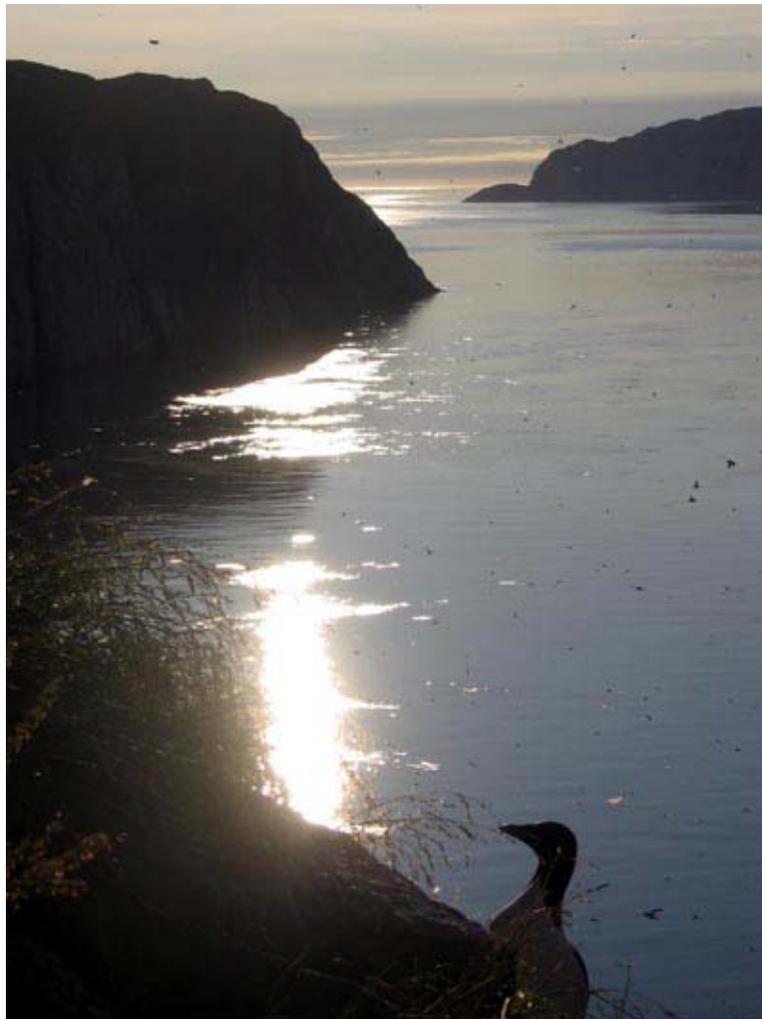


**SEABIRD RESEARCH AT DIGGES ISLAND AND VICINITY,
25 JULY – 17 AUGUST, 2008**

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SUMMARY

1. A field team of three conducted surveys and monitored the breeding ecology of marine birds at East Digges Island, Nunavut, from 25 July until 17 August, 2008.
2. Daily counts of Thick-billed Murres were made on 10 long-term study plots from 26 July until 16 August. Mean daily count was significantly higher than in 1980-1982, and we estimate an increase of 0.4% per year.
3. The median date of laying for Thick-billed Murres was 26 June; identical to that observed in 2004 and within the range of median lay dates observed in 1980-82.
4. We monitored chick diet through 6 days of feeding watches, and identified 367 prey items. Capelin represented 49% of all prey items delivered. However, its prevalence was much lower in 2008 than in 2004, where it accounted for >80% of the diet. Arctic Cod accounted for 27% of prey items in 2008; an increase over 2004. Feeding rates were estimated at 3.3 – 4.7 meals per chick per day.
5. Regression of mass on age for Thick-billed Murre chicks measured at plot S1 suggested a mean 14 d mass of 143 g. This is more than 10 g lighter than that observed in 2004 or in 1980-1982.
6. We surveyed Glaucous and Iceland Gulls at seven colonies throughout the area. The abundance of Glaucous Gulls continues to be much lower than in 1980-1982, with 69% fewer pairs or apparently occupied sites observed. In contrast, counts of Iceland Gulls were 13% higher than in 1980-1982, due to an increase in the number observed at the colony south of Akpa Cove.
7. We made several notable sightings of rare birds and mammals including Great Black-backed Gull, Golden Eagle, Song Sparrow, American Robin, Killer Whale, and Harbour Seal.

