seen in 2000 on all seven islands where they occurred in 1980. The fact that gulls were observed again, twenty years later, on 18 of the 22 islands featuring gulls in 1980 is indicative of quite a strong site fidelity. However, once again, we cannot determine whether it can be attributed to natal phylopatry (across generations) or simply habitat suitability.

Results from the generalized linear model showed a nearly significant year effect (chi-square=3.49, *df*=1, *p*=0.062), but no archipelago effect (chi-square=0.26, *df*=1, *p*=0.61) or of the term of interaction (which was therefore excluded from the model). The deviance (100.04) divided by the degree of freedom (109) was used as a measure of fit, and the result (0.92), close to one, indicated a well-fitted model.

## CANADA GEESE

### Results in 2000

In 2000, Canada Geese nests were found on 40% and 50% of the islands on Gyrfalcon and Payne archipelago, respectively. Up to eight nests were found on a single island, and the average number of nests per occupied island was higher on Payne Islands (mean=2.91) than on Gyrfalcon Islands (mean=1.83). Overall, Canada Geese appeared twice as abundant on Payne Islands than on Gyrfalcon Islands, in terms of mean number of nests per island visited. In contrast, we found no Canada Geese nest on Plover archipelago, and only two on Eider Islands.

Table XII. Paired comparisons: estimated numbers of gulls[1] observed on islands surveyed in 1980 and 2000

| Gyrfalcon Islands | | | | Eider Islands | | | |
|---|---|---|---|---|---|---|---|
| Island | 1980 | 2000 | Trend | Island | 1980 | 2000 | Trend |
| 31 | 0 | 8 | 8 | 12 | 0 | 0 | 0 |
| 32 | 0 | 2 | 2 | 32 | 0 | 8 | 8 |
| 35 | 2 | 7 | 5 | 36 | 0 | 0 | 0 |
| 36 | 4 | 3 | -1 | 57 | 0 | 6 | 6 |
| 37 | 2 | 27 | 25 | 68 | 0 | 0 | 0 |
| 39 | 0 | 5 | 5 | 69 | 0 | 0 | 0 |
| 40 | 0 | 3 | 3 | 71 | 0 | 0 | 0 |
| 43 | 0 | 3 | 3 | 102 | 0 | 16 | 16 |
| 44 | 4 | 11 | 7 | 114 | 6 | 9 | 3 |
| 46 | 0 | 0 | 0 | 130 | 4 | 1 | -3 |
| 47 | 0 | 18 | 18 | 133 | 2 | 3 | 1 |
| 63 | 0 | 0 | 0 | 142 | 6 | 4 | -2 |
| 65 | 26 | 63 | 37 | 143 | 0 | 0 | 0 |
| 66 | 18 | 45 | 27 | 149 | 0 | 2 | 2 |
| 71 | 0 | 2 | 2 | 141+144 | 52 | 10 | -42 |
| 75 | 0 | 0 | 0 | 151 | 12 | 14 | 2 |
| 85 | 2 | 1 | -1 | 152 | 70 | 59 | -11 |
| 87 | 0 | 2 | 2 | | | | |
| 96 | 0 | 0 | 0 | | | | |
| 97 | 22 | 0 | -22 | | | | |
| 112 | 0 | 0 | 0 | | | | |
| 125 | 1 | 0 | -1 | | | | |
| 130 | 0 | 0 | 0 | | | | |
| 150 | 0 | 5 | 5 | | | | |
| 151 | 0 | 4 | 4 | | | | |
| 159 | 0 | 0 | 0 | | | | |
| 162 | 0 | 0 | 0 | | | | |
| 166 | 0 | 0 | 0 | | | | |
| 169 | 0 | 10 | 10 | | | | |
| 171 | 0 | 4 | 4 | | | | |
| 178 | 0 | 0 | 0 | | | | |
| 179 | 2 | 0 | -2 | | | | |
| 182 | 6 | 7 | 1 | | | | |
| 183 | 34 | 0 | -34 | | | | |
| 184 | 10 | 8 | -2 | | | | |
| 190 | 0 | 0 | 0 | | | | |
| 198 | 2 | 11 | 9 | | | | |
| 203 | 4 | 12 | 8 | | | | |
| 204 | 0 | 0 | 0 | | | | |
| 205 | 0 | 0 | 0 | | | | |
| Sum | 139 | 216 | 122 | | 152 | 132 | -20 |
| Islands with rises | | | 20 | | | | 7 |
| Islands with drops | | | 7 | | | | 4 |
| Occupied islands even | | | 0 | | | | 0 |
| Unoccupied islands | | | 13 | | | | 6 |
| Islands re-used | | | 11 | | | | 7 |
| Islands abandoned | | | 4 | | | | 0 |
| New colonies | | | 12 | | | | 4 |

[1]Number of gulls = maximum between number of gull nests×2 and number of gulls observed

Since Payne and Plover archipelagos are very close and seem to offer similar habitats, it is puzzling that no nest was found on Plover archipelago while there were nests on half (11/22) of the islands of Payne archipelago (table XIII).

Table XIII. Distribution patterns of Canada Geese nests on four Ungava Bay archipelagos

| | Year | GYRFALCON | PAYNE | PLOVER | EIDER | TOTAL |
|---|---|---|---|---|---|---|
| nb islands visited | 1980 | 98 | 0 | 0 | 43 | 141 |
| | 2000 | 58 | 22 | 21 | 39 | 140 |
| nb occupied islands | 1980 | 7 (7.14%) | - | - | 2 (4.65%) | 9 (6.38%) |
| | 2000 | 23 (39.66%) | 11 (50.00%) | 0 (0.00%) | 2 (5.13%) | 36 (25.71%) |
| nb nests[1] | 1980 | 12 | - | - | 2 | 14 |
| | 2000 | 42 | 32 | - | 2 | 76 |
| mean nb nests[1]/ island | 1980 | 0.12 | - | - | 0.05 | 0.10 |
| | 2000 | 0.72 | 1.45 | - | 0.05 | 0.54 |
| mean nb nests[1]/ occupied island | 1980 | 1.71 | - | - | 1.00 | 1.56 |
| | 2000 | 1.83 | 2.91 | - | 1.00 | 2.11 |

[1] includes freshly hatched broods

In 2000, population estimates (Bootstrap method) showed that 97% of Canada Geese nests in the study area were distributed on Gyrfalcon and Payne archipelagos, with estimates of 147 and 106 nests respectively. No nest was found on Payne archipelago, whereas an estimate of only 8 nests was calculated for the whole Eider archipelago.

### Trends from 1980 to 2000

On Gyrfalcon islands in 1980, Canada Geese nests were found on only 7 out the 98 islands visited (7.1%), whereas, in 2000, nests were found on approximately 40% of islands (23/58), suggesting a substantial increase in the abundance of the species. In contrast, the proportion of islands occupied by nesting Canada Geese was low on Eider Islands both in 1980 (4.65%) and in 2000 (5.13%). In fact, nesting geese are almost absent from the two northernmost archipelagos, Plover (no nest in 2000) and Eider Islands (2 nests in 1980 and in 2000).

Population estimates on Gyrfalcon Islands (figure 16) show a very large and significant increase in the number of geese nests between 1980 and 2000, while the number of nests remained very low on Eider Islands during the same period.

#### Islands surveyed both in 1980 and 2000

Paired comparisons for islands surveyed in 1980 and 2000 show the same trends. On Gyrfalcon Islands, geese nests were present on a much greater number of islands in 2000 ($n$=19) than in 1980 ($n$=5) (table XIV). Since only five nests were found in 1980 on the islands also surveyed in 2000, data are too scarce to investigate site fidelity (three islands were re-used whereas two islands were abandoned) or temporal trend in mean number of nests per occupied island.

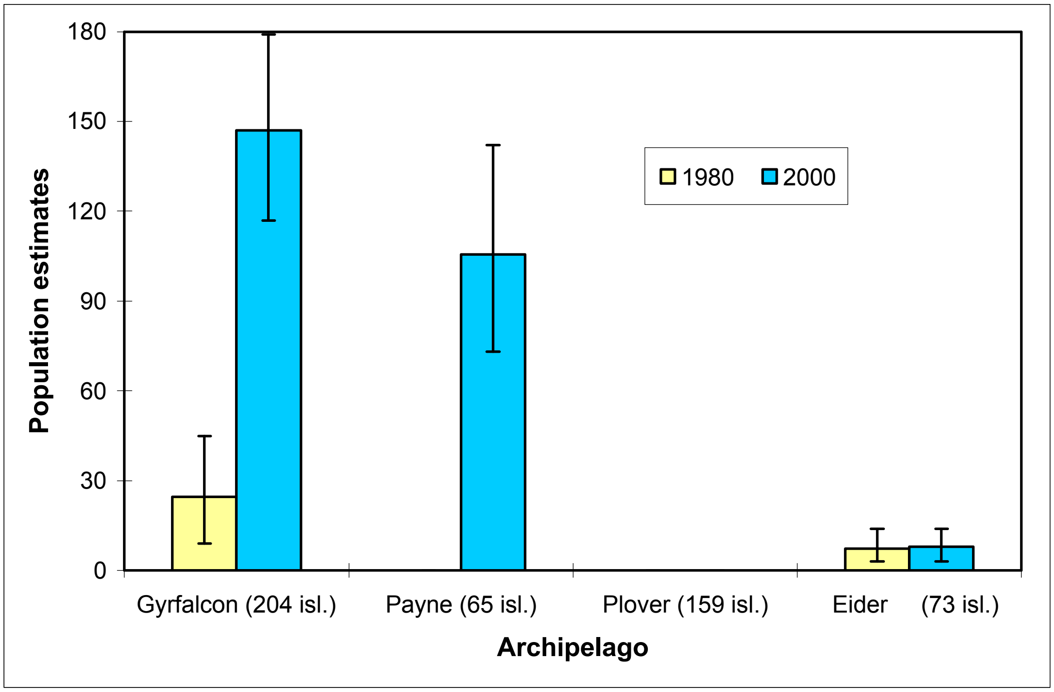


Figure 16. Canada Geese population estimates for each archipelago

The generalized linear model results showed a significant and important year effect (chi-square=12.0, *df*=1, *p*=0.0005) and archipelago effect (chi-square=11.0, *df*=1, *p*=0.0009). The term of interaction had no significant effect and was excluded from the model. We used the Poisson distribution to model the number of Canada Goose nests because it best fitted the data, according to the result of the deviance (94.91) divided by the degree of freedom (109), which was close to one (0.87).

Table XIV. Paired comparisons: estimated numbers of Canada Goose nests observed on islands surveyed in 1980 and 2000

| Gyrfalcon Islands | | | | Eider Islands | | | |
|---|---|---|---|---|---|---|---|
| Island | 1980 | 2000 | Trend | Island | 1980 | 2000 | Trend |
| 31 | 1 | 0 | -1 | 12 | 0 | 0 | 0 |
| 32 | 0 | 1 | 1 | 32 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 36 | 0 | 1 | 1 |
| 36 | 1 | 2 | 1 | 57 | 0 | 0 | 0 |
| 37 | 0 | 4 | 4 | 68 | 0 | 0 | 0 |
| 39 | 0 | 1 | 1 | 69 | 0 | 0 | 0 |
| 40 | 0 | 2 | 2 | 71 | 0 | 0 | 0 |
| 43 | 0 | 0 | 0 | 102 | 0 | 0 | 0 |
| 44 | 0 | 2 | 2 | 114 | 0 | 0 | 0 |
| 46 | 0 | 1 | 1 | 130 | 0 | 0 | 0 |
| 47 | 0 | 0 | 0 | 133 | 0 | 0 | 0 |
| 63 | 1 | 5 | 4 | 142 | 0 | 0 | 0 |
| 65 | 0 | 0 | 0 | 143 | 0 | 0 | 0 |
| 66 | 0 | 0 | 0 | 149 | 0 | 0 | 0 |
| 71 | 0 | 0 | 0 | 141+144 | 0 | 0 | 0 |
| 75 | 0 | 0 | 0 | 151 | 0 | 0 | 0 |
| 85 | 0 | 1 | 1 | 152 | 0 | 0 | 0 |
| 87 | 0 | 0 | 0 | | | | |
| 96 | 0 | 0 | 0 | | | | |
| 97 | 0 | 0 | 0 | | | | |
| 112 | 0 | 0 | 0 | | | | |
| 125 | 0 | 3 | 3 | | | | |
| 130 | 0 | 1 | 1 | | | | |
| 150 | 0 | 1 | 1 | | | | |
| 151 | 0 | 0 | 0 | | | | |
| 159 | 0 | 0 | 0 | | | | |
| 162 | 0 | 4 | 4 | | | | |
| 166 | 1 | 0 | -1 | | | | |
| 169 | 0 | 1 | 1 | | | | |
| 171 | 0 | 2 | 2 | | | | |
| 178 | 1 | 1 | 0 | | | | |
| 179 | 0 | 1 | 1 | | | | |
| 182 | 0 | 0 | 0 | | | | |
| 183 | 0 | 0 | 0 | | | | |
| 184 | 0 | 1 | 1 | | | | |
| 190 | 0 | 0 | 0 | | | | |
| 198 | 0 | 0 | 0 | | | | |
| 203 | 0 | 3 | 3 | | | | |
| 204 | 0 | 0 | 0 | | | | |
| 205 | 0 | 0 | 0 | | | | |
| Sum | 5 | 37 | 32 | | 0 | 1 | 1 |
| Islands with rises | | | 18 | | | | 1 |
| Islands with drops | | | 2 | | | | 0 |
| Occupied islands even | | | 1 | | | | 0 |
| Unoccupied islands | | | 19 | | | | 16 |
| Islands re-used | | | 3 | | | | - |
| Islands abandoned | | | 2 | | | | - |
| New colonies | | | 16 | | | | 1 |

# DISCUSSION

## EIDERS

### Population trends

Paired comparisons indicate an important increase on Gyrfalcon Islands, but 82% of the increase comes from only three islands. However, more islands showed declines in the number of eider nests rather than increases and nine colonies were abandoned. The large increases seem restricted to a few islands since no other important colony (not already included in the sample) was found even if we flew over most of the archipelago. It is clear there were important changes in the distribution of nesting eiders among islands. Eiders have concentrated on some islands at the expense of many others and it is probable that the increase in paired comparisons reflects those changes more than a real population increase. After all, if the population had nearly doubled as indicated by paired comparisons, the number of nests should have increased on most colonies surveyed both years.

