

## The Breeding Distribution and Current Population Status of the Ivory Gull in Canada

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(Received 9 December 1985; accepted in revised form 17 June 1987)

**ABSTRACT.** Aerial surveys were conducted in the eastern Canadian High Arctic from 1982 to 1985 to determine the distribution and size of breeding populations of the ivory gull (*Pagophila eburnea*). The known Canadian population is confined to Ellesmere, Devon, Seymour, Baffin and Perley islands. Two major concentrations of ivory gull colonies exist, one among the granitic nunataks of southeastern Ellesmere Island and the other on the sedimentary plateaus of the Brodeur Peninsula of Baffin Island. The size of breeding groups varies greatly from 4 to over 300 adult gulls. Breeding colonies are typified by their inland, remote and desolate locations and virtual absence of other animal species. We suggest that there is a single Canadian population of ivory gulls whose adult cohort contains over 2400 birds. The small number of leg band recoveries and retrapping of banded birds indicates that individuals can live at least 15 years. One-year-old ivory gulls were not seen at the colonies or on adjacent waters, and their location during summer remains unknown.

**Key words:** ivory gull, *Pagophila eburnea*, arctic breeding populations, nunataks, polynyas

**RÉSUMÉ.** On a effectué des relevés aériens dans la partie est de l'Extrême-Arctique canadien de 1982 à 1985 pour établir la distribution et la taille des populations de mouettes blanches (*Pagophila eburnea*) qui se reproduisent. La population canadienne que l'on connaît habite seulement les îles Ellesmere, Devon, Seymour, Baffin et Perley. Il y a deux endroits importants où se concentrent les colonies de mouettes blanches, l'une parmi les nunataks granitiques du sud-est de l'île Ellesmere, et l'autre sur les plateaux sédimentaires de la presqu'île Brodeur dans l'île Baffin. La taille des groupes qui se reproduisent varie grandement, allant de 4 à plus de 300 oiseaux adultes. Les colonies d'animaux qui se reproduisent sont caractérisées par leur aire de nidification isolée, loin à l'intérieur des terres, et par l'absence virtuelle d'autres espèces animales. Notre opinion est qu'il existe une seule population canadienne de mouettes blanches, dont l'ensemble des adultes compte plus de 2400 oiseaux. Le petit nombre de bagues récupérées et d'oiseaux bagués recapturés, montre que les individus peuvent vivre au moins 15 ans. On n'a pas vu de mouettes blanches d'un an dans les colonies ou sur les eaux avoisinantes, et l'endroit où elles se tiennent reste inconnu.

**Mots clés:** mouette blanche, *Pagophila eburnea*, populations qui se reproduisent dans l'Arctique, nunataks, polynies

Traduit pour le journal par Nésida Loyer.

**Резюме:** В 1982-1985 годах в восточных районах канадской Арктики проводились наблюдения с воздуха за гнездовыми колониями белой чайки (*Pagophila eburnea*) с целью установления их размеров и географического распределения. По имеющимся сведениям, территория распространения канадской популяции белой чайки ограничивается островами Элсмир, Девон, Симор, Баффинова Земля и Перли. Отмечены два основных района сосредоточения гнездовых колоний белой чайки - на гранитных утесах (нунатаках) юго-восточной части острова Элсмир и на осадочных плато полуострова Бродёр на острове Баффинова Земля. Численность чаек в гнездовых колониях в период размножения варьируется в широких пределах: от четырех до 300 с лишним взрослых птиц. Гнездовые колонии располагаются, как правило, на значительном расстоянии от побережья, в отдаленных и пустынных районах, для которых характерно почти полное отсутствие других птиц и животных. По нашему мнению, в Канаде имеется единая популяция белых чаек, насчитывающая свыше 2400 взрослых особей. Небольшое количество найденных мертвыми или заново отловленных окольцованных белых чаек позволяет предположить, что отдельные особи этого вида могут доживать по крайней мере до 15 лет. В ходе наблюдений ни в гнездовых колониях, ни на ближайших к ним водных пространствах не было обнаружено чаек-однолеток. Местонахождение их в летние месяцы остается невыясненным.