INTRODUCTION

A field party consisting of Paul Smith (Carleton University), Kerry Woo and Kyle Elliott (contractors), arrived in Ivujivik by charter aircraft on the evening of 24 July and spent the night in the village's hotel. All gear was picked up at the airport and delivered to a secure storage shed, free of charge, by employees of the hamlet office (contact Moses Audlaluk: 819-922-3603). The following day, we chartered two canoes to travel to the field site and surveyed gull colonies en route.

A camp was established in "camp cove", the location on the southeast corner of East Digges Island used previously by Environment Canada teams. A wooden frame was constructed for the 8' x 10' canvas wall tent that we used for eating and living. This frame remains on site. Dome tents were used for sleeping, and water was obtained from a small stream flowing close to the tent sites. The camp was sheltered and comfortable, however, shallow soil prevented us from erecting a bear fence around the dome tents and the creek was nearly dry prior to the significant rain events in early August.

Weather during our stay was moderate, with several aspects of our work complicated by wet conditions. Rain was encountered on 13 of 23 days, and thick fog on seven days, making colony counts impossible or unsafe on five occasions, and hampering our ability to band chicks. High winds (> 40 km/h) were observed on only five occasions, and wind speeds never exceeded 30km/h in the shelter of Camp Cove. Temperatures were warm in late July and early August, with daytime highs exceeding 20°C on three occasions. Several people in Ivujivik remarked that ice out was "2 weeks early" this year, and that drifting ice cleared quickly after break-up.

Filmmakers Steve Smith and Julia Szucs (Meltwater Media) joined the crew on 11 August to document our research activities. Camp was closed on 17 August, and all equipment (except the tent frame) removed from the site. The crew left Ivujivik for Iqaluit on the morning of 18 August by Twin Otter.

RESULTS

Thick-billed Murre *Uria lomvia*

Counts of monitoring plots

We counted the number of murrelets present on 10 monitoring plots daily between 26 July and 16 August (Appendix 1). Counts took place between 1700-1800 h. The daily total of the plot counts was variable, ranging from 1548 – 2007 birds. Counts were depressed during periods of bad weather, but showed no seasonal trend (Fig. 1). Daily totals were $15 \pm 4\%$ greater than those from the same set of plots on corresponding days in the baseline years of 1980-1982 (Fig. 1). The mean total is the highest recorded to date at Digges Island (Fig. 2), and significantly higher than the mean for the same period in 1980-1982 (paired t-test: $t_{15} = 4.4$, $P < 0.001$).

We used a general linear model to assess the magnitude of the yearly changes in the total plot counts. Because seasonal trends are apparent in some years and the dates upon which surveys were conducted varied, we added day of the season and day² to the model. All effects were significant (Table 1); after accounting for the influence of the survey dates, the estimated trend in colony size is an increase of 4% per decade. When we break down this trend roughly by decade, we find that the rate of increase between the 1980-82 period (mean 1571 ± 152 [SD]) and 1993 (1618 ± 133) averaged 0.2%/yr, between 1993 and 1999 (1726 ± 130) it averaged 1.1%/yr and between 1999 and 2008 it averaged 0.4%/yr. The colonies in Digges Sound constitute the second largest aggregation of Thick-billed Murrelets in Canada, and an increase of 4% per decade here is significant for the population as a whole.

The increasing trend in monitoring plot counts at Digges Island parallels observations from Coats Island (Fig 2), where similar counts are available from 1985 onwards. Counts in 2007 and 2008 at Coats were the highest since observation began. As at Digges, the rate of increase at Coats was highest in the 1990s (2.3%/yr during 1993-1999), following a decrease from 1989-1991. The rate of growth appears to have slowed subsequently (0.7%/yr during 2000-2008).