Similarly, 76% of the total increase observed with paired comparisons comes from three islands on Payne Islands, and 85% of the increase from a single island on Plover Islands. Large increases also seem limited to those few islands because no other important colony was found while flying over most of these archipelagos. However, the increase in Payne Islands is more convincing with 10 islands with increases on a total of 13 islands. However, results from paired comparisons on these archipelagos are difficult to interpret and compare to population estimates considering the small sample size. Furthermore, we are not sure how representative the 1980 baseline data is on those two archipelagos because we have no information on survey dates, clutch sizes and other data that would have given information about the breeding season (see below for more details).

Paired comparisons of islands with most nests in 1980 were based on the hypothesis that this eider population would be highly phylopatric to specific islands, as observed in the St. Lawrence River. Considering that phylopatry to nesting islands was not as strong as expected, population estimates probably give a better indication of population trends than paired comparisons. On the other hand, since the largest increases seem to have occurred on islands included in the sample stratum 1 (which had a weight of only 1.0 in the calculation of the population estimate), it is also possible that population estimates underestimated the increase. Clearly, a better understanding of the factors influencing the use of specific islands by eiders would help in the design of more efficient monitoring programs.

Furthermore, differences in timing in regard to nesting chronology in 1980 and 2000 complicate the interpretation for most archipelagos. Timing was good in 1980 on Gyrfalcon Islands, but the survey was conducted approximately a week too early in 2000. Therefore, some eiders had not yet completed or even initiated laying, causing an underestimation of the real population level. A correction ratio was calculated in order to compensate for this bias. It may be partly inaccurate because it is based on the resurvey of only eight islands. Nevertheless, we believe it gives a better picture of this archipelago's population level than the non-corrected numbers. In 2000, the timing was good on Payne and Plover archipelagos, but we have no information on the timing of the 1980 survey and on the state of the breeding chronology. However, an Inuit met in Kangirsuk, who participated in the 1980 surveys, told us that Plover Islands were reached by skidoos, indicating that the ice was still covering the survey area. If this is true, this suggests that the surveys were performed too early in the breeding season and population levels were most probably underestimated on Plover Islands in 1980, and maybe also on Payne Islands.

We registered an important drop in the number of nests on Eider archipelago from 1980 to 2000. High predation rate, low clutch size, and late breeding on this archipelago indicate a poor breeding year (Robertson and Gilchrist 1998). The aerial survey showed a lower nests / males ratio than on the other archipelagos, suggesting there could have been twice as many more breeding couples than nests counted. From the air, we saw many flocks of males and flocks of females instead of pairs, which is an indication that those birds had given up on breeding in this particular year, probably because it was too late in the breeding season. Coulson (1984) mentions that up to 65% of the adults that have previously bred can fail to nest on a bad breeding season. In a similar case, there would have been three times as many couples in 2000 on Eider Islands than our population estimate indicates. However, even if that optimistic hypothesis was confirmed, it would still represent less than half of the 1980 population level. An important decline in the eider population probably occurred on Eider archipelago, but another survey would be urgently needed to confirm and clarify this trend.

A few Inuit met in Aupaluk (Gyrfalcon Islands) and Kangirsuk (Payne and Plover Islands) believed that the eider population increased since 1980 and some commented more precisely that the increase started only a few years after 1980. We don't know however if this feeling is based on a global view of the whole archipelagos or only on the colonies with the highest counts that increased in the last 20 years. In Quaqtaq, some Inuit confirmed that the numbers of nesting eiders had dropped on Eider Islands. Their feeling was that eiders had moved elsewhere, including toward inland colonies.

We monitored an important decline on the inland colonies surveyed in 1980, but this result is difficult to interpret. The extent and location of inland colonies is not fully known and it is not possible to assess if a real decline occurred or if eiders simply moved to other undiscovered inland colonies. Moreover, the decline is based on the comparison of nest counts in 1980 and from male aerial counts in 2000. It has been reported that eiders commute daily between the inland nesting locations and the coastal feeding areas used on the falling tide (Nakashima 1986). This possibly makes single aerial counts a poor indicator of the nesting population on an inland colony.

This study emphasizes the difficulty of obtaining clear trends by comparing only two years, especially with northern eider populations. There can be considerable year to year variation in the number and distribution of nesting eiders within colonies (Coulson 1984; Bjorn and Erikstad 1994). It might also be difficult to get a perfect timing between surveys and breeding chronology in all archipelagos in the same year. Furthermore, with such a data distribution (a few islands with large numbers of eiders and many islands with low numbers), samples can sometimes deviate from the real population levels if the sample size is not large enough. The 1980 and 2000 data will have to be re-examined to determine optimal sample sizes for future monitoring surveys.

According to a population model developed for the *S. m. borealis* subspecies, a drastic decline was expected due to the over harvesting occurring in Greenland (Gilchrist *et al.* 1999; Gilliland *et al.* submitted). Assuming that the trends observed are accurate, this could possibly imply that the eiders breeding on Eider archipelago winter in areas with strong hunting pressures, while the eiders breeding in the three other archipelagos winter in different areas with lower hunting pressures. This is a plausible deduction because eiders wintering in south-western Greenland split in two major groups: those wintering in coastal waters where hunting is important and those wintering inside fjords where hunting pressure is lower (G. Gilchrist, pers. comm.). Other surveys and research studies are needed to elucidate this question. Satellite telemetry is also needed to determine the wintering location of the eiders nesting in Ungava Bay.

### Breeding biology

The uncorrected mean clutch sizes found during the 2000 surveys were below those reported in the Ungava Bay 1980 surveys and those reported for the *borealis* subspecies in other areas (table XV). The corrected mean clutch sizes calculated only with complete clutches on Gyrfalcon and Payne Islands in 2000 (table V) are similar to those reported in other studies (table XV), but complete clutch sizes on Plover and Eider archipelagos are still the smallest reported for this subspecies. The *sedenteria* subspecies produces larger clutches than *borealis*. This is thought to be a consequence of its bigger body size (Freeman 1970).

Breeding phenology was very similar in 2000 and 1980 on Gyrfalcon archipelago (table XV). However, the estimated laying and hatching dates were almost two weeks later on Eider Islands in 2000 compared to 1980. Small clutch size and late breeding as observed in 2000 on Eider archipelago are indicative of a poor breeding season (Coulson 1984; Robertson and Gilchrist 1998). Low temperatures at the normal onset of egg-laying (Milne 1974) and depredation by foxes (Nakashima 1986) are causes of poor breeding. With the exception of Eider archipelago, earliest dates of laying (beginning of June) and hatching (beginning of July) match quite closely with the reported dates from other studies on northern Canadian eider populations (table XV).

Chapdelaine *et al.* (1986) did not find strong correlations between the number of nests and the island's size in Ungava Bay in 1980. Eider ($r$=0.49) and Payne ($r$=0.39) archipelagos were the only two with fair correlations. In 2000, we had good correlations for Payne and Plover Islands, but our sample sizes were small. Forthcoming surveys should confirm whether or not this pattern stands. Other studies report that eiders prefer to nest on small islands (Schmutz *et al.* 1983; Barry 1986; Nakashima 1986) rather than on large islands which can support foxes throughout the summer. Nakashima and Murray (1988) point out more precisely that the islands with an area greater than 500 ha are generally avoided.

Barry (1986) adds that eiders nest near marine feeding areas that remain ice-free during their whole reproduction period. Moreover, Nakashima and Murray (1988) report that eiders begin nesting only when there is no ice left around the nesting islands, because the ice can be used as a bridge by foxes. They also add that there are usually more nests and eggs on islands around which ice melts first whereas islands bounded in ice are avoided. This is consistent with our observations on Gyrfalcon Islands where few nests were found in the middle of the archipelago where sea water was still solidly frozen. The same pattern was observed on Eider Islands, probably for the same reason. However, we did not find a relationship between the islands' location and nesting densities on Payne and Plover archipelagos because islands are not clumped and probably get free of ice at the same time.

Table XV. Clutch size and breeding phenology reported in other studies in northern Canada

| *Study, area, subspecies* | *Location, year* | *Clutch size* | *Breeding phenology* laying | hatching |
|---|---|---|---|---|
| This study<br>Ungava Bay | Gyrfalcon Islands, 2000 | 2.58 ± 1.14 | June 3 - 25 | July 2 - 24 |
| | Payne Islands, 2000 | 2.91 ± 1.08 | June 1 - 28 | June 30 - July 27 |
| | Plover Islands, 2000 | 2.69 ± 1.03 | June 5 - 30 | July 4 - 29 |
| | Eider Islands, 2000 | 2.00 ± 1.09 | June 26 - July 5 | July 24 - August 3 |
| (Chapdelaine *et al.* 1986)<br>Ungava Bay [b] | Gyrfalcon Islands., 1980 | 3.57 | Began June 5 | Began July 2 |
| | Eider Islands, 1980 | 3.19 | Began June 14 | Began July 12 |
| (Cooch 1965)<br>Cape Dorset area, NWT [b] | West Foxe Islands, 1955 | 3.36 | Began June 19 | July 19 - Aug. 13 |
| | West Foxe Islands, 1956 | 3.44 | | June 23 - Aug. 16 |
| (Cooch 1986)<br>Cape Dorset area, NWT [b] | West Foxe Islands, 1976 | 3.11 | | |
| (Cornish and Dickson 1997)<br>Northwest Territories [n] | Western Victoria Island, 1992 | 3.93 ± 1.55 | | |
| | Western Victoria Island, 1993 | 3.94 ± 1.48 | | |
| | Banks Islands, 1993 | 5.23 ± 2.42 | | July 5 - 9 |
| (Freeman 1970)<br>Hudson Bay [s] | Belcher Islands, 1960 | 4.48 | First week of June - first week of July | |
| (Nakashima and Murray 1988)<br>Hudson Bay [s] | Long Island Sound, 1985 | 5.6 | | |
| | Nastapoka Islands, 1985 | 4.1 | | Began 1 July 1 |
| | Salikuit Islands, 1985 | 4.4 | | |
| | North Belcher Is., 1985 | 4.0 | | |
| | Sleeper Islands, 1985 | 4.3 | | Began July 3 |
| | Koktac River region, 1985 | 4.8 | | Began July 11 |
| (Prach *et al.* 1986)<br>High Arctic (Hell Gate - Cardigan Strait area) [b] | St. Helena Island, 1980 | 2.72 ± 0.99 | | |
| | St. Helena, Calf, and Devil Islands, 1981 | 3.30 ± 0.98 | June 6 - July 11 (was an early year) | |
| (Robertson 1995)<br>Northern Manitoba [s] | La Pérouse Bay, 1991 | 4.4 ± 0.8 | May 26 - June 11 | |
| | La Pérouse Bay, 1992 | 3.5 ± 0.6 | June 4 - 29 | |
| | La Pérouse Bay, 1993 | 4.4 ± 0.9 | May 25- June 16 | |
| (Robertson and Gilchrist 1998)<br>Hudson Bay (Belcher Is.) [s] | S. Flaherty, S. Churcill, and Sleeper Islands, 1997 | 4.4 ± 1.0 | Began mid to late June | Began in third week of July |
| | Split and Laddie Is., 1997 | 4.0 ± 1.1 | | |

*b* = *borealis* subspecies, *n* = *nigra* subspecies, *s* = *sedenteria* subspecies

Phylopatry to nesting islands was not as strong as expected. While some islands seem to be rarely or never used for breeding (few or no old nests, lack of appropriate vegetation), nesting densities appeared to change among suitable islands, possibly in response to ice conditions and the presence of predators. For example, Bjorn and Erikstad (1994) found considerable differences in the density of breeding eiders among colonies in two different years due to different ice conditions.

## Aerial survey

We had good correlations between the aerial surveys and ground counts on Gyrfalcon Islands. However, correlations were not as strong on Payne and Plover due to outliers and smaller sample sizes. For these two archipelagos, it would be necessary to survey more islands on the ground to get a more precise ratio. Also, the ratio varies from archipelago to archipelago and/or according to the timing of the breeding season, making it mandatory to survey a large number of islands on the ground in every archipelago, every year an aerial survey would be conducted. The ground survey has the advantage of collecting valuable information such as clutch size, predation rate, and breeding phenology. On the other hand, the aerial survey accuracy is less influenced by years of low breeding, but is more difficult to replicate from year to year. However, the results suggest a good potential to monitor population trends using aerial surveys.

### BLACK GUILLEMOTS

The total Black Guillemot population in the four archipelagos visited in 2000 was estimated at 9818 individuals. Given that the ratio « number of breeding pairs / individual observed » is extremely variable across study sites, but often close to or above 1.0 (Cairns 1977, 1979; Ewins 1985; Harris 1989), 10,000 breeding pairs can be considered as a realistic if not conservative population estimate for the whole study area.

The statistical analysis along with population estimates and mean number of birds observed per island indicate a decline in Black Guillemot numbers on Gyrfalcon and Eider Islands between 1980 and 2000. However, guillemot distribution appeared more spread out in 2000 than in 1980, i.e. guillemots were reported on a higher proportion of islands on both archipelagos in 2000.

### GULLS

The total “gull” population in the four archipelagos was estimated at 5270 individuals in 2000. The Herring Gull was the most common species, representing 80-90% of the gulls. Gulls were most abundant on Payne Islands, followed by Plover Islands.

Compared to 1980, the percentage of islands with gulls was twice as high in 2000, but the number of birds per colony was lower. Despite this scattering of gull distribution, the statistical analysis and the mean number of gulls per island suggest that the number of gulls went up slightly but significantly between 1980 and 2000 on Gyrfalcon and Eider Islands.

### CANADA GEESE

The total Canada Goose population in 2000 was estimated at 261 pairs distributed mostly on Gyrfalcon (147 pairs or 56%) and Payne (106 pairs or 41%) archipelagos. We estimated that eight pairs were breeding on Eider Islands, while no nests were found on Plover Islands. The latter result is somewhat surprising given the proximity and apparent habitat similarity between Plover and Payne archipelagos.

No trend was detected on Eider Islands, as Canada Geese were nearly absent from the archipelago on both years. In contrast, the number of Canada Geese nests has increased undeniably on Gyrfalcon Islands, and particularly, nests were found on a much larger proportion of islands in 2000. In fact, the population estimate for Gyrfalcon Islands was six times higher in 2000 than in 1980.

# RECOMMENDATIONS FOR FUTURE MONITORING AND RESEARCH

## EIDERS

The aerial surveys yielded interesting results, but further surveys are needed to refine the technique. A mixed protocol with complete coverage of the archipelagos by aerial surveys conducted early in the breeding season combined with ground surveys on a sample of islands in each archipelago, could be an interesting option to get population estimates and information on nesting biology (clutch sizes, predation) and chronology.