**Ключевые слова:** белая чайка, *Pagophila eburnea*, арктические гнездовые колонии, нунатаки, полыньи

### INTRODUCTION

The ivory gull (*Pagophila eburnea* [Phipps]) is a holarctic species known to breed in arctic Canada, Spitsbergen (Bateson and Plowright, 1959; Birkenmajer and Skreslet, 1963), arctic Soviet Union (Løvenskiold, 1964; Dementiev and Gladkov, 1969) and Greenland (Salomonsen and Johansen, 1950; Wright and Mathews, 1980). Records of ivory gulls breeding in the

Canadian High Arctic have existed for a long time (1853, 1916 and 1960), but the locations described have subsequently been abandoned (MacDonald and Macpherson, 1962). However in 1973 a major breeding colony of ivory gulls was discovered on Seymour Island, and from 1974 research was conducted on the breeding biology of those birds (MacDonald, 1976). It is a rare species despite its widespread distribution, and in 1978 it was

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estimated that only about 2000 individuals existed in Canada (MacDonald and Cooper, 1978).

The incidental discovery of six ivory gull colonies on the nunataks projecting from the glaciers of northeastern Ellesmere Island (Frisch and Morgan, 1979; Wits and Morrison, 1980) and four colonies in similar terrain on northeastern Devon Island (Frisch, 1983) established these land forms as additional breeding habitat. The subsequent discovery of two ivory gull colonies on the plateaus of Brodeur Peninsula (Reed and Dupuis, 1983) extended the known breeding range of this species. Intensive aerial surveys of the sea ice and open waters of eastern Lancaster Sound, western Baffin Bay and more southerly waters have indicated considerable ivory gull activity in those regions (Orr and Parsons, 1982; Renaud and McLaren, 1982).

Apart from sporadic reporting of locations of ivory gull colonies, no intensive studies have been done on the Canadian population except at Seymour Island. This paper reports on the distribution, habitats and estimated population size of the ivory gull in the eastern Canadian Arctic, specifically on southeastern Ellesmere Island, Devon Island and the Brodeur Peninsula. Research concentrated on intensive searches for breeding ivory gull colonies coupled with leg banding of adults and chicks.

#### STUDY AREA AND METHODS

##### *Location and Size of Breeding Colonies*

Searches for colonies of breeding ivory gulls were conducted during July 1981-83 on southeastern Ellesmere Island, in early August 1982 and 1983 on the Brodeur Peninsula, in early August 1983 on northeastern Devon Island and on 19 July 1985 on south-central Ellesmere Island. The areas that have been surveyed by helicopter for ivory gulls are indicated in Figures 1-5.

On eastern Ellesmere Island flight transects passed over nunataks emerging from ice fields and cliffs bordering glaciers (Fig. 2). The number of gulls flying from the rock faces was estimated on encountering a colony, and a landing was made whenever possible. The number of adult gulls was then counted with the aid of a spotting scope. In this and other surveys, the orientation of each colony was noted, together with features of the colony's location, such as rock texture, type of rock, wind shelter, presence of plants and lichens, accessibility to ground predators and the presence of other species, especially glaucous gulls (*Larus hyperboreus*) and Thayer's gulls (*Larus thayeri*).

Transect lines were flown over the land mass between the eastern shores of Baad Fiord and Harbour Fiord north to the Sydkap Ice Field and southern Ellesmere Island (Fig. 3). This area is at the confluence of metamorphic granites and the more easterly deposits of sedimentary rocks of Ellesmere Island. The southern fringes of the Sydkap Ice Field contain many nunataks of heavily eroded sedimentary rocks, and extensive regions of highly eroded sedimentary plateaus exist on South Cape and Heim peninsulas.