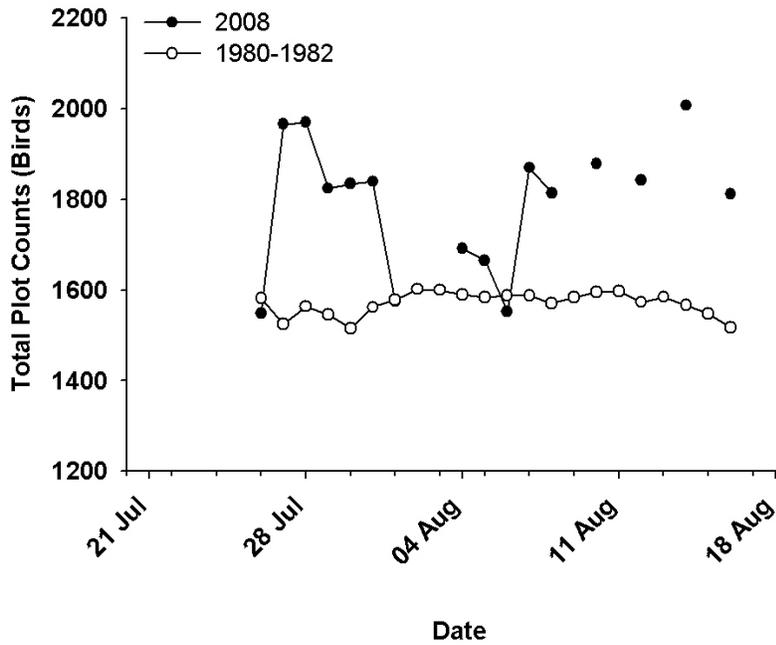


Figure 1
Daily counts in 2008 compared to 5 day running means for 1980-1982

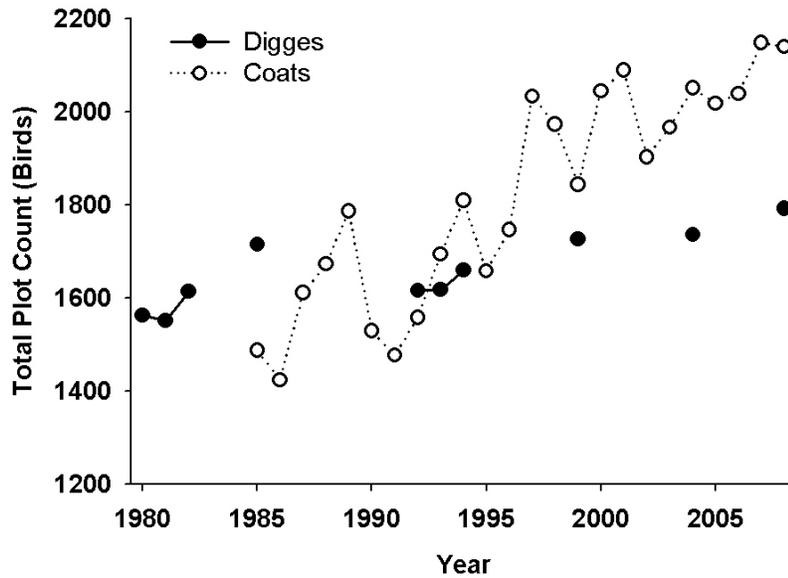


Figure 2
Mean monitoring counts at East Digges and Coats Islands since 1980. Means were calculated for 16 July – 15 August; the period best represented among years

Table 1

Results of a general linear model assessing the effect of year, date of observation (June 1 = 1) and date² on the total number of birds counted on standard monitoring plots at Digges Island, 1980-2008

Effect	F	P	$\beta \pm SE$
Intercept	17.9	0.00	-11952 \pm 2824
Year	19.2	0.00	6.28 \pm 1.43
Date	35.0	0.00	33.44 \pm 5.65
Date ²	21.0	0.00	-0.25 \pm 0.06

Timing of breeding

The colony was first inspected on 26 July, and we estimated that approximately half of the active nest sites in plots A-J had chicks at this time. At plot “R” however, 8/8 sites observed had eggs and we concluded that eggs from this plot might have been harvested by local people. On 30 July, we measured eggs and chicks at plot S1, and again concluded that approximately half of the active sites had hatched by this date.

Dates of hatch were estimated from wing length, using a regression equation calculated from known age chicks in 1982 ($\text{Age (days)} = -0.0096(\text{wing, mm})^2 + 1.2677(\text{wing}) - 23.973$, $R^2 = 0.98$; Gaston et al. 1985). A sample of 49 chicks was measured between 30 July – 14 August at the S1 plot. Chicks were measured 1 – 5 times (depending on timing of hatch, predation or fledging), and an average estimate of hatch date was calculated for chicks with repeated observations. The median hatch date was 28-Jul, suggesting a median lay date of 26 June (assuming a 33d incubation period). This is identical to that observed in 2004 and within the range of median lay dates observed in 1980-82 (26-30 June, Gaston et al. 1985). Young chicks and eggs were encountered even on our final visit to the plot on 14 August, but some of these may have been the product of replacement laying.