Regarding ground surveys, the 2000 sample size appeared to be adequate for the nest count on Gyrfalcon Islands as indicated by fairly low coefficient of variation (12.7%) and confidence limits. Coefficient of variation (11.5%) and confidence limits were also pretty good for Payne archipelago, but the sample size should probably be increased to reduce the impact of possible outliers in future surveys. A larger sample size is definitely needed for Plover Islands, because the coefficient of variation (42.0%) and confidence limits were too large. Another survey would be needed on Eider Islands to confirm the trend and determine the optimal sample size. In order to be better prepared in case a survey is conducted too early in the breeding season, as on Gyrfalcon Islands in 2000, it would be important to determine the number of islands to resurvey later in the breeding season to get a good correction ratio. This study also demonstrated the importance of the timing of the surveys in regard to breeding chronology.

Only long term and regular monitoring can yield reliable information on population trends. Trends based on surveys from only two different years can be uncertain because bad timing between survey and breeding chronology or poor breeding conditions can affect the results for one or both years.

To help manage this important resource for Inuit communities, it would be very helpful to better know the affiliations between breeding areas, migration routes and wintering areas. This could be accomplished through banding and satellite tracking. Surveys and studies would also have to delineate the brood-rearing and molting areas. We would then get a better understanding of the important areas for the *borealis* subspecies as well as the areas where they face the most important threats.

## OTHER AQUATIC BIRDS

Gathering data on breeding Canada Goose, Black Guillemots, and gulls did not impair our survey, and it provided valuable information on population trends for those species. Therefore, we recommend that future eiders surveys include surveys of nesting Canada Goose, Black Guillemots, and gulls.

Unfortunately, we don't have any explanations for the trends that were detected, due to a lack of other biological information on those northern populations. This confirms the need for more frequent and better surveys to confirm these population trends, and for research studies to identify the causes underlying the trends.

# LITTERATURE CITED


Allison, P. D. 1999. Logistic regression using the SAS system: theory and application. SAS Institute Inc., Cary, NC, vi + 288 pp.

Barry, T. W. 1986. Eiders of the western Canadian Arctic, pp. 74-80 *in* Reed, A., ed. Eider ducks in Canada. Canadian Wildlife Service, Ottawa. Report Series No. 47, 177 pp.

Bjorn, T. H., and K. E. Erikstad. 1994. Patterns of intraspecific nest paratism in the High Arctic common eider (*Somateria mollissima borealis*). Canadian Journal of Zoology, 72(6): 1027-1034.

Cairns, D. 1977. The use of visual counts to estimate breeding populations of hole-nesting auks. Unpublished manuscript, Université Laval, Sainte-Foy, 15 pp.

Cairns, D. 1979. Censusing hole-nesting auks by visual counts. Bird-Banding, 50: 358-364.

Caswell, H. 1989. Matrix population models: construction, analysis, and interpretation. Sinauer Associates Inc., Sunderland, Massachusetts, 328 pp.

Chapdelaine, G., A. Bourget, W. B. Kemp, D. J. Nakashima, and D. J. Murray. 1986. Population d'Eider à duvet près des côtes du Québec septentrional, pp. 39-50 *in* Reed, A., ed. Eider ducks in Canada. Canadian Wildlife Service, Ottawa. Report Series No. 47, 177 pp.

Cochran, W. G. 1977. Sampling techniques, 3rd ed. John Wiley & Sons, New York, xvi + 428 pp.

Cooch, F. G. 1965. The breeding biology and management of the Northern Eider (*Somateria mollissima borealis*) in the Cape Dorset area, Northwest Territories. Canadian Wildlife Service, Ottawa, 68 pp.

Cooch, F. G. 1986. The number of nesting Northern Eiders on the West Foxe Islands, NWT, in 1956 and 1976, pp. 114-118 *in* Reed, A., ed. Eider ducks in Canada. Canadian Wildlife Service, Ottawa. Report Series No. 47, 177 pp.

Cornish, B. J., and D. L. Dickson. 1997. Common Eiders nesting in the western Canadian Arctic, pp. 40-50 *in* Dickson, D. L., ed. King and Common eiders of the Western Canadian Arctic. Canadian Wildlife Service, Ottawa. Occasional Paper No. 94, 75 pp.

Coulson, J. C. 1984. The population dynamics of the Eider Duck *Somateria mollissima* and evidence of extensive non-breeding by adult ducks. Ibis, 126: 525-543.

Dunbar, M. J. 1966. The sea waters surrounding the Québec-Labrador peninsula. Cahiers de géographie du Québec, 10(19): 13-23.

Environment Canada. 1982. Canadian climate normals, temperature and precipitation 1951-1980, vol. 5: Québec. Environment Canada, Atmospheric Environment Service, 216 pp.

Ewins, P. J. 1985. Colony attendance and censusing of Black Guillemots *Cepphus grylle* in Shetlands. Bird Study, 32: 176-185.

Freeman, M. M. R. 1970. Observations on the seasonal behaviour of the Hudson Bay Eider (*Somateria mollissima sedentaria*). Canadian Field-Naturalist, 84: 145-153.

Gilchrist, H. G., S. Gilliland, J.-P. L. Savard, and F. Merkel. 1999. Management and conservation of marine bird population shared by Greenland and Canada. Result from a strategic planning meeting held in Nuuk, Greenland, April 1999, Unpublished Report, Canadian Wildlife Service, 20 pp.

Gilliland, S., H. G. Gilchrist, R. F. Rockwell, G. J. Robertson, J.-P. L. Savard, F. Merkel, and A. Mosbech. submitted. Evaluating the sustainability of fixed-number harvest of northern Common Eiders in Greenland and Canada. Submitted to the Journal of Wildlife Management.

Gouvernement du Québec. 1983. Le nord du Québec: profil régional. Gouvernement du Québec, Ministère des communications, Direction générale des publications gouvernementales et Service des communications de l'Office de planification et de développement du Québec, xi + 184 pp.

Groupe de travail sur les écorégions. 1989. Régions écoclimatiques du Canada : première approximation. 0-662-95193-X, Environnement Canada, Service canadien de la faune, Direction du développement durable, Ottawa, vii + 188 pp.

Guignion, D. L. 1967. A nesting study of the Common Eider (*Somateria mollissima dresseri*) in the St. Lawrence estuary. M.Sc. Thesis, Université Laval, Sainte-Foy, xi + 131 pp.

Harris, M. P. 1989. Variation in the correction factor used for converting counts of individual Guillemots *Uria aalge* into breeding pairs. Ibis, 131: 85-93.

Manly, B. F. J. 1997. Randomization, Bootstrap and Monte Carlo methods in biology, 2nd ed. Chapman & Hall, New York, xix + 399 pp.

Milne, H. 1974. Breeding numbers and reproductive rate of eiders at the Sands of Forvie National Nature Reserve, Scotland. Ibis, 116: 135-154.

Nakashima, D. J. 1986. Inuit knowledge of the ecology of the Common Eider in northern Quebec, pp. 102-113 *in* Reed, A., ed. Eider ducks in Canada. Canadian Wildlife Service, Ottawa. Report Series No. 47, 177 pp.

Nakashima, D. J., and D. J. Murray. 1988. The Common Eider (*Somateria mollissima sedentaria*) of eastern Hudson Bay: a survey of nest colonies and Inuit ecological knowledge. 0-921652-02-X, Makivik Corporation, Research Department, xxiv + 174 pp.

Prach, R. W., A. R. Smith, and A. Dzubin. 1986. Nesting of the Common Eider near the Hell Gate - Cardigan Strait polynya, 1980-81, pp. 127-135 *in* Reed, A., ed. Eider ducks in Canada. Canadian Wildlife Service, Ottawa. Report Series No. 47, 177 pp.

Robertson, G. J. 1995. Annual variation in common eider egg size: effects of temperature, clutch size, laying date, and laying sequence. Canadian Journal of Zoology, 73: 1579-1587.

Robertson, G. J., and H. G. Gilchrist. 1998. Evidence of population declines among Common Eiders breeding in the Belcher Islands, Northwest Territories. Arctic, 51(4): 378-385.

Robertson, G. J., M. D. Watson, and F. Cooke. 1992. Frequency, timing and costs of intraspecific nest parasitism in the Common Eider. Condor, 94: 871-879.

Schmutz, J. K., R. J. Robertson, and F. Cooke. 1983. Colonial nesting of the Hudson Bay eider duck. Canadian Journal of Zoology, 61: 2424-2433.

Stokes, M. E., C. S. Davis, and G. G. Koch. 2000. Categorical data analysis using the SAS System. SAS Institute Inc., Cary, NC, viii +626 pp.

Suydam, R., L. Quakenbush, M. Johnson, J. C. George, and J. Young. 1997. Migration of King and Common eiders past Point Barrow, Alaska, in spring 1987, spring 1994, and fall 1994, pp. 21-28 *in* Dickson, D. L., ed. King and Common eiders of the Western Canadian Arctic. Canadian Wildlife Service, Ottawa. Occasional Paper No 94, 75 pp.

# APPENDICES

Appendix 1. Common Eider nest data

| | | | | nb eggs per nest | | | | | | | nb nests | mean | std- | other nests / broods | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Archipelago | Island # | Stratum | Date | 1 | 2 | 3 | 4 | 5 | 6 | 7 | with eggs | clutch size | dev. | empty[1] | predated[2] | ?[3] | N total | old bowls[4] |
| GYR | 125 | 1 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 112 | 1 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 50 |
| GYR | 96 | 1 | 21-06-00 | 1 | | | | | | | 1 | 1.00 | | | | | 1 | 56 |
| GYR | 97 | 1 | 21-06-00 | 1 | 2 | 2 | | | | | 5 | 2.20 | | | | | 5 | 55 |
| GYR | 162 | 1 | 21-06-00 | 12 | 4 | 1 | | | | | 17 | 1.35 | | | | | 17 | 148 |
| GYR | 166 | 1 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 134 |
| GYR | 167 | 3 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 1 |
| GYR | 132 | 3 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 133 | 3 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 130 | 2 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 2 |
| GYR | 136 | 3 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 198 | 2 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 159 | 1 | 21-06-00 | | 1 | | | | | | 1 | 2.00 | | | | | 1 | 15 |
| GYR | 111 | 3 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 103 | 3 | 21-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 5 |
| GYR | 201 | 3 | 21-06-00 | 7 | 4 | | 1 | | | | 12 | 1.58 | | | | | 12 | 45 |
| GYR | 189 | 3 | 23-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 79 |
| GYR | 84 | 3 | 23-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 23 |
| GYR | 36 | 1 | 23-06-00 | 7 | | 1 | | | | | 8 | 1.25 | | | 4 | | 12 | 300 |
| GYR | 37 | 1 | 23-06-00 | 24 | 17 | 9 | 1 | | | | 51 | 1.75 | | | 14 | | 65 | 406 |
| GYR | 190 | 1 | 23-06-00 | 2 | 2 | | | | | | 4 | 1.50 | | | 4 | | 8 | 77 |
| GYR | 3 | 3 | 23-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 10 |
| GYR | 35 | 1 | 23-06-00 | 6 | 14 | 1 | | | | | 21 | 1.76 | | 1 | 2 | | 24 | 195 |
| GYR | 31 | 1 | 23-06-00 | 24 | 16 | 12 | 4 | | | | 56 | 1.93 | | 6 | 2 | | 64 | 212 |
| GYR | 32 | 1 | 23-06-00 | 8 | 2 | 1 | | | | | 11 | 1.36 | | 1 | | | 12 | 62 |
| GYR | 88 | 3 | 23-06-00 | 2 | 1 | 1 | | | | | 4 | 1.75 | | | | | 4 | 8 |
| GYR | 87 | 2 | 23-06-00 | 1 | 2 | | | | | | 3 | 1.67 | | | | | 3 | 4 |
| GYR | 85 | 1 | 23-06-00 | 7 | 4 | 4 | | | | | 15 | 1.80 | | | | | 15 | 81 |
| GYR | 203 | 1 | 24-06-00 | 43 | 51 | 86 | 60 | 5 | | | 245 | 2.73 | | 8 | 27 | | 280 | 224 |
| GYR | 43 | 1 | 24-06-00 | 48 | 57 | 86 | 63 | 6 | | | 260 | 2.70 | | 4 | 26 | | 290 | 176 |
| GYR | 121 | 3 | 24-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 39 | 2 | 24-06-00 | 3 | 8 | 2 | 5 | | | | 18 | 2.50 | | | 9 | | 27 | 69 |
| GYR | 71 | 1 | 24-06-00 | 5 | 6 | 1 | | | | | 12 | 1.67 | | | | | 12 | 13 |
| GYR | 67 | 3 | 24-06-00 | 8 | 11 | 11 | 4 | | | | 34 | 2.32 | | 1 | 4 | | 39 | 144 |
| GYR | 65 | 1 | 24-06-00 | 1 | 2 | 8 | 5 | | 2 | | 18 | 3.39 | | | | | 18 | 30 |
| GYR | 63 | 1 | 24-06-00 | 24 | 37 | 64 | 41 | 9 | 1 | | 176 | 2.87 | | 1 | 28 | 11 | 216 | 209 |
| GYR | 80 | 3 | 24-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 1 |
| GYR | 75 | 1 | 24-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 17 |
| GYR | 44 | 1 | 24-06-00 | 29 | 25 | 35 | 11 | 2 | | | 102 | 2.33 | | 1 | 2 | | 105 | 186 |