Five equidistant lines parallel to the western shore of Brodeur Peninsula were flown from Port Bowen to Cape York in 1983 (Fig. 4). The area north of the survey line was judged to be unsuitable for breeding ivory gulls because a large amount of melt water runoff saturated the ground. Each line was flown at an altitude of approximately 75 m. Banding of chicks was followed by counts of active nests and adult birds.

The survey of Devon Island included the cliff faces bordering

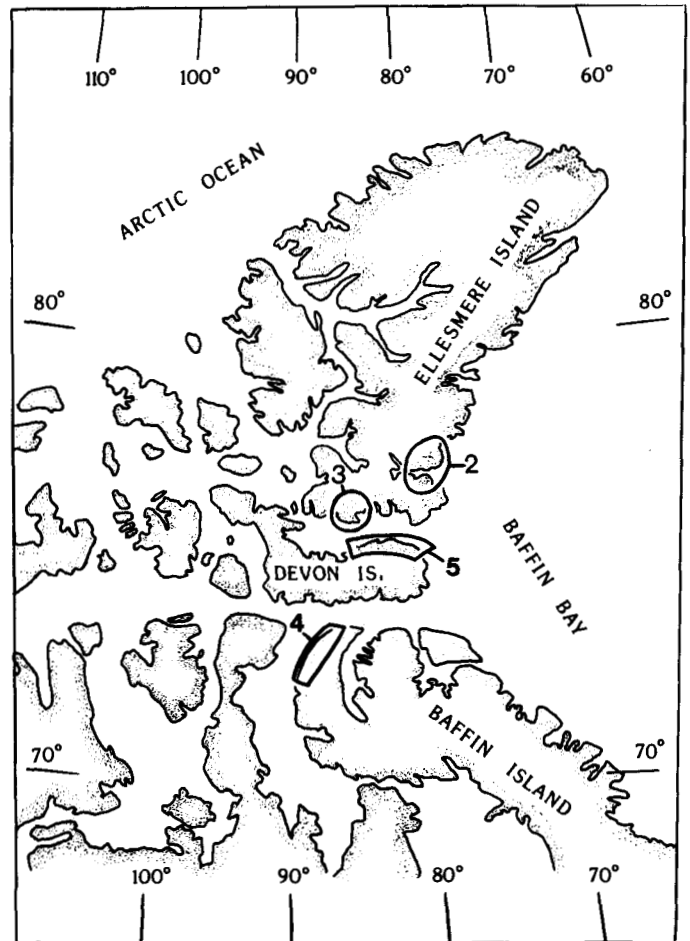


FIG. 1. Map of the eastern Canadian Arctic showing regions surveyed for ivory gulls in Figures 2-5.

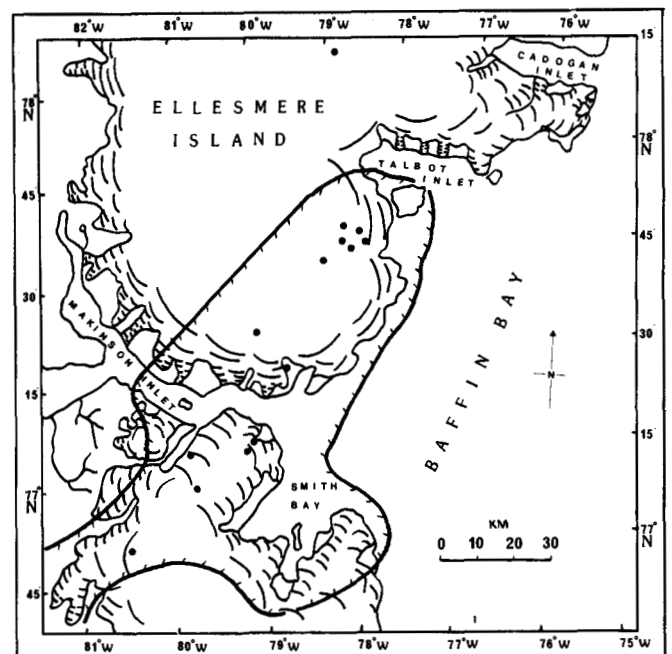


FIG. 2. Map of southeastern Ellesmere Island showing locations (●) of active ivory gull breeding colonies. The area within the line ( / / / / / ) has been intensively surveyed.