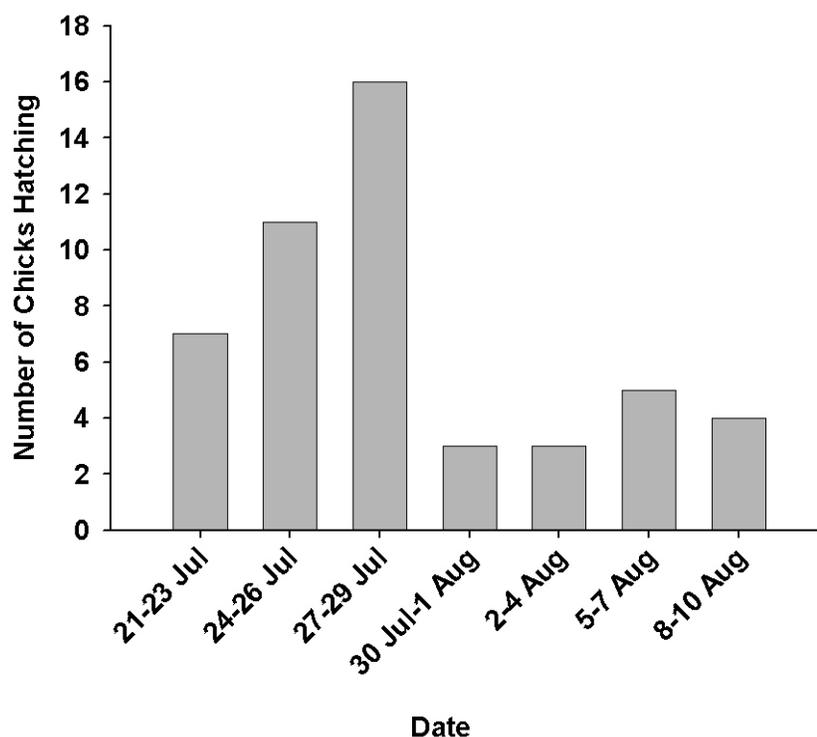


Figure 3

The distribution of hatch dates for Thick-billed Murre chicks at East Digges Island, estimated on the basis of wing-length measurements

Diet of nestlings

We conducted six days of feeding watches (73 h total) between 0600h and 2200h. Five days of watches were carried out at plot S1, and 1 day at J. A total of 470 feeds were observed, and the prey was identified in 367 cases. Capelin *Mallotus villosus* (Osmeridae) was the single most important diet item, representing 49% of all identified feeds (Table 2). Arctic cod *Boreogadus saida* (Gadidae) were also well represented, and tended to be larger than the capelin (10.2 ± 0.3 [SE] cm vs. 8.6 ± 0.1). While capelin remains the dominant diet item, its prevalence was lower in 2008 than in 2004, where it accounted for >80% of all identified prey deliveries (Fig. 4). The 2008 value of 49% is similar to values observed at Coats Island during 1997-2007, where capelin comprised <60% of deliveries in any year. However, in 2008, capelin constituted 69% of deliveries at Coats Island. At Digges, as at Coats, blenny-like fishes (Zoarcidae,

Pholididae, Lumpenidae, Blennioididae) and sculpins (Cottidae) made up a greater proportion of diet items in years when Arctic cod dominated the diet than in those when capelin predominated.

In contrast to the decrease observed in capelin, Arctic cod were fed to nestlings nearly 5 times more often in 2008 than in 2004 (Fig. 4). The extent to which this reflects an increase in the local abundance of cod, versus a decrease in the abundance of capelin, is unknown. The people of Ivujivik felt that 2008 was a year of particularly early ice clearance. However, total ice extent in Hudson Strait on 25 June in 2008 was 44%: almost identical with conditions at the same date in 2004 (41%), although somewhat less than in 1980-1982 (51-57%).

Two extended feeding watches (60.5 h over 4 d) at plot S1 yielded estimates of 4.6 and 4.7 meals per chick per day, while we estimated 3.3 feeds per chick per day from a shorter watch (9 h) at plot J. Feeding rates were somewhat lower during the early afternoon than in the morning and evening, a pattern also seen at Coats island in most years (Hipfner et al. 2006), but diel patterns in feeding rates were not strong overall (Fig. 5). This observation supports Hipfner et al.'s (2006) suggestion that diel patterns in delivery rates of Thick-billed Murres are most pronounced when food is abundant.