Appendix 1. Common eider nest data (continued)

| Archipelago | Island # | Stratum | Date | nb eggs per nest 1 | 2 | 3 | 4 | 5 | 6 | 7 | nb nests with eggs | mean clutch size | std-dev. | other nests / broods empty[1] | predated[2] | ?[3] | N total | old bowls[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GYR | 40 | 1 | 24-06-00 | 5 | 3 | 10 | 2 | | | | 20 | 2.45 | | 3 | 11 | | 34 | 137 |
| GYR | 46 | 1 | 24-06-00 | | 2 | | | | | | 2 | 2.00 | | | | | 2 | 27 |
| GYR | 47 | 1 | 24-06-00 | 22 | 21 | 47 | 36 | 6 | 1 | | 133 | 2.89 | | | | | 133 | 111 |
| GYR | 64 | 3 | 24-06-00 | | 2 | 1 | | | | | 3 | 2.33 | | | | | 3 | 10 |
| GYR | 66 | 2 | 24-06-00 | | | | 2 | | | | 2 | 4.00 | | | | | 2 | 2 |
| GYR | 171 | 2 | 25-06-00 | 5 | 3 | 4 | 1 | | | | 13 | 2.08 | | | 15 | | 28 | 67 |
| GYR | 170 | 3 | 25-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 14 |
| GYR | 169 | 2 | 25-06-00 | 8 | 3 | | 1 | 1 | | | 13 | 1.77 | | | 19 | | 32 | 69 |
| GYR | 179 | 1 | 25-06-00 | 5 | 8 | 19 | 20 | 2 | | | 54 | 3.11 | | | 11 | | 65 | 147 |
| GYR | 178 | 1 | 25-06-00 | 2 | 5 | 2 | 2 | 2 | | | 13 | 2.77 | | | 3 | | 16 | 70 |
| GYR | 205 | 1 | 25-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 204 | 2 | 25-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| GYR | 150 | 2 | 25-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 42 |
| GYR | 151 | 2 | 25-06-00 | 1 | | | | | | | 1 | 1.00 | | | | | 1 | 26 |
| GYR | 140 | 3 | 25-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 2 |
| GYR | 123 | 3 | 25-06-00 | 1 | 1 | | | | | | 2 | 1.50 | | | | | 2 | 16 |
| GYR | 182 | 1 | 25-06-00 | 22 | 25 | 29 | 29 | 4 | | | 109 | 2.71 | | 1 | | | 110 | 122 |
| GYR | 184 | 2 | 25-06-00 | 5 | 11 | 12 | 17 | 3 | | | 48 | 3.04 | | | | | 48 | 48 |
| GYR | 183 | 2 | 25-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| | | | sub-total | 339 | 350 | 449 | 305 | 40 | 4 | 0 | 1487 | 2.58 | 1.14 | 27 | 208 | 11 | 1733 | 3920 |
| PAY | 22 | 2 | 27-06-00 | | | 1 | | | | | 1 | 3.00 | | | | | 1 | 19 |
| PAY | 141 | 3 | 27-06-00 | 7 | 7 | 13 | 11 | | | | 38 | 2.74 | | | 9 | | 47 | 283 |
| PAY | 21 | 2 | 27-06-00 | 3 | 3 | 4 | 6 | 1 | | | 17 | 2.94 | | | 3 | | 20 | 84 |
| PAY | 23 | 1 | 27-06-00 | 49 | 38 | 64 | 47 | 2 | | | 200 | 2.58 | | | 35 | | 235 | 237 |
| PAY | 134 | 3 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PAY | 128 | 3 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PAY | 127 | 3 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PAY | 14 | 1 | 27-06-00 | 24 | 48 | 87 | 73 | 7 | 1 | | 240 | 2.98 | | | 46 | | 286 | 729 |
| PAY | 20 | 1 | 27-06-00 | 5 | 6 | 26 | 13 | 3 | | | 53 | 3.06 | | | 6 | | 59 | 386 |
| PAY | 17 | 1 | 27-06-00 | 10 | 11 | 30 | 13 | 1 | | | 65 | 2.75 | | 2 | 9 | | 76 | 26 |
| PAY | 110 | 3 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PAY | 113 | 3 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 1 |
| PAY | 120 | 3 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PAY | 18 | 2 | 27-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 26 |
| PAY | 16 | 1 | 27-06-00 | 6 | 5 | 6 | 11 | 2 | | | 30 | 2.93 | | | 2 | | 32 | 2 |
| PAY | 130 | 3 | 27-06-00 | | 1 | 1 | 1 | | | | 3 | 3.00 | | | 3 | | 6 | 21 |
| PAY | 11 | 1 | 29-06-00 | 6 | 10 | 11 | 5 | 1 | 1 | | 34 | 2.65 | | | 2 | | 36 | 119 |
| PAY | 10 | 1 | 29-06-00 | 6 | 8 | 9 | 9 | 2 | | | 34 | 2.79 | | 1 | 4 | 7 | 46 | 507 |
| PAY | 12 | 1 | 29-06-00 | 10 | 38 | 44 | 36 | 5 | | 1 | 134 | 2.94 | | | 8 | | 142 | 409 |
| PAY | 9 | 1 | 29-06-00 | 24 | 73 | 112 | 105 | 11 | 1 | | 326 | 3.03 | | | 42 | 3 | 371 | 904 |
| PAY | 106 | 3 | 29-06-00 | | | | | | | | 0 | 0.00 | | | 1 | | 1 | 7 |
| PAY | 13 | 1 | 27/29-06 | 58 | 138 | 242 | 138 | 42 | 6 | | 624 | 2.98 | | | 103 | 10 | 737 | 718 |
| | | | sub-total | 208 | 386 | 650 | 468 | 77 | 9 | 1 | 1799 | 2.92 | 1.08 | 3 | 273 | 20 | 2095 | 4477 |

Appendix 1. Common eider nest data (continued)

| Archipelago | Island # | Stratum | Date | nb eggs per nest | | | | | | | nb nests with eggs | mean clutch size | std-dev. | other nests / broods | | | N total | old bowls[4] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | | | empty[1] | predated[2] | ?[3] | | |
| PLO | 103 | 3 | 30-06-00 | 8 | 12 | 33 | 22 | | | | 75 | 2.92 | | | 7 | | 82 | 366 |
| PLO | 44 | 2 | 30-06-00 | 30 | 71 | 152 | 116 | 6 | | | 375 | 2.99 | | | 60 | | 435 | 770 |
| PLO | 84 | 1 | 30-06-00 | 30 | 21 | 17 | 2 | 1 | | | 71 | 1.92 | | 1 | 18 | | 90 | 265 |
| PLO | 63 | 3 | 30-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PLO | 36 | 2 | 30-06-00 | 19 | 21 | 25 | 8 | 1 | | | 74 | 2.34 | | 12 | 59 | | 145 | 420 |
| PLO | 67 | 1 | 30-06-00 | 9 | 25 | 23 | 9 | 3 | | | 69 | 2.59 | | | 57 | | 126 | 335 |
| PLO | 60 | 1 | 30-06-00 | 1 | 2 | | | 1 | | | 4 | 2.50 | | | 1 | | 5 | 130 |
| PLO | 42 | 2 | 30-06-00 | 4 | | | | | | | 4 | 1.00 | | | 1 | | 5 | 66 |
| PLO | 68 | 3 | 30-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PLO | 46 | 1 | 30-06-00 | 4 | | 2 | | | | | 6 | 1.67 | | | 8 | | 14 | 83 |
| PLO | 72 | 3 | 30-06-00 | 3 | 4 | 7 | 1 | | | | 15 | 2.40 | | | 2 | | 17 | 60 |
| PLO | 43 | 1 | 30-06-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PLO | 38 | 1 | 1-07-00 | 10 | 22 | 22 | 15 | | | | 69 | 2.61 | | | 3 | | 72 | 254 |
| PLO | 91 | 3 | 1-07-00 | 2 | 3 | 3 | | | | | 8 | 2.13 | | | 2 | | 10 | 141 |
| PLO | 89 | 3 | 1-07-00 | 2 | 3 | 5 | 2 | | | | 12 | 2.58 | | | 1 | | 13 | 181 |
| PLO | 87 | 3 | 1-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PLO | 95 | 3 | 1-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PLO | 94 | 3 | 1-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| PLO | 47 | 1 | 1-07-00 | 16 | 17 | 31 | 15 | | | | 79 | 2.57 | | 2 | 25 | | 106 | 368 |
| PLO | 92 | 3 | 1-07-00 | 2 | 5 | 4 | 1 | | | | 12 | 2.33 | | | | | 12 | 16 |
| PLO | 90 | 3 | 1-07-00 | | 1 | | | | | | 1 | 2.00 | | | | | 1 | 0 |
| | | | sub-total | 140 | 207 | 324 | 191 | 12 | 0 | 0 | 874 | 2.69 | 1.03 | 15 | 244 | 0 | 1133 | 3455 |
| EDR | 32 | 2 | 5-07-00 | 1 | | | | | | | 1 | 1.00 | | 1 | 3 | | 5 | 202 |
| EDR | 37 | 3 | 5-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| EDR | 75 | 3 | 5-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 14 |
| EDR | 57 | 1 | 5-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 83 |
| EDR | 102 | 1 | 5-07-00 | | | 1 | 1 | | | | 2 | 3.50 | | | 1 | | 3 | 78 |
| EDR | 30 | 3 | 5-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 6 |
| EDR | 87 | 3 | 5-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 4 |
| EDR | 83 | 3 | 5-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 2 |
| EDR | 153 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| EDR | 152 | 1 | 6-07-00 | | | | | | | | 0 | 0.00 | | | 12 | | 12 | 34 |
| EDR | 151 | 1 | 6-07-00 | 7 | | 1 | | | | | 8 | 1.25 | | 5 | 43 | | 56 | 78 |
| EDR | 149 | 2 | 6-07-00 | | | | | 1 | | | 1 | 5.00 | | | | | 1 | 0 |
| EDR | 146 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| EDR | 133 | 2 | 6-07-00 | | 1 | | | | | | 1 | 2.00 | | | 2 | | 3 | 40 |
| EDR | 130 | 1 | 6-07-00 | 2 | 2 | 1 | | | | | 5 | 1.80 | | | 3 | | 8 | 70 |
| EDR | 101 | 3 | 6-07-00 | 4 | 1 | | | | | | 5 | 1.20 | | | 1 | | 6 | 24 |
| EDR | 100 | 3 | 6-07-00 | | | 1 | | | | | 1 | 3.00 | | | 1 | | 2 | 38 |
| EDR | 69 | 1 | 6-07-00 | | 1 | 1 | 1 | 1 | | | 4 | 3.50 | | | 3 | | 7 | 123 |
| EDR | 68 | 2 | 6-07-00 | | 1 | | | | | | 1 | 2.00 | | | | | 1 | 4 |
| EDR | 71 | 2 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| EDR | 70 | 3 | 6-07-00 | | 1 | 5 | 1 | 1 | | | 8 | 3.25 | | | | | 8 | 5 |
| EDR | 88 | 3 | 6-07-00 | 1 | | 1 | | | | | 2 | 2.00 | | | 1 | | 3 | 168 |
| EDR | 12 | 2 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |

Appendix 1. Common eider nest data (continued)

| Archipelago | Island # | Stratum | Date | nb eggs per nest | | | | | | | nb nests | mean | std- | other nests / broods | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | with eggs | clutch size | dev. | empty[1] | predated[2] | ?[3] | N total | old bowls[4] |
| EDR | 3 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 2 |
| EDR | 5 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| EDR | 143 | 2 | 6-07-00 | | | | | | | | 0 | 0.00 | | 1 | 3 | | 4 | 6 |
| EDR | 142 | 1 | 6-07-00 | | | | | | | | 0 | 0.00 | | 22 | 10 | | 32 | 57 |
| EDR | 141+144 | 1 | 6-07-00 | 1 | 1 | | | | | | 2 | 1.50 | | 22 | 1 | | 25 | 347 |
| EDR | 140 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | 24 | 1 | | 25 | 35 |
| EDR | 131 | 3 | 6-07-00 | 2 | 2 | | | | | | 4 | 1.50 | | 8 | 1 | | 13 | 132 |
| EDR | 132 | 3 | 6-07-00 | 1 | 2 | | | | | | 3 | 1.67 | | | | | 3 | 12 |
| EDR | 128 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 1 |
| EDR | 127 | 3 | 6-07-00 | 2 | | | | | | | 2 | 1.00 | | | | | 2 | 3 |
| EDR | 125 | 3 | 6-07-00 | 3 | 3 | | | | | | 6 | 1.50 | | 2 | | | 8 | 1 |
| EDR | 114 | 1 | 6-07-00 | 7 | 4 | 4 | | | | | 15 | 1.80 | | 3 | 1 | 1 | 20 | 210 |
| EDR | 113 | 3 | 6-07-00 | 1 | 1 | 2 | | | | | 4 | 2.25 | | | 1 | | 5 | 3 |
| EDR | 117 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 0 |
| EDR | 119 | 3 | 6-07-00 | | | | | | | | 0 | 0.00 | | | | | 0 | 1 |
| EDR | 36 | 1 | 7-07-00 | | | | | | | | 0 | 0.00 | | | 3 | | 3 | 312 |
| | | | sub-total | 32 | 20 | 17 | 3 | 3 | 0 | 0 | 75 | 2.00 | 1.09 | 88 | 91 | 1 | 255 | 2095 |
| | | | **total** | **719** | **963** | **1440** | **967** | **132** | **13** | **1** | **4235** | **2.73** | **1.11** | **133** | **816** | **32** | **5216** | **13947** |

[1]Nest with fresh down but no eggs (yet)
[2]nest showing signs of predation (ex: broken egg shell, blood, nest destroyed)
[3]Adult sitting on the nest: nest content not verified
[4]Old eider nest: lack of fresh down or sign of recent occupation