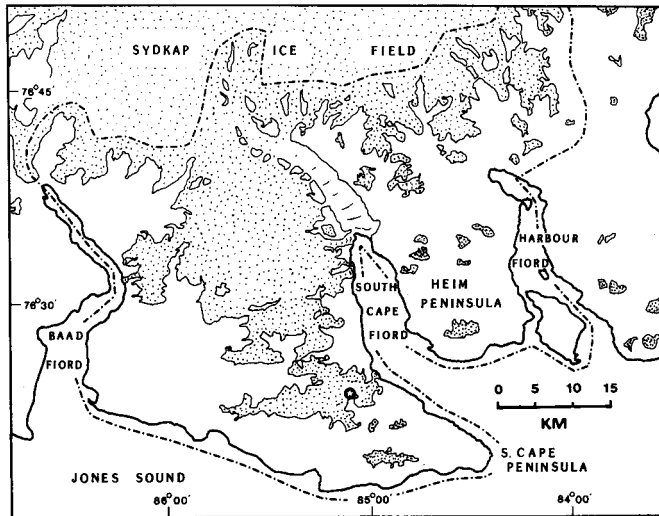


FIG. 3. Map of the coastal zone of Ellesmere Island south of the Sydkap Ice Field showing the area surveyed for ivory gull colonies. The stippled zones denote areas of ice field and glaciers, and the broken line denotes the limits of the survey. The single colony is denoted by a star.

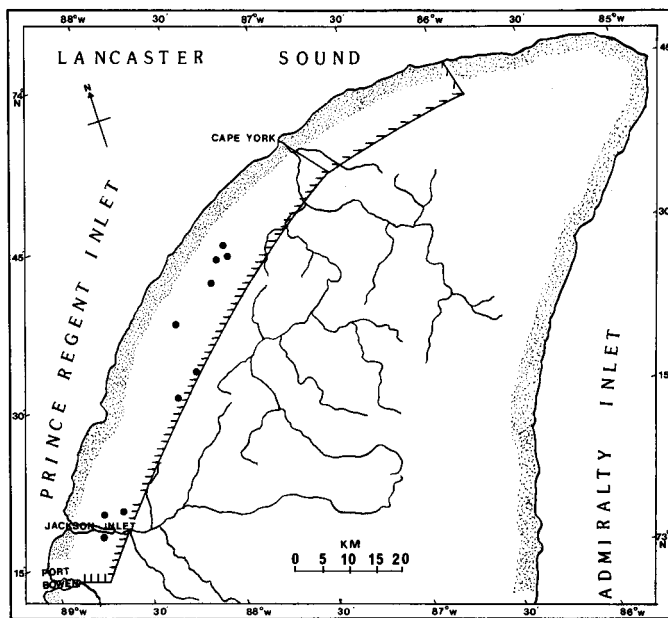


FIG. 4. Map of the Brodeur Peninsula, Baffin Island, showing the coastal region north of Port Bowen systematically surveyed for active colonies of ivory gulls (●).

glaciers and nunataks from Cape Sparbo to Cape FitzRoy (Fig. 5). This coastal zone is heavily incised by a series of glaciers arising from the Devon Ice Cap and flowing into Jones Sound. We flew up the western edge of each glacier to its confluence with the ice cap and descended along its eastern edge to Jones Sound.

#### Leg Banding of Ivory Gulls

Adult ivory gulls congregate at Resolute Bay ( $74^{\circ}41'N$ ,  $94^{\circ}50'W$ ) and Grise Fiord ( $76^{\circ}15'N$ ,  $83^{\circ}10'W$ ) during the arctic spring to feed on marine carrion. Leg banding of adult birds was done at these locations from mid-June to early July of 1982-84.