Table 2

The proportion of prey items in the diet of nestling Thick-billed Murres at Digges Island, 1980-2008

Year	1980-82	1992	1999	2004	2008
(N feeds)	(194)	(35)	(122)	(184)	(367)
Cod	52	51	19	6	27
Capelin	7	17	41	84	49
Sandlance	14	3	14	3	7
Blenny-like	14	17	14	2	6
Sculpin	5	11	7	2	3
Squid	5	0	3	2	4
Crustacea	1	0	1	1	4
Others	3	0	2	1	1

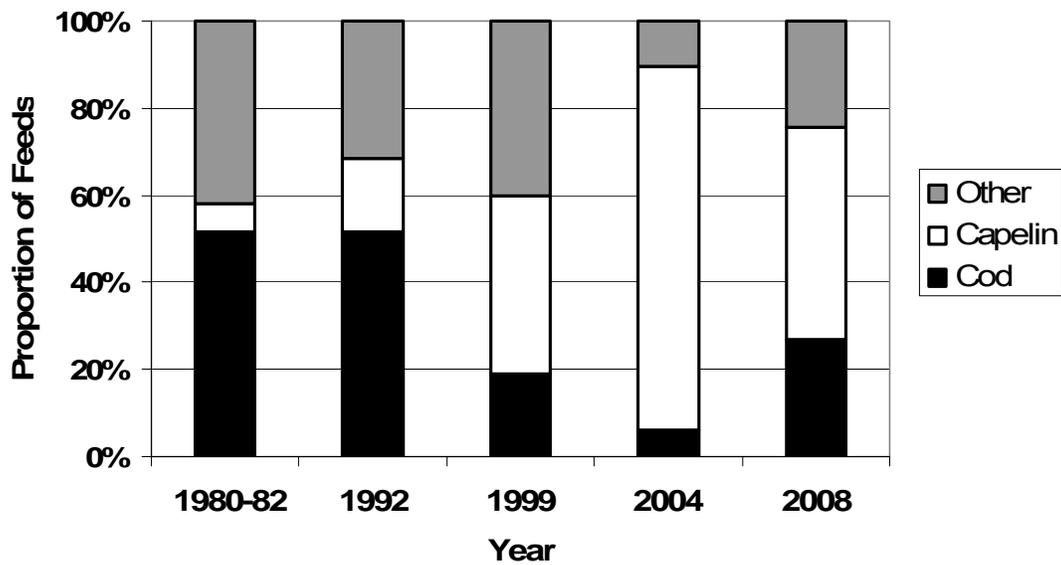


Figure 4

The relative proportion of Capelin, Cod and all other prey items in the diets fed to nestling Thick-billed Murres at Digges Island, 2008

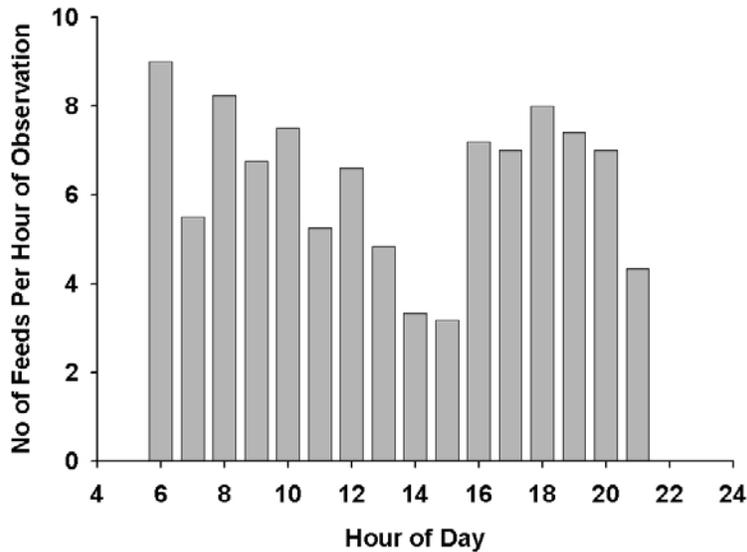


Figure 5

The rate of prey deliveries to Thick-billed Murre nestlings in relation to time of day. No observations were made between 2200h and 0600h

Egg size and nestling growth

A sample of 25 eggs was measured with calipers (± 0.1 mm) at the S1 plot on 30 July. The mean length (\pm SE) was 77.8 ± 0.7 mm, while breadth was 50.1 ± 0.3 mm, for a length x breadth² of 195.1 ± 31.4 cm³. This value does not differ significantly from the mean for Digges Island of 204.0 ± 15.9 cm³ (SD) reported in Gaston and Hipfner (2000).