Appendix 2. Canada Geese nest data

| Archipelago | Island # | Date | nb eggs per nest 1 | 2 | 3 | 4 | 5 | nb nests with eggs | mean clutch size | std-dev. | other nests / broods predated | hatched[1] | ?[2] | N total | old nests | comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GYR | 125 | 21-06-00 | | 3 | | | | 3 | 2.00 | | | | | 3 | | |
| GYR | 162 | 21-06-00 | | 1 | 2 | | | 3 | 2.67 | | 1 | | | 4 | | |
| GYR | 130 | 21-06-00 | | | | 1 | | 1 | 4.00 | | | | | 1 | | |
| GYR | 84 | 23-06-00 | | | | | 1 | 1 | 5.00 | | | | 1 | 2 | | |
| GYR | 36 | 23-06-00 | | | | | 1 | 1 | 5.00 | | 1 | | | 2 | | |
| GYR | 37 | 23-06-00 | | | | 4 | | 4 | 4.00 | | | | | 4 | | |
| GYR | 3 | 23-06-00 | | | 1 | | | 1 | 3.00 | | | | | 1 | 1 | |
| GYR | 32 | 23-06-00 | | | | | 1 | 1 | 5.00 | | | | | 1 | | |
| GYR | 85 | 23-06-00 | | | | | | 0 | 0.00 | | | 1 | | 1 | | nest with 1 egg + 1 chick |
| GYR | 203 | 24-06-00 | | | | 1 | | 1 | 4.00 | | 2 | | | 3 | | |
| GYR | 121 | 24-06-00 | | | | | | 0 | 0.00 | | 1 | | | 1 | | |
| GYR | 39 | 24-06-00 | | | 1 | | | 1 | 3.00 | | | | | 1 | 1 | |
| GYR | 67 | 24-06-00 | | | | | 1 | 1 | 5.00 | | | | | 1 | | |
| GYR | 63 | 24-06-00 | 1 | 2 | | | | 3 | 1.67 | | 2 | | | 5 | | |
| GYR | 44 | 24-06-00 | | | | 1 | 1 | 2 | 4.50 | | | | | 2 | | |
| GYR | 40 | 24-06-00 | | | 1 | | | 1 | 3.00 | | | 1 | | 2 | | |
| GYR | 46 | 24-06-00 | | | | 1 | | 1 | 4.00 | | | | | 1 | | |
| GYR | 171 | 25-06-00 | | | | | | 0 | 0.00 | | 2 | | | 2 | | |
| GYR | 169 | 25-06-00 | | | | 1 | | 1 | 4.00 | | | | | 1 | | |
| GYR | 179 | 25-06-00 | | | | | | 0 | 0.00 | | | 1 | | 1 | | nest with 1 egg + 1 chick |
| GYR | 178 | 25-06-00 | | | | | | 0 | 0.00 | | | 1 | | 1 | | brood of four chicks |
| GYR | 150 | 25-06-00 | | | 1 | | | 1 | 3.00 | | | | | 1 | 2 | |
| GYR | 184 | 25-06-00 | | 1 | | | | 1 | 2.00 | | | | | 1 | | |
| | | sub-total | 1 | 7 | 6 | 9 | 5 | 28 | 3.36 | 1.16 | 9 | 4 | 1 | 42 | 4 | |
| PAY | 141 | 27-06-00 | | 2 | 1 | | 1 | 4 | 3.00 | | | | | 4 | | |
| PAY | 21 | 27-06-00 | | 1 | | | | 1 | 2.00 | | | | | 1 | | |
| PAY | 128 | 27-06-00 | | | | 1 | | 1 | 4.00 | | | | | 1 | | |
| PAY | 14 | 27-06-00 | | | | | | 0 | 0.00 | | 2 | | | 2 | | |
| PAY | 20 | 27-06-00 | | | | | | 0 | 0.00 | | 2 | | | 2 | | |
| PAY | 18 | 27-06-00 | | | | 2 | | 2 | 4.00 | | | | | 2 | | |
| PAY | 130 | 27-06-00 | | 1 | | 1 | 1 | 3 | 3.67 | | | | | 3 | | |
| PAY | 10 | 29-06-00 | | | 2 | | 1 | 3 | 3.67 | | 1 | 1 | | 5 | | nest with 1 egg + 2 chicks |
| PAY | 12 | 29-06-00 | 1 | | | | | 1 | 1.00 | | | | | 1 | | |
| PAY | 106 | 29-06-00 | | | | 2 | | 2 | 4.00 | | 1 | | | 3 | 1 | |
| PAY | 13 | 27/29-06 | 0 | 1 | 1 | 0 | 0 | 2 | 2.50 | | 5 | 1 | 0 | 8 | 1 | nest with 1 egg + 2 chicks |
| | | sub-total | 1 | 5 | 4 | 6 | 3 | 19 | 3.26 | 1.19 | 11 | 2 | 0 | 32 | 2 | |
| EDR | 70 | 6-07-00 | | | 1 | | | 1 | 3.00 | | | | | 1 | | |
| EDR | 36 | 7-07-00 | | | | | | 0 | 0.00 | | 1 | | | 1 | 2 | |
| | | sub-total | | | 1 | | | 1 | 3.00 | - | 1 | | | 2 | 2 | |
| | | total | 2 | 12 | 11 | 15 | 8 | 48 | 3.31 | 1.15 | 21 | 6 | 1 | 76 | 8 | |

[1]Nest with one or more egg(s) hatched [2]Adult sitting on the nest : nest content not verified

N.B.: Islands with no Canada Geese were not included in the table; see appendix 1 for complete list of islands that were surveyed

Appendix 3. Herring Gulls nest data

| Archipelago | Island # | Date | nb eggs per nest empty | 1 | 2 | 3 | 4 | 5 | nb nests with eggs | mean clutch size | std-dev. | other nests / broods predated | hatched[1] | ?[2] | N total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GYR | 37 | 23-06-00 | 1 | 1 | 1 | 1 | | | 3 | 2.00 | | | | | 3 |
| GYR | 35 | 23-06-00 | | 1 | | | | | 1 | 1.00 | | | | | 1 |
| GYR | 31 | 23-06-00 | | | | 1 | | | 1 | 3.00 | | | | | 1 |
| GYR | 32 | 23-06-00 | | 1 | | | | | 1 | 1.00 | | | | | 1 |
| GYR | 87 | 23-06-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| GYR | 203 | 24-06-00 | | 1 | | | | | 1 | 1.00 | | | | | 1 |
| GYR | 39 | 24-06-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| GYR | 40 | 24-06-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| GYR | 47 | 24-06-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| GYR | 198 | 21-06-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| | | sub-total | 1 | 4 | 6 | 2 | | | 12 | 1.83 | 0.72 | | | | 12 |
| PAY | 23 | 27-06-00 | | 3 | 7 | 16 | 1 | | 27 | 2.56 | | | 1 | | 28 |
| PAY | 14 | 27-06-00 | | 18 | 20 | 27 | 1 | | 66 | 2.17 | | | 1 | | 67 |
| PAY | 17 | 27-06-00 | | 1 | 8 | 6 | | | 15 | 2.33 | | | | | 15 |
| PAY | 11 | 29-06-00 | | | | 1 | | | 1 | 3.00 | | | | | 1 |
| PAY | 10 | 29-06-00 | 1 | 1 | | | | | 1 | 1.00 | | | | | 1 |
| PAY | 12 | 29-06-00 | | | | 1 | | | 1 | 3.00 | | | | | 1 |
| PAY | 9 | 29-06-00 | 0 | 4 | 7 | 8 | 0 | 0 | 19 | 2.21 | | | 0 | | 19 |
| PAY | 13 | 27/29-06 | | 1 | 2 | 6 | | | 9 | 2.56 | | | | 15 | 24 |
| | | sub-total | 1 | 28 | 44 | 65 | 2 | | 139 | 2.30 | 0.80 | | 2 | 15 | 156 |
| PLO | 44 | 30-06-00 | 2 | 1 | 2 | 3 | 1 | | 7 | 2.57 | | | | | 7 |
| PLO | 36 | 30-06-00 | | 4 | 4 | 5 | | 1 | 14 | 2.29 | | | 3 | | 17 |
| PLO | 67 | 30-06-00 | 4 | 5 | 13 | 12 | | | 30 | 2.23 | | | | | 30 |
| PLO | 46 | 30-06-00 | | 2 | 1 | | | | 3 | 1.33 | | | | | 3 |
| PLO | 47 | 1-07-00 | | 6 | | 3 | | | 9 | 1.67 | | | | | 9 |
| PLO | 92 | 1-07-00 | | 2 | 1 | 1 | | | 4 | 1.75 | | | | | 4 |
| | | sub-total | 6 | 20 | 21 | 24 | 1 | 1 | 67 | 2.13 | 0.92 | | 3 | | 70 |
| EDR | 102 | 5-07-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| EDR | 131 | 6-07-00 | | 1 | | | | | 1 | 1.00 | | | | | 1 |
| EDR | 132 | 6-07-00 | | 3 | | | | | 3 | 1.00 | | | | | 3 |
| EDR | 114 | 6-07-00 | | | 1 | | | | 1 | 2.00 | | | | | 1 |
| | | sub-total | | 4 | 2 | | | | 6 | 1.33 | 0.52 | | | | 6 |
| | | total | 8 | 56 | 73 | 91 | 3 | 1 | 224 | 2.20 | 0.85 | | 5 | 15 | 244 |

[1]Nest with one or more egg(s) hatched [2]Adult sitting on the nest : nest content not verified

N.B.: Islands with no Herring Gulls were not included in the table; see appendix 1 for complete list of islands that were surveyed

Appendix 4. Great Black-backed Gull nest data

| | | | nb eggs per nest | | | | | nb nests | mean | std- | other nests / broods | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Archipelago | Island # | Date | 1 | 2 | 3 | 4 | 5 | with eggs | clutch size | dev. | predated | hatched[1] | N total | comments |
| GYR | 47 | 24-06-00 | | 1 | | | | 1 | 2.00 | | | | 1 | |
| GYR | 66 | 24-06-00 | | 1 | | | | 1 | 2.00 | | | | 1 | |
| GYR | 184 | 25-06-00 | | 1 | | | | 1 | 2.00 | | | | 1 | |
| | | | | | | | | | | | | | | |
| PAY | 17 | 27-06-00 | | 4 | 3 | | | 7 | 2.43 | | | 1 | 8 | one dead chick |
| PAY | 11 | 29-06-00 | | | 1 | | | 1 | 3.00 | | | | 1 | |
| PAY | 10 | 29-06-00 | | | 1 | | | 1 | 3.00 | | | | 1 | |
| PAY | 13 | 27/29-06 | | 1 | 3 | | | 4 | 2.75 | | | 3 | 7 | 1 chick, 1 egg+2 chicks, 2 chicks |
| | | sub-total | | 5 | 8 | | | 13 | 2.62 | 0.51 | | 4 | 17 | |
| | | | | | | | | | | | | | | |
| EDR | 149 | 6-07-00 | 1 | | | | | 1 | 1.00 | | | | 1 | |
| | | total | 1 | 8 | 8 | 0 | 0 | 17 | 2.41 | 0.62 | | 4 | 21 | |

[1]nest with one or more egg(s) hatched ; see comments

N.B.: Islands with no Black-backed Gulls were not included in the table; see appendix 1 for a complete list of the islands surveyed

Appendix 5. Glaucous Gulls nest data

| | | | nb eggs per nest | | | | | nb nests | mean | std- | other nests / broods | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Archipelago | Island # | Date | 1 | 2 | 3 | 4 | 5 | with eggs | clutch size | dev. | predated | hatched | N total |
| GYR | 66 | 24-06-00 | 1 | | | | | 1 | 1.00 | | | | 1 |
| | | | | | | | | | | | | | |
| PAY | 14 | 27-06-00 | | | 4 | | | 4 | 3.00 | | | | 4 |
| PAY | 17 | 27-06-00 | | | 1 | | | 1 | 3.00 | | | | 1 |
| | | | | | | | | | | | | | |
| PLO | 36 | 30-06-00 | 2 | | | | | 2 | 1.00 | | | | 2 |
| | | total | 3 | | 5 | | | 8 | 2.25 | 1.04 | | | 8 |

N.B.: Islands with no Glaucous Gulls were not included in the table; see appendix 1 for a complete list of the islands surveyed

Appendix 6. Unidentified gulls nest data

| Archipelago | Island # | Date | nb eggs per nest: empty | 1 | 2 | 3 | 4 | 5 | nb nests with eggs | mean clutch size | std-dev. | other nests / broods: predated | hatched[1] | N total | old nests |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GYR | 167 | 21-06-00 | 2 | | | | | | | | | | | 0 | |
| GYR | 103 | 21-06-00 | | | | | | | | | | | | 0 | 1 |
| GYR | 189 | 23-06-00 | | | | | | | | | | | | 0 | 3 |
| GYR | 31 | 23-06-00 | | | | | | | | | | | | 0 | 2 |
| GYR | 32 | 23-06-00 | | | | | | | | | | | | 0 | 1 |
| GYR | 121 | 24-06-00 | | | | | | | | | | | | 0 | 1 |
| GYR | 39 | 24-06-00 | | | | | | | | | | | | 0 | 1 |
| GYR | 71 | 24-06-00 | | | | | | | | | | | | 0 | 2 |
| GYR | 65 | 24-06-00 | | 2 | 1 | 6 | | | 9 | 2.44 | 0.88 | | | 9 | |
| GYR | 44 | 24-06-00 | | | | | | | | | | | | 0 | 1 |
| GYR | 47 | 24-06-00 | | | | | | | | | | | | 0 | 1 |
| GYR | 184 | 25-06-00 | | | | | | | | | | | | 0 | 2 |
| | | sub-total | 2 | 2 | 1 | 6 | | | 9 | 2.44 | 0.88 | | | 9 | 15 |
| PAY | 23 | 27-06-00 | | | | | | | | | | | | 0 | 9 |
| PAY | 14 | 27-06-00 | | | | | | | | | | | | 0 | 24 |
| PAY | 17 | 27-06-00 | | | | | | | | | | | | 0 | 3 |
| PAY | 10 | 29-06-00 | | | | 1 | | | 1 | 3.00 | | | | 1 | |
| PAY | 12 | 29-06-00 | 2 | | 1 | 1 | | | 2 | 2.50 | | | | 2 | |
| PAY | 9 | 29-06-00 | | | | | | | | | | | | 0 | 4 |
| PAY | 106 | 29-06-00 | | | | | | | | | | | | 0 | 1 |
| PAY | 13 | 27/29-06 | | 6 | 10 | 31 | | | 47 | 2.53 | | 1 | 15 | 63 | 10 |
| | | sub-total | 2 | 6 | 11 | 33 | | | 50 | 2.54 | 0.71 | 1 | 15 | 66 | 51 |
| PLO | 103 | 30-06-00 | | 1 | | | | | 1 | 1.00 | | | | 1 | |
| PLO | 84 | 30-06-00 | 7 | | 1 | 1 | | | 2 | 2.50 | | | | 2 | |
| PLO | 36 | 30-06-00 | 16 | 8 | 4 | 9 | | | 21 | 2.05 | | | 1 | 22 | |
| PLO | 67 | 30-06-00 | 5 | 5 | 6 | 6 | | | 17 | 2.06 | | | | 17 | |
| PLO | 42 | 30-06-00 | 1 | | | | | | 0 | 0.00 | | | | 0 | |
| PLO | 46 | 30-06-00 | 26 | 3 | | | | | 3 | 1.00 | | | | 3 | |
| PLO | 72 | 30-06-00 | 2 | | 1 | | | | 1 | 2.00 | | 1 | | 2 | |
| PLO | 38 | 1-07-00 | | | 4 | 5 | 3 | | 12 | 2.92 | | | | 12 | |
| PLO | 47 | 1-07-00 | 4 | | | | | | | | | | | 0 | |
| PLO | 92 | 1-07-00 | 6 | | | | | | | | | | | 0 | |
| | | sub-total | 67 | 17 | 16 | 21 | 3 | | 57 | 2.18 | 0.93 | 1 | 1 | 59 | |
| EDR | 152 | 6-07-00 | 17 | 6 | | 1 | | | 7 | 1.29 | | | | 7 | 7 |
| EDR | 151 | 6-07-00 | 2 | 1 | 1 | | | | 2 | 1.50 | | | | 2 | |
| EDR | 130 | 6-07-00 | | | | | | | | | | | | 0 | 1 |
| EDR | 142 | 6-07-00 | | | | | | | | | | | | 0 | 1 |
| EDR | 141+144 | 6-07-00 | | | | | | | | | | | | 0 | 1 |
| EDR | 131 | 6-07-00 | | | | | | | | | | | | 0 | 3 |
| EDR | 132 | 6-07-00 | | | | | | | | | | | | 0 | 2 |
| EDR | 128 | 6-07-00 | | | | | | | | | | | | 0 | 1 |
| EDR | 125 | 6-07-00 | | | 1 | | | | 1 | 2.00 | | | | 1 | |
| | | sub-total | 19 | 7 | 2 | 1 | | | 10 | 1.40 | 0.70 | | | 10 | 16 |
| | | total | 90 | 32 | 30 | 61 | 3 | | 126 | 2.28 | 0.87 | 2 | 16 | 144 | 82 |