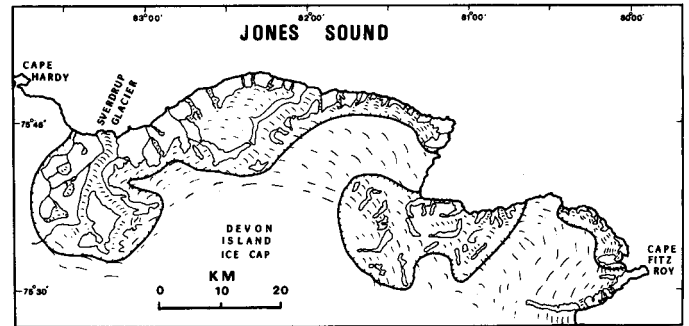


FIG. 5. Map of northeastern Devon Island showing the region surveyed intensively for ivory gull colonies.

Standard measurements were taken from each bird, and the presence or absence of a brood patch was recorded. Each gull was fitted with a lock-on band, and an expandable plastic colour-coded band was applied to the opposite leg. Picric acid-ethanol solution was used to dye one wing of each bird so that such gulls might be identified during inspection of breeding colonies.

Banding of ivory gull chicks was performed at Seymour Island ( $76^{\circ}48'N$ ,  $101^{\circ}19'W$ ) and at colonies on the Brodeur Peninsula usually after the first week of August. Each chick was given a numbered lock-on band and a site-specific colour-coded expandable plastic band on the opposite leg. No chicks were banded at Ellesmere Island colonies because they are inaccessible to humans.

## RESULTS

### Distribution of Ivory Gull Colonies

Locations of confirmed ivory gull colonies in southeastern Ellesmere Island indicate a widespread distribution north and south of Makinson Inlet (Fig. 2). Between 730 and 830 adults were counted at the 14 colonies. Considerable variation in the number of ivory gulls present at a colony exists, ranging from 12 to 300 birds. All the colonies are located inland among the highest regions of nunataks emerging from glaciers and ice fields, but the colonies are not oriented in any particular direction. The colonized rocks are principally granitic gneiss, migmatic, undifferentiated plutonic and volcanic rocks. The sites are typified by being highly eroded, with conspicuous deep vertical fissures and narrow ledges on which nests are built (Fig. 6). Some colonies are conspicuous due to the abundant growth of arctic poppy (*Papaver radicum*), mosses and lichens about the nest sites. No birds or mammals were observed at or near the ivory gull colonies among the ice fields. However, scats of arctic fox (*Alopex lagopus*) were found at an inland nunatak colony north of Makinson Inlet, indicating that some predators reach these sites. No ivory gull colonies were present at the coast north or south of Makinson Inlet, although glaucous gull colonies were common.

A single ivory gull colony containing 275-300 breeding adults was found on the land mass south of the Sydkap Ice Field on southern Ellesmere Island (Figs. 3 and 7). The colony ( $76^{\circ}23'N$ ,  $84^{\circ}58'W$ ) is located on the shoulder of a plateau surrounded by glacial tongues protruding from a small ice field and is remarkably similar in appearance to breeding sites on the Brodeur Peninsula (Fig. 8). The terrain comprised eroded limestone plates, among which nests were located. This inland colony was