We monitored the growth of nestlings at the S1 plot on five visits between 30 July and 14 August. A sample of 49 nestlings was weighed (± 1 g) on a 300 g Pesola spring scale, and measured (carpus to tip of wing, feather or pin, ± 1 mm) with calipers. Nestling age was determined as above, using the wing/age regression obtained in 1982. We regressed observed mass on our estimates of age (Fig. 6), and used this relationship to predict mean mass at 14 d for our sample of nestlings. Repeat observations of chicks were included despite non-independence, yielding 130 data points. Mean mass at 14 d was estimated to be 142.5 g; 10.6 g lighter than observed in 2004, when the diet was dominated by capelin, but similar to weights observed during 1980-82.

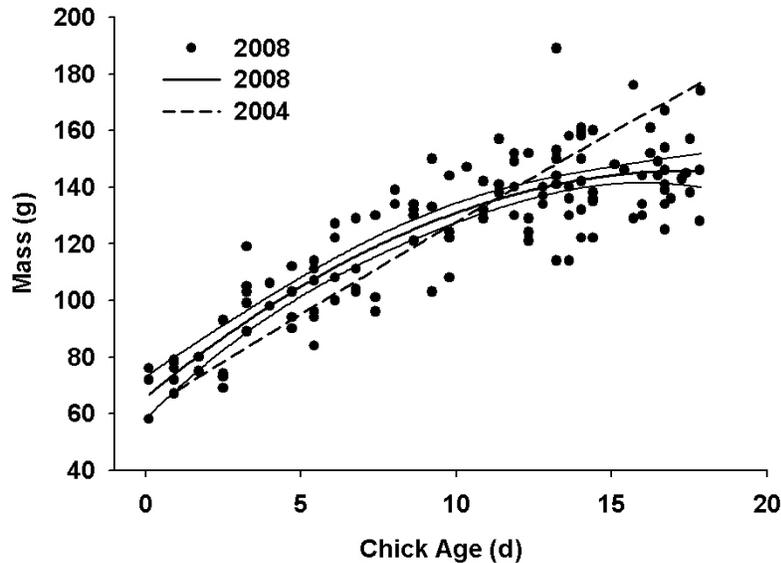


Figure 6

The rate of growth among Thick-billed Murre nestlings at East Digges Island in 2008. The regression for 2008 is displayed with 95% confidence intervals [mass (g) = 65.714 + 9.120(age(d))-0.259(age²)]. The dashed line represents the relationship between mass and age obtained from East Digges Island in 2004

Capture, banding and collections

As part of the regular monitoring program, we captured a sample of 60 adults during chick rearing (mass 935.4 ± 6.8 g). Chick banding was hampered by a long bout of wet weather in early August. A total of 150 chicks were banded, including 100 below the S1 ledge.

We undertook several projects that are not part of the basic monitoring program, and these are described in detail elsewhere. In brief, we deployed 31 BAS geolocator units on adults in the area south of the J plot. These birds can be accessed in 2009 for retrieval of the loggers without the use of climbing equipment (although pitons were left in place for fixing a hand-rail). We also made 41 deployments of temperature-depth recorders (88 days of records) throughout the chick-rearing period, and conducted feeding watches on individuals equipped with recorders. These data are currently being analysed by K. Elliott.

On 11 August, we collected 30 adult Murres from the area between the Nuvuk Islands and the mainland. The collection was made with the assistance of Adami Mangiuk, and samples will be analysed by J. Provencher. For future collections of foraging birds, a .22 rimfire rifle should be used to increase the range at which humane kills can be made.

Observations of Colony Disturbance

We monitored human disturbance of the colony to determine whether it could be affecting productivity. Because of our late arrival, we did not witness any egg collecting, however this (sustainable) practice continues to take place annually. Moses Audlaluk estimated that 3000 - 4000 eggs are taken in a successful year of egging. Over the 23 days of our stay, we observed 9 instances where passing boats or airplanes caused large numbers of birds to flush. Three observations were noteworthy. On 8 August, a person from Ivujivik boated along the entire length of the colony banging the gunwales of his canoe loudly, with the intention of causing the birds to flush. On 30 July and again on 10 August, an Air Inuit twin otter flew along the length of the Cape Wolstenhome colony and presumably caused a massive disturbance.