[1]Nest with one or more egg(s) hatched (N.B.: see appendix 1 for a complete list of the islands surveyed)

Appendix 7. Other species nest data

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | nb eggs per nest | | | | | | nb nests | mean | std- | other nests / broods | | | |
| Species | Archipelago | Island # | Date | 1 | 2 | 3 | 4 | 5 | 6 | with eggs | clutch size | dev. | predated | hatched[1] | ?[2] | N total |
| Red-throated Loon | GYR | 125 | 21-06-00 | | | | | | | 0 | - | - | | 1 | | 1 |
| | | | | | | | | | | | | | | | | |
| Snow Bunting | GYR | 36 | 23-06-00 | | | | | | 1 | 1 | 6.00 | | | | | 1 |
| Snow Bunting | PAY | 12 | 29-06-00 | | | | | | | 0 | - | | | | 1 | 1 |
| Snow Bunting | PAY | 9 | 29-06-00 | | | | 1 | | 2 | 3 | 5.33 | | | | | 3 |
| Snow Bunting | PLO | 84 | 30-06-00 | | | | 1 | | | 1 | 4.00 | | | | | 1 |
| Snow Bunting | PLO | 89 | 1-07-00 | | | | | | | 0 | - | | | | 1 | 1 |
| Snow Bunting | EDR | 133 | 6-07-00 | | | | | | 1 | 1 | 6.00 | | | | | 1 |
| | | | sub-total | | | | 2 | | 4 | 6 | 5.33 | 1.03 | 0 | 0 | 2 | 8 |
| | | | | | | | | | | | | | | | | |
| Peregrine Falcon | GYR | 63 | 24-06-00 | | | | | | | 0 | - | | | | 1 | 1 |
| Peregrine Falcon | PAY | 23 | 27-06-00 | | | | 1 | | | 1 | 4.00 | | | | | 1 |
| Peregrine Falcon | PAY | 10 | 29-06-00 | | 1 | | | | | 1 | 2.00 | | | | | 1 |
| | | | sub-total | | 1 | | 1 | | | 2 | 3.00 | 1.41 | 0 | 0 | 1 | 3 |
| | | | | | | | | | | | | | | | | |
| Arctic Tern | PAY | 14 | 27-06-00 | 4 | | | | | | 4 | 1.00 | - | | | | 4 |
| | | | | | | | | | | | | | | | | |
| Black Guillemot | PAY | 14 | 27-06-00 | | 1 | | | | | 1 | 2.00 | | | | | 1 |
| Black Guillemot | PLO | 103 | 30-06-00 | | | | | | | 0 | - | | | | 2 | 2 |
| Black Guillemot | PLO | 84 | 30-06-00 | | | | | | | 0 | - | | | | 2 | 2 |
| Black Guillemot | EDR | 151 | 6-07-00 | | 2 | | | | | 2 | 2.00 | | | | | 2 |
| | | | sub-total | | 3 | | | | | 3 | 2.00 | - | 0 | 0 | 4 | 7 |
| | | | | | | | | | | | | | | | | |
| Rough-legged Hawk | EDR | 36[3] | 5-07-00 | | | | | | | 0 | - | - | | | 1 | 1 |

[1]Nest with one or more egg(s) hatched
[2]Adult sitting on the nest : nest content not verified
[3]observation made from island #32

Appendix 8. Aerial surveys data

A. Gyrfalcon Islands

June 23rd (9h55-10h40), Obs: Scott Gilliland and Gilles Falardeau; partly cloudy sky, 5° C, wind S (170°) 20-30 knots

| Cluster | Islands | ground nest count | Eiders Males | Eiders females | HERG | GBBG | WWGU | GULL | BLGU | CAGO | OLDS | KIEI | PEFA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 35 | 24 | 52 | 14 | 8 | 2 | | 9 | 13 | 2 | | | |
| 2 | 36+37 | 77 | 145 | 94 | 2 | | | 6 | 3 | 1 | | | 1 |
| 3 | 43 | 290 | 238 | 75 | | | | 2 | | 2 | | | |
| 4 | 44+203 | 385 | 319 | 155 | 7 | 6 | | 7 | 36 | 1 | | | |
| 5 | 46 | 29 | 8 | 8 | | | | | | | | | |
| 6 | 47 | 133 | 147 | 52 | 2 | 1 | | | | | | | |
| 7 | 204 | 0 | 4 | 13 | | | | | 1 | | | | |
| 8 | 182 | 115 | 62 | 6 | 1 | | 1 | 1 | | | | | |
| 9 | 178+179 | 81 | 92 | 22 | 7 | 2 | | 12 | 35 | 3 | | | |
| 10* | 71 | 12 | | | | | | | | | | | |
| 11 | 201 | 12 | 25 | 13 | 1 | | | | 1 | | | | |
| 12 | 159 | 8 | 18 | 21 | 4 | | | | 50 | | | | |
| 13 | 31 | 64 | 109 | 47 | | | | 1 | | 4 | | | |
| 14 | 96+97 | 73 | 40 | 23 | | | | | | | | | |
| 15 | 162 | 17 | 23 | 22 | 3 | 2 | | 1 | 21 | 6 | | | |
| 16 | 112 | 0 | 7 | 7 | | | | | 3 | 2 | | | |
| 17 | 39+40 | 61 | 101 | 48 | 1 | 2 | | | 27 | | | | |
| 18 | 166+167 | 11 | 45 | 38 | 4 | | | 1 | 1 | | | | |
| 19 | 84+189+190 | 8 | 20 | 21 | 4 | | | | 1 | 1 | | 1 | 1 |
| 20* | 63+64+65+67 | 276 | | | | | | | | | | | |
| 21 | 183+184+205 | 48 | 42 | 14 | | 1 | | 1 | | | 4 | | |

HERG=Herring Gull, GBBG=Great black-backed Gull, WWGU=White-winged gull (either Glaucous or Iceland Gull), GULL=Gull sp., BLGU=Black Guillemot, CAGO=Canada Goose, OLDS=Long-tailed Duck, KIEI=King Eider, PEFA=Peregrine Falcon, ARTE=Arctic Tern

* No data from aerial survey for clusters 10 and 20 because of problems with the recording tape

B. Payne Islands

South of Payne Bay: June 27th (?h-9h45); Obs: Scott Gilliland and Gilles Falardeau; mid-broken sky, 5° C, wind SE (130°) 10 knots
North of Payne Bay: June 29th (8h26-9h55); Obs: Scott Gilliland and Gilles Falardeau; mid-level overcast sky, 3° C, wind W 5-10 knots

| Cluster | Islands | Date | ground nest count | Eiders males | Eiders females | HERG | GBBG | WWGU | GULL | BLGU | CAGO | ARTE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 13 | 27 June | r740 | r254 | 94 | | 7 | | 101 | | | |
| 2a | 14 | 27 June | . | NA | - | 67 | 12 | 4 | 10 | 9 | 1 | 13 |
| 2b | 127 | 27 June | . | 10 | 10 | | | | | 12 | | |
| 3 | 18+120 | 27 June | 0 | 25 | 31 | | | | | | | |
| 4 | 20+21 | 27 June | 79 | 42 | 19 | 3 | | | 5 | | | |
| 5 | 22+141 | 27 June | . | NA | | | | | | | | |
| 6 | 9 | 29 June | r371 | r104 | 87 | 8 | 1 | 1 | 14 | | | |
| 7 | 10 | 29 June | r46 | r270 | 154 | 3 | | | | | 2 | |
| 8 | 11 | 29 June | 119 | 40 | 19 | 1 | 2 | | | | | |
| 9 | 12 | 29 June | 409 | 114 | 54 | 4 | 3 | | | 9 | 6 | |

N.B : Cluster 2a was not included in the analysis; clusters 4 and 5 were lumped, and so were clusters 6 and 7 for reasons explained in the text.

C. Plover Islands

June 30th (11h30-12h01); Obs: Scott Gilliland and Gilles Falardeau; mid-level overcast sky with showers, 5° C, wind light and variable
July 1st (9h35-9h47); Obs: Scott Gilliland and Gilles Falardeau; high broken sky, 9° C, wind E 8 knots

| Cluster | Islands | Date | ground nest count | Eiders males | Eiders females | HERG | GBBG | WWGU | GULL | BLGU | CAGO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 38+87 | 30 June | 72 | 79 | 29 | 16 | | | 2 | | |
| 3 | 47+94+95 | 30 June | 106 | 68 | 32 | 38 | 3 | 1 | 1 | | |
| 4 | 91+92 | 30 June | 22 | 7 | 10 | 4 | | | 5 | | |
| 5 | 89+90 | 30 June | 14 | 21 | 7 | 7 | | | | | 8 |
| 8 | 60 | 30 June | 126 | NS | | | | | | | |
| 7 | 67 | 30 June | 126 | 35 | 47 | 10 | | 1 | 60 | | |
| 6 | 46+68 | 30 June | 14 | 119 | 68 | 56 | | 1 | | 2 | 15 |
| 10 | 84 | 30 June | 90 | 61 | 38 | 4 | 7 | | 1 | | |
| 9 | 36+63 | 30 June | 145 | 70 | 31 | | 1 | | 32 | | 44 |
| 1 | 103 | 1 July | 82 | 43 | 28 | | 1 | 1 | 94 | | |

N.B : Cluster 1 was dropped of the analysis for reasons explained in the text

D. Eiders Islands

July 5th (12h26-13h060), Obs: Scott Gilliland and Gilles Falardeau; overcast, 6° C, wind WSW (310°) 15-20 knots

| Cluster | Islands | Date | ground nest count | males | Eiders females | unknown | HERG | GBBG | WWGU | GULL | BLGU | CAGO | OLDS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 5 July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 5+8 | 5 July | - | 26 | 3+ | 200 | 0 | 0 | 0 | 0 | 0 | 0 | 25 |
| 3 | 30+36+37 | 5 July | 3 | 32 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 | 113+114 | 5 July | 25 | 130 | 63 | 0 | 7 | 0 | 0 | 1 | 1 | 1 | 0 |
| 5 | 125 | 5 July | 8 | 12 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 127+128 | 5 July | 2 | 10 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 130+133 | 5 July | 11 | 23 | 23+ | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 |
| 8 | 131+132 | 5 July | 16 | 39 | 25 | 0 | 2 | 0 | 0 | 23 | 0 | 0 | 0 |
| 9 | 146 | 5 July | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 151+152+153 | 5 July | 68 | 44 | 45 | 0 | 73 | 3 | 1 | 0 | 2 | 0 | 0 |
| 11 | 140+141+142 +143+144 | 5 July | 84 | 28 | 38 | 0 | 5 | 0 | 0 | 23 | 10 | 10 | 0 |
| 12 | 100+101+102 | 5 July | 11 | 36 | 34 | 0 | 1 | 2 | 0 | 0 | 4 | 1 | 0 |
| 13 | 68+69 | 5 July | 8 | 14 | 15 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 70+71 | 5 July | 8 | 39 | 34 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 57+83 | 5 July | 0 | 19 | 18 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

N.B.: Cluster 2 was dropped of the analysis because there was no ground count on one of the islands (no. 8)

HERG=Herring Gull, GBBG=Great Black-backed Gull, WWGU=White-winged gull (either Glaucous or Iceland Gull), GULL=Gull sp., BLGU=Black Guillemot, CAGO=Canada Goose, OLDS=Long-tailed Duck, KIEI=King Eider, PEFA=Peregrine Falcon, ARTE=Arctic Tern