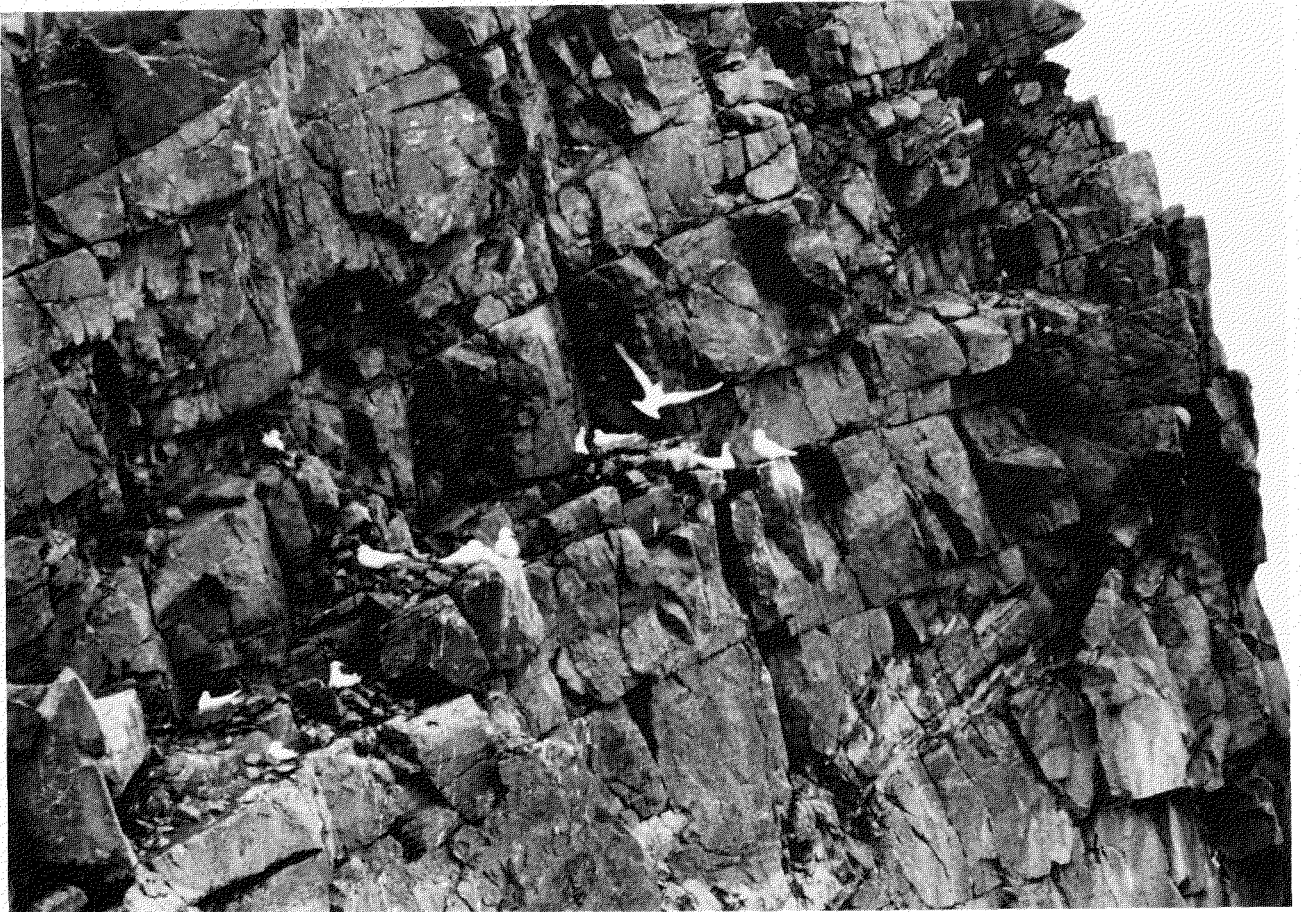


FIG. 6. Ivory gulls nesting on a ledge of a highly eroded nunatak emerging from the ice fields north of Makinson Inlet, Ellesmere Island.

situated in a barren area where no vegetation, birds or mammals were evident.