Glaucous and Iceland Gulls *Larus hyperboreus, L. glaucoides*

Numbers and trends

Work in 2004 documented substantial declines in the number of Glaucous and Iceland Gulls breeding in Digges Sound. In 2008, we revisited seven aggregations of nests, including Fairway Island, Staffe Islet, Islet B, West Digges Island, East Digges Island plots U and S, and a colony south of Akpa Cove. At these sites, we counted the number of adult birds present, the number of apparently occupied sites or nest cups, and the number and size of broods (Table 3, 4). The dates upon which surveys were conducted varied (Tables 3 and 4).

The number of Glaucous Gulls observed at the colonies was substantially lower than in 1980-1982, but differed little from the observations in 2004 (Table 5). We

counted a total of only 27 pairs, in comparison to 88 counted at these colonies in 1980-1982. The colony at Fairway Island, once holding 28 pairs of Glaucous Gulls, was attended by only 3 individuals (however, none was found here in 2004). Our counts of Iceland Gulls were higher than in 1980-1982 because of a substantial increase in numbers at the colony south of Akpa Cove. The count of Iceland Gulls at the Staffe Islet colony was similar to that observed in 1980-1982, suggesting that the depressed count there in 2004 might have been anomalous.

Reproductive success

Glaucous Gulls were breeding at all six locations where they were found, but only a small number of individuals bred. We observed a total of 16 broods (Table 3), with a mean brood size of 2.2. The Glaucous Gulls breeding at plot S1, in the centre of the Thick-billed Murre colony, were observed on 30 July and 14 August. On 30 July, 8 birds were attending sites, and three of these were sitting in nest cups with tails raised. On 14 August, 8 birds continued to attend sites, and two had chicks (one brood of three, one brood of one). Only one brood was observed among five pairs at plot U, and only 2 broods among 16 individuals counted at Islet B. This low reproductive success is similar to that observed in 2004.

Among 273 pairs of Iceland Gulls, we counted 56 broods with a mean brood size across all sites of 1.86 young/pair. At the Akpa Cove colony, where our observations suggest an increase in colony size, we counted 26 broods versus the 16 observed there in 2004.

Table 3

The number of Glaucous Gulls observed at seven breeding sites in Digges Sound

Site	Date	Total Birds	Occupied Sites	Broods	Brood Sizes
Fairway Isl.	25-Jul	3	1	1	2
Islet B	25-Jul	16	2	2	3,1
W. Digges	25-Jul	0	0	0	0
Staffe Isl.	25-Jul	11	6	4	2,2,2,2
S. of Akpa Cove	04-Aug	18	5	5	3,3,2,2,?
Plot S	30-Jul/14-Aug	10/13	8/8	3/2	3,1,?
Plot U	30-Jul	29	5	1	3

Table 4

The number of Iceland Gulls observed at seven breeding sites in Digges Sound

Site	Date	Total Birds	Occupied Sites	Broods	Brood Sizes
Fairway Isl.	25-Jul	0	0	0	0
Islet B	25-Jul	0	0	0	0
W. Digges	25-Jul	36	15	6	2,1,2,1,1,?
Staffe Isl.	25-Jul	145	122	24	Mean=1.96
S. of Akpa Cove	04-Aug	191	136	26	Mean=1.85
Plot S	30-Jul/14-Aug	0	0	0	0
Plot U	30-Jul	0	0	0	0

Table 5

The change in the number (pairs or apparently occupied sites) of Glaucous Gulls (GLGU) and Iceland Gulls (ICGU) observed at seven breeding sites in Digges Sound

Site	GLGU		ICGU	
	Change 2008 vs 1980-1982	Change 2008 vs 2004	Change 2008 vs 1980-1982	Change 2008 vs 2004
Fairway Isl.	-27	1	0	0
Islet B	-10	-1	0	0
W. Digges	-2	-1	-9	-35
Staffe Isl.	-4	4	-4	62
S. of Akpa Cove	-2	5	54	76
Plot S	-13	-5	0	0
Plot U	-3	0	-10	-10
Total	-61	3	31	93

Common Eiders *Somateria mollissima*

Local people reported that a small number of Common Eiders were found dead in the Nuvuk Islands area earlier in the summer. This die-off was small in comparison to that observed in 2004, and A. Mangiuk estimated that only 20 carcasses were found. Two or three carcasses were sent to Kuujjuak (presumably to the research division of Makivik) for analysis, and were reportedly found to contain bacteria of avian cholera.