Appendix 9. Incubation stage of Common Eiders clutches

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Gyrfalcon | 21-Jun-2000 | 201 | 2 | 4to5 | Incubation |
| Gyrfalcon | 21-Jun-2000 | 201 | 4 | Fresh | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 2 | lay | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 2 | lay | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 1 | Fresh | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 1 | lay | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 1 | lay | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 1 | lay | Laying |
| Gyrfalcon | 21-Jun-2000 | 201 | 1 | lay | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 3 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 31 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 32 | 3 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 32 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 32 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 32 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 32 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 32 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 35 | 2 | 1to5 | Incubation |
| Gyrfalcon | 23-Jun-2000 | 35 | 3 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 35 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 35 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 35 | 2 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 85 | 4 | 1to5 | Incubation |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Gyrfalcon | 23-Jun-2000 | 85 | 2 | 5 | Incubation |
| Gyrfalcon | 23-Jun-2000 | 85 | 3 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 85 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 85 | 1 | Fresh | Laying |
| Gyrfalcon | 23-Jun-2000 | 88 | 3 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 4 | 8to10 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 44 | 3 | 5to8 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 44 | 3 | 5to8 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 44 | 4 | 2to5 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 44 | 3 | 3to5 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 44 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 44 | 2 | 0TO5 | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 4 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 2 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 2 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 2 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 2 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 1 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 44 | 1 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 4 | 12 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 47 | 3 | 10 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 47 | 3 | 5to8 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 47 | 4 | 5 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 47 | 4 | 5 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 47 | 3 | 3to5 | Incubation |
| Gyrfalcon | 24-Jun-2000 | 47 | 6 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 5 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 4 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 4 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 4 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 3 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 3 | Fresh | Laying |
| Gyrfalcon | 24-Jun-2000 | 47 | 3 | Fresh | Laying |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Gyrfalcon | 25-Jun-2000 | 178 | 2 | 0TO5 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 182 | 4 | 12 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 182 | 3 | 10to12 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 182 | 4 | 5to8 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 182 | 3 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | 18to20 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | 15to18 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | 12 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | 5to8 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | 5to8 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | 5to8 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | 5to8 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | 5to8 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | 0TO5 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 2 | 0TO5 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 1 | 0TO5 | Incubation |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 4 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 3 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 2 | Fresh | Laying |
| Gyrfalcon | 25-Jun-2000 | 184 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 4 | 8to10 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 3 | 8to10 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 3 | 0TO5 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 3 | 1to5 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | 0TO5 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | 0TO5 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | Fresh | Laying |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 97 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 159 | 2 | 5to8 | Incubation |
| Gyrfalcon | 26-Jun-2000 | 159 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 159 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 159 | 2 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 159 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 166 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 166 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 166 | 1 | Fresh | Laying |
| Gyrfalcon | 26-Jun-2000 | 166 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 13 | 3 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 13 | 3 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 3to5 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 3to5 | Incubation |
| Payne | 27-Jun-2000 | 13 | 5 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 3to5 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 13 | 3 | 12to15 | Incubation |
| Payne | 27-Jun-2000 | 13 | 3 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 13 | 3 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 13 | 2 | Fresh | Laying |
| Payne | 27-Jun-2000 | 13 | 4 | 15to18 | Incubation |
| Payne | 27-Jun-2000 | 13 | 2 | 5to8 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 13 | 4 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 13 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 13 | 4 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 2 | Fresh | Laying |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Payne | 27-Jun-2000 | 16 | 4 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 16 | 3 | 12 | Incubation |
| Payne | 27-Jun-2000 | 16 | 3 | 5 | Incubation |
| Payne | 27-Jun-2000 | 16 | 3 | 15to18 | Incubation |
| Payne | 27-Jun-2000 | 16 | 5 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 16 | 3 | 5to8 | Incubation |
| Payne | 27-Jun-2000 | 16 | 3 | 5to8 | Incubation |
| Payne | 27-Jun-2000 | 16 | 2 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 16 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 16 | 5 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 16 | 4 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 16 | 4 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 16 | 4 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 16 | 4 | 5to8 | Incubation |
| Payne | 27-Jun-2000 | 17 | 2 | 22 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 12to15 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 12to15 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 17 | 2 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 2 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 2 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | Fresh | Laying |
| Payne | 27-Jun-2000 | 17 | 3 | 4to5 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 8 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 12 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 12 | Incubation |
| Payne | 27-Jun-2000 | 17 | 1 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | Fresh | Laying |
| Payne | 27-Jun-2000 | 17 | 5 | 15to18 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | Fresh | Laying |
| Payne | 27-Jun-2000 | 17 | 3 | 10to12 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 17 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 17 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 17 | 3 | 5to8 | Incubation |
| Payne | 27-Jun-2000 | 17 | 2 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 18to20 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 8to10 | Incubation |
| Payne | 27-Jun-2000 | 17 | 4 | 22 | Incubation |
| Payne | 27-Jun-2000 | 17 | 3 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 17 | 2 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 3 | 5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 3 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 3 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 4 | 12 | Incubation |
| Payne | 27-Jun-2000 | 20 | 2 | 12to15 | Incubation |
| Payne | 27-Jun-2000 | 20 | 4 | 5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 4 | 0TO5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 3 | Fresh | Laying |
| Payne | 27-Jun-2000 | 20 | 3 | Fresh | Laying |
| Payne | 27-Jun-2000 | 20 | 3 | Fresh | Laying |
| Payne | 27-Jun-2000 | 20 | 3 | Fresh | Laying |
| Payne | 27-Jun-2000 | 20 | 4 | 10 | Incubation |
| Payne | 27-Jun-2000 | 20 | 3 | 15 | Incubation |
| Payne | 27-Jun-2000 | 20 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 20 | 1 | Fresh | Laying |
| Payne | 27-Jun-2000 | 20 | 3 | 10 | Incubation |
| Payne | 27-Jun-2000 | 20 | 5 | 3to5 | Incubation |
| Payne | 27-Jun-2000 | 20 | 4 | 14to18 | Incubation |
| Payne | 27-Jun-2000 | 20 | 2 | Fresh | Laying |
| Payne | 29-Jun-2000 | 10 | 3 | Fresh | Laying |
| Payne | 29-Jun-2000 | 10 | 3 | Fresh | Laying |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Payne | 29-Jun-2000 | 10 | 3 | 5 | Incubation |
| Payne | 29-Jun-2000 | 10 | 2 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 10 | 3 | 3to5 | Incubation |
| Payne | 29-Jun-2000 | 10 | 3 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 10 | 1 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 10 | 2 | Fresh | Laying |
| Payne | 29-Jun-2000 | 10 | 3 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 10 | 5 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 10 | 1 | Fresh | Laying |
| Payne | 29-Jun-2000 | 10 | 4 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 11 | 3 | Fresh | Laying |
| Payne | 29-Jun-2000 | 11 | 3 | 10to12 | Incubation |
| Payne | 29-Jun-2000 | 11 | 3 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 11 | 2 | Fresh | Laying |
| Payne | 29-Jun-2000 | 11 | 2 | Fresh | Laying |
| Payne | 29-Jun-2000 | 11 | 3 | 3to5 | Incubation |
| Payne | 29-Jun-2000 | 11 | 1 | Fresh | Laying |
| Payne | 29-Jun-2000 | 11 | 1 | Fresh | Laying |
| Payne | 29-Jun-2000 | 11 | 2 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 11 | 5 | 3to5 | Incubation |
| Payne | 29-Jun-2000 | 11 | 4 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 11 | 3 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 11 | 3 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 11 | 2 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 11 | 4 | 5 | Incubation |
| Payne | 29-Jun-2000 | 11 | 1 | 18to20 | Incubation |
| Payne | 29-Jun-2000 | 11 | 3 | 22 | Incubation |
| Payne | 29-Jun-2000 | 12 | 1 | 5to8 | Incubation |
| Payne | 29-Jun-2000 | 12 | 3 | 12to15 | Incubation |
| Payne | 29-Jun-2000 | 12 | 3 | 3to5 | Incubation |
| Payne | 29-Jun-2000 | 12 | 4 | 10to12 | Incubation |
| Payne | 29-Jun-2000 | 12 | 2 | 18to20 | Incubation |
| Payne | 29-Jun-2000 | 12 | 5 | 15to18 | Incubation |
| Payne | 29-Jun-2000 | 12 | 4 | 0TO5 | Incubation |
| Payne | 29-Jun-2000 | 12 | 5 | 22 | Incubation |
| Payne | 29-Jun-2000 | 12 | 4 | 24 | Incubation |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Payne | 29-Jun-2000 | 12 | 1 | Fresh | Laying |
| Payne | 29-Jun-2000 | 12 | 5 | 0TO5 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 10to15 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 20 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 18to20 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 18to20 | Incubation |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 1 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 3 | 8to10 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 8to10 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 5to8 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 12to15 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 12to15 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 0TO5 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 2 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 2 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 3 | 15to18 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 15to18 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 63 | 1 | 15to18 | Incubation |
| Plover | 30-Jun-2000 | 63 | 1 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 8to10 | Incubation |
| Plover | 30-Jun-2000 | 63 | 2 | 8to10 | Incubation |
| Plover | 30-Jun-2000 | 63 | 3 | Fresh | Laying |
| Plover | 30-Jun-2000 | 63 | 4 | 12to15 | Incubation |
| Plover | 30-Jun-2000 | 63 | 1 | 12to15 | Incubation |
| Plover | 30-Jun-2000 | 67 | 2 | 0TO5 | Incubation |
| Plover | 30-Jun-2000 | 67 | 2 | 0TO5 | Incubation |
| Plover | 30-Jun-2000 | 67 | 4 | 0TO5 | Incubation |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Plover | 30-Jun-2000 | 67 | 4 | 10to12 | Incubation |
| Plover | 30-Jun-2000 | 67 | 2 | Fresh | Laying |
| Plover | 30-Jun-2000 | 67 | 4 | 15to18 | Incubation |
| Plover | 30-Jun-2000 | 67 | 2 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 67 | 2 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 67 | 3 | 18to20 | Incubation |
| Plover | 30-Jun-2000 | 67 | 1 | 5to8 | Incubation |
| Plover | 30-Jun-2000 | 67 | 2 | 20to24 | Incubation |
| Plover | 30-Jun-2000 | 67 | 4 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 67 | 5 | 5 | Incubation |
| Plover | 30-Jun-2000 | 72 | 2 | Fresh | Laying |
| Plover | 30-Jun-2000 | 72 | 3 | 0TO5 | Incubation |
| Plover | 30-Jun-2000 | 72 | 3 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 72 | 3 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 72 | 3 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 72 | 2 | 3to5 | Incubation |
| Plover | 30-Jun-2000 | 72 | 4 | 3to5 | Incubation |
| Plover | 1-Jul-2000 | 47 | 2 | 0TO5 | Incubation |
| Plover | 1-Jul-2000 | 47 | 3 | 18to20 | Incubation |
| Plover | 1-Jul-2000 | 47 | 2 | Fresh | Laying |
| Plover | 1-Jul-2000 | 47 | 1 | Fresh | Laying |
| Plover | 1-Jul-2000 | 47 | 1 | Fresh | Laying |
| Plover | 1-Jul-2000 | 47 | 3 | 3to5 | Incubation |
| Plover | 1-Jul-2000 | 47 | 4 | 3to5 | Incubation |
| Eider | 6-Jul-2000 | 113 | 2 | 3to5 | Incubation |
| Eider | 6-Jul-2000 | 113 | 3 | 5to8 | Incubation |
| Eider | 6-Jul-2000 | 114 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 114 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 114 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 114 | 1 | Fresh | Laying |

| Archipelago | Date | Island | Clutch | Days | Stage |
|---|---|---|---|---|---|
| Eider | 6-Jul-2000 | 114 | 3 | 3to5 | Incubation |
| Eider | 6-Jul-2000 | 114 | 3 | 0TO5 | Incubation |
| Eider | 6-Jul-2000 | 114 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 114 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 114 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 114 | 1 | 3to5 | Incubation |
| Eider | 6-Jul-2000 | 114 | 3 | 5 | Incubation |
| Eider | 6-Jul-2000 | 114 | 3 | 5 | Incubation |
| Eider | 6-Jul-2000 | 114 | 2 | 5to8 | Incubation |
| Eider | 6-Jul-2000 | 125 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 125 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 125 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 125 | 2 | 0TO5 | Incubation |
| Eider | 6-Jul-2000 | 125 | 2 | 3to5 | Incubation |
| Eider | 6-Jul-2000 | 125 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 127 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 127 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 130 | 2 | 0TO5 | Incubation |
| Eider | 6-Jul-2000 | 130 | 3 | 0TO5 | Incubation |
| Eider | 6-Jul-2000 | 131 | 1 | 0TO5 | Incubation |
| Eider | 6-Jul-2000 | 131 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 131 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 131 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 132 | 2 | 3to5 | Incubation |
| Eider | 6-Jul-2000 | 132 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 132 | 2 | 0TO5 | Incubation |
| Eider | 6-Jul-2000 | 133 | 2 | Fresh | Laying |
| Eider | 6-Jul-2000 | 141+144 | 1 | Fresh | Laying |
| Eider | 6-Jul-2000 | 141+144 | 2 | Fresh | Laying |

N.B.: All eggs were handled and candled by Scott Gilliland

Appendix 10. Egg size of Common Eiders, Herring Gulls and Great Black-backed Gulls

A. Common Eiders egg sizes

| Archipelago | Date | Clutch * | Lengh | Width | Weight | Inc. Stage | BAGWTCORR |
|---|---|---|---|---|---|---|---|
| Gyrfalcon | 23-Jun-00 | 1 | 70.4 | 49.4 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 1 | 74.9 | 51.3 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 1 | 70.4 | 49.6 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 1 | 72.9 | 48.8 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 2 | 73.0 | 48.6 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 2 | 75.2 | 49.4 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 2 | 74.0 | 50.6 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 3 | 77.2 | 50.8 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 3 | 72.4 | 47.6 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 3 | 74.1 | 50.0 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 3 | 75.0 | 51.1 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 4 | 75.9 | 50.3 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 4 | 69.9 | 49.0 | . | . | minus 1.5 |
| Gyrfalcon | 23-Jun-00 | 4 | 75.2 | 50.9 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 5 | 72.2 | 48.5 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 5 | 72.0 | 48.9 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 5 | 74.4 | 49.6 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 6 | 75.5 | 51.2 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 7 | 75.0 | 50.9 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 7 | 74.1 | 50.1 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 7 | 77.8 | 49.2 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 8 | 77.1 | 50.2 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 9 | 77.4 | 49.7 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 10 | 77.8 | 49.9 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 10 | 78.0 | 48.7 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 11 | 76.0 | 49.5 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 11 | 73.1 | 49.8 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 11 | 73.7 | 49.5 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 12 | 74.9 | 48.8 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 12 | 75.0 | 49.1 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 12 | 72.7 | 46.6 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 13 | 81.8 | 48.8 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 13 | 74.9 | 50.3 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 14 | 76.8 | 50.8 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 15 | 73.2 | 48.3 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 15 | 72.2 | 51.2 | . | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 15 | 77.6 | 51.2 | . | . | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 16 | 74.6 | 50.0 | 106 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 16 | 72.3 | 51.3 | 112 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 16 | 73.4 | 51.6 | 113 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 17 | 73.1 | 50.4 | 102 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 17 | 71.2 | 50.9 | 102 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 17 | 72.6 | 48.9 | 95 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 17 | 73.1 | 49.1 | 96 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 18 | 74.0 | 47.9 | 95 | FRESH | minus 1.5 |