The cliffs and land spits between the north-flowing glaciers of the Devon Ice Cap (Fig. 5) were not colonized by ivory gulls. However one small colony containing 7 adults and three active nests was located on the limestone plateaus south of Thomas Lee Inlet (northern Devon Island, at  $75^{\circ}24'N$ ,  $88^{\circ}35'W$ ) during late July 1983. The nature of the terrain at this site and the location of the nests among the limestone plaques is very similar to colonies on the Brodeur Peninsula. This colony and the four small colonies (containing 90 adults) reported among the nunataks of northeastern Devon Ice Field (Frisch, 1983) are the only known colonies on Devon Island.

Ten active ivory gull colonies were located on the western edge of Brodeur Peninsula in 1982-83, including the two colonies first discovered in this region by Reed and Dupuis (1983). This region comprises limestone plateaus extensively intersected by ravines (Fig. 8). In the area surveyed (Fig. 4) little vegetation was apparent, especially on the plateaus or near water (Fig. 9). The terrain and the location of the nest sites were very similar among colonies. Plaques of highly eroded limestone constitute the colony substrate, and nests were built on this using imported vegetation. Nests were not concealed among the substrate and were open to wind chill. The colonies varied in size from 12 to 180 adults and comprised, in total, 560-580 birds. Many more birds in adult plumage were present than expected from the number of nests. This indicates that some birds in

non-breeding condition were at the colonies. Ivory gulls were the only animal species seen at or near the colonies. Glaucous gulls were seen along the shore of Prince Regent Inlet but were not observed inland.

In August 1986 adult ivory gulls and chicks were observed on the reefs of Perley Island ( $80^{\circ}11'N$ ,  $99^{\circ}15'W$ ), northwest of Meighen Island ( $80^{\circ}N$ ,  $99^{\circ}W$ ) (Lundsgaard, pers. comm. 1986), thus confirming the long-standing suspicion that ivory gulls bred at or near Meighen Island (MacDonald and Macpherson, 1962).

#### *Numbers of Ivory Gulls Banded*

Thirty-six and 240 adult birds were banded at Resolute Bay and Grise Fiord respectively from 1982 to 1984. All but one (at Resolute Bay) showed a conspicuous brood patch, indicating that they were in breeding (incubating) condition. The spring of 1984 in the eastern High Arctic was characterized by a prolonged exceptionally warm period in June, which led to early sea ice break-up and marked thinning of offshore ice. No ivory gulls were seen at Grise Fiord during that spring, due, presumably, to abundant offshore open waters in Jones Sound.

None of the ivory gulls colour-marked at Grise Fiord has been observed during the surveys of breeding colonies north and south of Makinson Inlet. Thus the ivory gulls frequenting Grise Fiord must belong to a colony (colonies) whose location remains undiscovered. One ivory gull banded as an adult of unknown age at Grise Fiord in 1971 was retrapped at the same location in





FIG. 7. Site of the ivory gull colony on the shoulder of a plateau surrounded by ice tongues south of the Sydkap Ice Field, Ellesmere Island.

1983, and one ivory gull banded at sea east of Cape Chidley, Labrador ( $60^{\circ}40'N$ ,  $64^{\circ}30'W$ ) during April 1966 was recaptured at Grise Fiord in 1983. These records and those of birds banded as breeding adults in 1971 at Grise Fiord and recaptured there in 1983 indicate that ivory gulls are long-lived ( $>15$  years), as are most gull species. Immature ivory gulls have never been observed or banded at Grise Fiord or Resolute Bay during the spring.

From 1982 to 1984, 230 ivory gull chicks were banded at the Brodeur Peninsula colonies, but no adults were banded. On 3 August 1983, 144 of more than 200 chicks were banded on Seymour Island ( $76^{\circ}47'N$ ,  $107^{\circ}17'W$ ), and 200-250 adults were estimated to be on the island that year. Ivory gull chicks banded at the Seymour Island and Brodeur Peninsula colonies from 1982 to 1984 were of markedly different ages. We estimate that hatching (and laying) began over an interval of about 14 days.