Observations of other birds and mammals

We made several bird sightings of note. Great Black-backed Gulls (*Larus marinus*) were reported by local people to be common summer residents in the Nuvuk Islands area.

We observed one individual in breeding plumage on 11 August, during our only visit to that area. Golden Eagles (*Aquila chrysaetos*) are now reported to breed on East Digges

Island (A. Mangiuk Jr., *pers. comm.*), and while we found no evidence of breeding, one was seen on several occasions throughout the summer. This species is known to breed farther south in the Ungava Peninsular, but was not mapped as present as far north as Digges Island by Gauthier and Aubry (1996). Other possible first sightings for the area include a single American Robin *Turdus migratorius* observed in the village of Ivujivik on 24 July, a Song Sparrow *Melospiza melodia* observed in camp on several occasions throughout the season, and a Black Scoter *Melanitta nigra* observed near Cape Wolstenhome on 14 August.

We saw a large number of apparently recent lemming nests, and saw live specimens *Dicrostonyx spp.* on 3 occasions. Numerous caribou *Rangifer tarandus*, were seen throughout the summer, and a maximum of 12 was counted in a single sighting. These caribou are hunted occasionally by local people. An ermine was seen atop Digges Island near Plot A on 10 August. One polar bear *Ursus maritimus* was reportedly seen on the north side of East Digges Island during our stay, but we made no sightings directly. Fresh scat was observed atop the island on several occasions in the week before our departure.

On 25 July we observed 6 adult and 3 young Killer Whales *Orca orca* in Digges Sound, near Staffe Islet. These are uncommon in the area, and caused some excitement among the people of Ivujivik. Although uncommon, A. Mangiuk reports having seen them 2-3 times during his lifetime. On the same day, we observed a group of approximately 50 Harp Seals *Phoca groenlandica* travelling together. While these are not uncommon, a group of this size apparently is. A single Harbour Seal *Phoca vitulina* was seen in the area of camp cove; this species was not recorded here in 1980-1982, although it is known to the people of Ivujivik, and occurs widely in southern and western Hudson Bay.

ACKNOWLEDGEMENTS

We are grateful for the warm welcome we received from the village of Ivujivik. Moses Audlaluk was especially helpful, arranging for transport and storage of our gear upon arrival, and helping to coordinate our boat travel. He, along with Adami Mangiuk Sr., Adami Kalingo, Saima Mark and Adami Mangiuk Jr. delivered us safely to our field site and assisted with surveys and collections. Thanks to Rick Armstrong of the Nunavut Research Institute for arranging accommodation while we were in Iqaluit and to the Polar Continental Shelf project of Natural Resources Canada for logistic support in the form of Twin-Otter flying time and the loan of a satellite phone. Christine Eberl assisted with provisioning and communications for the camp.

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Appendix 1

Details of daily monitoring counts performed at East Digges Island in 2004

Date	F1	F2	D	E	B	C	G	H	A1	A2
26-Jul	199	242	98	192	119	167	129	173	77	152
27-Jul	194	300	115	297	124	217	184	239	79	217
28-Jul	179	305	117	293	147	208	146	258	99	218
29-Jul	160	286	104	236	148	207	162	233	76	212
30-Jul	162	262	100	262	159	217	137	231	93	211
31-Jul	170	284	105	257	134	212	154	224	94	205
01-Aug	149	253	85	204	128	186	118	181	84	186
02-Aug	No Counts									
03-Aug	No Counts									
04-Aug	153	249	89	214	153	210	137	200	85	201
05-Aug	148	274	85	211	136	190	141	206	96	178
06-Aug	145	230	87	197	125	188	130	182	93	175
07-Aug	164	277	108	253	144	222	157	226	112	207
08-Aug	169	288	109	266	131	210	143	194	106	198
09-Aug	No Counts									
10-Aug	170	288	105	241	164	226	149	224	113	198
11-Aug	No Counts									
12-Aug	161	274	98	247	159	208	153	228	107	207
13-Aug	No Counts									
14-Aug	179	309	113	249	172	214	183	235	135	218
15-Aug	No Counts									
16-Aug	155	293	109	264	146	191	154	174	121	205