A. Common Eiders egg sizes (continued)

| Archipelago | Date | Clutch * | Lengh | Width | Weight | Inc. Stage | BAGWTCORR |
|---|---|---|---|---|---|---|---|
| Gyrfalcon | 25-Jun-00 | 18 | 77.3 | 48.2 | 102 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 18 | 70.5 | 48.1 | 94 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 19 | 74.6 | 49.4 | 102 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 19 | 75.9 | 48.6 | 100 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 19 | 71.5 | 48.7 | 97 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 20 | 69.9 | 49.8 | 100 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 20 | 74.1 | 48.8 | 99 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 20 | 69.9 | 48.1 | 89 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 21 | 67.9 | 49.2 | 95 | 12 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 21 | 71.1 | 49.4 | 96 | 12 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 21 | 68.4 | 46.8 | 84 | 12 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 22 | 82.0 | 49.3 | 112 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 22 | 78.4 | 49.0 | 108 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 23 | 72.7 | 50.1 | 104 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 23 | 75.7 | 47.9 | 95 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 23 | 72.6 | 48.7 | 93 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 23 | 76.3 | 50.2 | 106 | 5 TO 8 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 24 | 76.1 | 50.5 | 95 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 24 | 73.7 | 51.7 | 110 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 25 | 76.6 | 50.0 | 110 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 25 | 74.8 | 47.5 | 93 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 25 | 76.0 | 48.5 | 99 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 25 | 77.9 | 47.9 | 103 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 26 | 71.4 | 45.2 | 84 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 26 | 74.5 | 47.9 | 97 | 0 TO 5 | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 27 | 77.2 | 49.5 | 108 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 27 | 75.6 | 47.7 | 99 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 27 | 76.6 | 48.2 | 104 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 28 | 77.1 | 48.1 | 94 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 28 | 75.1 | 48.5 | 98 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 28 | 78.2 | 50.2 | 106 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 28 | 76.6 | 48.2 | 104 | FRESH | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 29 | 75.7 | 48.6 | 101 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 29 | 73.3 | 50.7 | 107 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 29 | 75.4 | 50.1 | 105 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 29 | 76.7 | 49.2 | 103 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 30 | 75.0 | 51.3 | 111 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 30 | 76.9 | 52.2 | 117 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 30 | 78.3 | 50.0 | 116 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 31 | 78.5 | 50.1 | 110 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 31 | 77.1 | 50.6 | 108 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 31 | 76.8 | 47.2 | 106 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-00 | 31 | 76.6 | 49.4 | 94 | | minus 2.0 |
| Payne | 29-Jun-00 | 32 | 75.2 | 50.5 | 108 | . | 0 |
| Payne | 29-Jun-00 | 32 | 67.3 | 51.3 | 83 | . | 0 |
| Payne | 29-Jun-00 | 32 | 71.1 | 50.6 | 92 | . | 0 |
| Payne | 29-Jun-00 | 32 | 73.0 | 47.7 | 101 | . | 0 |
| Payne | 29-Jun-00 | 33 | 75.9 | 48.6 | 97 | . | 0 |

A. Common Eiders egg sizes (continued)

| Archipelago | Date | Clutch * | Lengh | Width | Weight | Inc. Stage | BAGWTCORR |
|---|---|---|---|---|---|---|---|
| Payne | 29-Jun-00 | 33 | 72.8 | 53.0 | 93 | . | 0 |
| Payne | 29-Jun-00 | 33 | 78.7 | 49.1 | 99 | . | 0 |
| Payne | 29-Jun-00 | 33 | 76.7 | 50.2 | 103 | . | 0 |
| Payne | 29-Jun-00 | 34 | 81.7 | 51.5 | 110 | . | 0 |
| Payne | 29-Jun-00 | 34 | 72.7 | 49.7 | 96 | . | 0 |
| Plover | 1-Jul-00 | 35 | 72.9 | 50.5 | 101 | . | minus 2.0 |
| Plover | 1-Jul-00 | 35 | 70.8 | 48.4 | 94 | . | minus 2.0 |
| Plover | 1-Jul-00 | 36 | 73.9 | 49.6 | 105 | . | minus 2.0 |
| Plover | 1-Jul-00 | 37 | 72.6 | 48.7 | 97 | . | minus 2.0 |
| Plover | 1-Jul-00 | 37 | 60.8 | 47.5 | 85 | . | minus 2.0 |
| Plover | 1-Jul-00 | 37 | 70.9 | 48.3 | 93 | . | minus 2.0 |
| Plover | 1-Jul-00 | 38 | 76.8 | 49.4 | 99 | . | minus 2.0 |
| Plover | 1-Jul-00 | 38 | 77.5 | 50.2 | 105 | . | minus 2.0 |
| Plover | 1-Jul-00 | 38 | 74.6 | 48.2 | 93 | . | minus 2.0 |
| Plover | 1-Jul-00 | 39 | 78.1 | 51.5 | 110 | . | minus 2.0 |
| Plover | 1-Jul-00 | 39 | 79.5 | 49.3 | 103 | . | minus 2.0 |
| Plover | 1-Jul-00 | 39 | 78.3 | 51.5 | 111 | . | minus 2.0 |
| Plover | 1-Jul-00 | 39 | 77.4 | 51.1 | 109 | . | minus 2.0 |
| Plover | 1-Jul-00 | 40 | 74.5 | 48.6 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 40 | 72.7 | 49.7 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 41 | 77.3 | 49.4 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 41 | 79.6 | 47.4 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 41 | 80.9 | 48.8 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 42 | 74.4 | 51.7 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 42 | 78.8 | 49.9 | . | . | minus 2.0 |
| Plover | 1-Jul-00 | 43 | 75.3 | 50.4 | 108 | . | minus 2.0 |
| Plover | 1-Jul-00 | 43 | 75.1 | 50.0 | 104 | . | minus 2.0 |
| Plover | 1-Jul-00 | 43 | 72.2 | 48.3 | 94 | . | minus 2.0 |
| Plover | 1-Jul-00 | 44 | 75.6 | 51.1 | 108 | . | minus 2.0 |
| Plover | 1-Jul-00 | 44 | 74.9 | 50.8 | 104 | . | minus 2.0 |
| Plover | 1-Jul-00 | 44 | 77.7 | 50.9 | 111 | . | minus 2.0 |
| Plover | 1-Jul-00 | 44 | 74.3 | 48.4 | 96 | . | minus 2.0 |

B. Herring Gulls egg sizes

| Archipelago | Date | Clucth* | Lenght | Width | Weight | BAGWTCORR |
|---|---|---|---|---|---|---|
| Gyrfalcon | 23-Jun-2000 | 1 | 73.3 | 51.4 | . | minus 1.5 |
| Gyrfalcon | 23-Jun-2000 | 1 | 75.4 | 51.2 | . | minus 1.5 |
| Gyrfalcon | 23-Jun-2000 | 1 | 74.3 | 50.8 | . | minus 1.5 |
| Gyrfalcon | 23-Jun-2000 | 2 | 73.8 | 52.0 | . | minus 1.5 |
| Gyrfalcon | 23-Jun-2000 | 3 | 72.9 | 50.9 | . | minus 1.5 |
| Gyrfalcon | 23-Jun-2000 | 3 | 72.8 | 52.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-2000 | 4 | 72.9 | 49.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-2000 | 4 | 72.6 | 50.6 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-2000 | 5 | 70.5 | 51.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-2000 | 5 | 68.5 | 51.1 | . | minus 1.5 |

B. Herring Gulls egg sizes (continued)

| Archipelago | Date | Clucth* | Lenght | Width | Weight | BAGWTCORR |
|---|---|---|---|---|---|---|
| Gyrfalcon | 24-Jun-2000 | 6 | 72.9 | 49.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-2000 | 6 | 72.6 | 50.6 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-2000 | 7 | 73.8 | 50.2 | 95.5 | minus 2.0 |
| Gyrfalcon | 24-Jun-2000 | 7 | 73.0 | 48.7 | 93.0 | minus 2.0 |
| Gyrfalcon | 24-Jun-2000 | 8 | 69.4 | 46.0 | 100.0 | minus 2.0 |
| Gyrfalcon | 24-Jun-2000 | 8 | 70.1 | 51.9 | 102.2 | minus 2.0 |
| Gyrfalcon | 24-Jun-2000 | 8 | 71.4 | 48.9 | 86.0 | minus 2.0 |
| Gyrfalcon | 25-Jun-2000 | 9 | 69.4 | 46.0 | 102.0 | minus 2.0 |
| Gyrfalcon | 25-Jun-2000 | 9 | 70.1 | 51.9 | 104.0 | minus 2.0 |
| Gyrfalcon | 25-Jun-2000 | 9 | 71.4 | 48.9 | 88.0 | minus 2.0 |
| Gyrfalcon | 25-Jun-2000 | 10 | 63.2 | 49.3 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-2000 | 10 | 74.6 | 47.1 | . | minus 2.0 |
| Gyrfalcon | 25-Jun-2000 | 10 | 71.1 | 47.4 | . | minus 2.0 |
| Payne | 27-Jun-2000 | 11 | 71.8 | 51.2 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 11 | 71.8 | 50.9 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 11 | 70.2 | 49.3 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 12 | 74.3 | 49.8 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 12 | 73.9 | 52.1 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 12 | 74.1 | 51.3 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 13 | 71.2 | 48.6 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 13 | 71.3 | 48.3 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 14 | 71.6 | 49.6 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 14 | 72.6 | 49.0 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 14 | 69.9 | 48.9 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 15 | 70.7 | 48.9 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 15 | 71.3 | 48.0 | . | minus 1.5 |
| Payne | 27-Jun-2000 | 15 | 68.9 | 46.9 | . | minus 1.5 |
| Plover | 1-Jul-2000 | 16 | 80.7 | 50.9 | . | minus 1.5 |
| Plover | 1-Jul-2000 | 16 | 70.7 | 51.8 | . | minus 1.5 |
| Plover | 1-Jul-2000 | 16 | 73.6 | 51.4 | . | minus 1.5 |
| Plover | 1-Jul-2000 | 17 | 72.3 | 49.9 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 18 | 72.5 | 51.9 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 18 | 71.4 | 51.6 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 19 | 72.8 | 50.2 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 19 | 74.3 | 50.5 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 19 | 73.1 | 49.4 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 24 | 69.2 | 50.0 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 24 | 71.6 | 48.5 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 20 | 66.3 | 45.9 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 21 | 72.8 | 51.1 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 21 | 73.2 | 51.2 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 22 | 73.5 | 50.6 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 22 | 66.5 | 48.9 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 23 | 72.5 | 51.2 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 23 | 69.6 | 50.2 | . | minus 1.5 |
| Plover | 30-Jun-2000 | 23 | 72.2 | 51.7 | . | minus 1.5 |

C. Great Black-backed Gulls egg sizes

| Archipelago | Date | Clutch* | Lenght | Width | Weight | BAGWTCORR |
|---|---|---|---|---|---|---|
| Gyrfalcon | 24-Jun-00 | 1 | 76.6 | 54.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 1 | 79.0 | 55.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 2 | 76.6 | 54.5 | . | minus 1.5 |
| Gyrfalcon | 24-Jun-00 | 2 | 76.5 | 53.1 | . | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 3 | 74.5 | 52.3 | . | minus 1.5 |
| Gyrfalcon | 25-Jun-00 | 3 | 72.2 | 53.1 | . | minus 1.5 |
| Payne | 27-Jun-00 | 4 | 80.2 | 55.1 | . | minus 1.5 |
| Payne | 27-Jun-00 | 4 | 79.8 | 54.4 | . | minus 1.5 |
| Payne | 27-Jun-00 | 5 | 75.0 | 55.3 | . | minus 1.5 |
| Payne | 27-Jun-00 | 6 | 72.0 | 53.1 | . | minus 1.5 |
| Payne | 27-Jun-00 | 6 | 73.9 | 54.4 | . | minus 1.5 |
| Payne | 27-Jun-00 | 6 | 73.9 | 54.5 | . | minus 1.5 |
| Payne | 29-Jun-00 | 7 | 80.8 | 55.5 | . | minus 1.5 |
| Payne | 29-Jun-00 | 7 | 79.6 | 54.2 | . | minus 1.5 |
| Payne | 29-Jun-00 | 7 | 85.3 | 53.3 | . | minus 1.5 |
| Payne | 29-Jun-00 | 8 | 74.7 | 53.1 | . | minus 1.5 |
| Payne | 29-Jun-00 | 8 | 75.0 | 53.8 | . | minus 1.5 |
| Payne | 29-Jun-00 | 8 | 74.1 | 53.0 | . | minus 1.5 |
| Payne | 29-Jun-00 | 9 | 83.4 | 53.2 | . | minus 1.5 |
| Payne | 29-Jun-00 | 9 | 78.6 | 52.5 | . | minus 1.5 |
| Payne | 29-Jun-00 | 9 | 81.9 | 51.4 | . | minus 1.5 |

* Refers to the clutch number and not the clutch size; eggs with the same number come from the same clutch. All eggs measured and weighted by Scott Gilliland

Appendix 11. Birds species observed during the ground survey of breeding Common Eiders on Gyrfalcon, Payne, Plover, and Eider archipelagos, from June 21st to July 7th 2000

| Species | number of individuals observed | confirmed status[1] |
|---|---|---|
| Red-throated Loon | 21 | breeder |
| Common Loon | 5 | |
| Unidentified loon | 2 | - |
| Brant | 1 | possible breeder[2] |
| Canada Goose | 66 | breeder |
| Northern Pintail | 7 | |
| Common Eider | no systematic count[3] | breeder |
| Long-tailed Duck | 7 | paired |
| Red-breasted Merganser | 31 | |
| Rough-legged Hawk | 6 | breeder |
| Peregrine Falcon | 6 | breeder |
| Rock Ptarmigan | 2 | paired |
| Semipalmated Plover | 7 | |
| Unidentified Shorebird | 1 | - |
| Parasitic Jaeger | 1 | |
| Long-tailed Jaeger | 1 | |
| Herring Gull | 880 | breeder |
| Iceland Gull | 2 | possible breeder[4] |
| Glaucous Gull | 61 | breeder |
| Great Black-backed Gull | 95 | breeder |
| Unidentified gull | 29 | - |
| Arctic Tern | 34 | breeder |
| Common Murre | 1 | |
| Thick-billed Murre | 1 | |
| Black Guillemot | 2771 | breeder |
| Horned Lark | 15 | |
| Common Raven | 1 | paired |
| American Pipit | 29 | |
| White-throated Sparrow | 1 | |
| White-crowned Sparrow | 1 | |
| Dark-eyed Junco | 1 | |
| Snow Bunting | 183 | breeder |
| Common Redpoll | 2 | |
| Unidentified redpoll | 2 | - |

[1] according to our observations

[2] the bird seemed paired with a Canada Goose, and two goose nests were found on that island

[3] nests were counted but not individual birds

[4] one adult seen in a gull colony seemed territorial

Appendix 12. Other bird species observed on the Ungava mainland from Kuujjuaq to Quaqtaq

Snow Goose
Green-winged Teal
Black Duck
Mallard
Northern Pintail
Lesser Scaup
King Eider
Black Scoter
Surf Scoter
Common Goldeneye
Barrow's Goldeneye
Common Merganser
Golden Eagle
Spotted Sandpiper
Least Sandpiper
Common Snipe
Short-eared Owl
Bank Swallow
Ruby-crowned Kinglet
Northern Wheatear
American Robin
Tenessee Warbler
Magnolia Warbler
Yellow-rumped Warbler
Blackpoll Warbler
Northern Waterthrush
Wilson's Warbler
American Tree Sparrow
Savannah Sparrow
Fox Sparrow
Song Sparrow
Lincoln's Sparrow