#### DISCUSSION

The 14 active colonies of the ice fields north and south of Makinson Inlet and the large number of gulls banded at Grise Fiord denote southeastern Ellesmere Island as a major component of ivory gull breeding range in Canada. The colonies on the nunataks of Ellesmere Island, the limestone plateaus of Brodeur Peninsula and Seymour Island and gravel-covered ice islands reflect the versatility of this species in being able to nest on very different terrains. The populations of the ivory gull in the

Canadian eastern High Arctic, while appearing discontinuous, are probably panmictic. Our finding adult ivory gulls in breeding condition at Grise Fiord and Seymour Island bearing leg bands put on at Cape Chidley supports this view. We confidently expect further reports of breeding ivory gull colonies for several reasons. None of the adults banded as breeders at Grise Fiord and Resolute Bay has yet been traced to its breeding colony, although the large colony found near South Cape Fiord in 1985 may contain adults banded at Grise Fiord. There is a phenomenal number of nunataks as yet unsurveyed on Ellesmere Island, and immense areas of limestone plateaus similar to the Brodeur and South Cape peninsulas exist elsewhere in the High Arctic, thus the fortuitous finding of one small colony on the plateaus south of Thomas Lee Inlet, Devon Island. The Thorndike Peaks and Inglefield Mountains of Ellesmere Island are areas where more colonies may exist. The sighting of a single adult ivory gull at Piper Pass ( $82^{\circ}10'N$ ,  $68^{\circ}50'W$ ) on 4 August 1983 (Thomas, unpubl. data) suggests that this species may extend into the northern ice fields of Ellesmere Island.

Our not finding immature (less than one-year-old) ivory gulls at any of the breeding colonies is consistent with observations on other arctic gull species. It is not known where these gulls spend their second summer, but the North Water of Baffin Bay could be a potential area, especially since Renaud and McLaren (1982) reported large numbers of ivory gulls in this area.

The potential importance of polynyas to ivory gulls has been indicated by Brown and Nettleship (1981). The Makinson Inlet



FIG. 8. Typical location of an ivory gull breeding site on northwestern Brodeur Peninsula. The colony site with sparsely formed nests is in the foreground.

and Flagler Bay polynyas are well defined and annually recurrent. They may partly determine southeastern Ellesmere Island as a focal area of breeding. There is abundant open water in Prince Regent Inlet during July, and this may relate to the presence of ivory gull colonies along western Brodeur Peninsula.

A great similarity in topography, relief and texture exists among the nunataks colonized by ivory gulls on Ellesmere Island, Devon Island and Greenland (Wright and Mathews, 1980: Figs. 2 and 3). A blatant feature common to all the colonies we observed is the highly eroded, fissured rock surface. These not only afford ledges and crevices for nesting, but may also moderate wind chill. Whereas Wright and Mathews (1980) observed ivory gull colonies on southeastern Greenland to be oriented toward the east and northeast, we did not see colonies on Ellesmere Island oriented in any predominant direction.

The highly remote, virtually inaccessible and desolate nature of the breeding sites may preclude much predation by ground and aerial predators. The ivory gull colonies observed by Wright and Mathews (1980) on southeastern Greenland appear very similar in this respect to those on the nunataks of Ellesmere Island. There are no ivory gull colonies along the coast north and south of Makinson Inlet, despite there being abundant nunataks similar in appearance to those used by colonies farther inland. However, glaucous gull colonies are common in this area. Similarly, the cliff faces of headlands separating adjacent glaciers flowing north from Devon Ice Cap were often colonized by breeding glaucous gulls. The cliffs bordering those glaciers

were similar to those colonized elsewhere by ivory gulls, yet no ivory gulls were present. The short length of the glaciers arising from the Devon Ice Cap may preclude colonization by ivory gulls because of the high possibility of competitive interactions with glaucous gulls. The only known ivory gull colonies on Devon Island are those reported by Frisch (1983), and they are so far inland as to be outside the probable foraging range of glaucous gulls.

The 14-day range of hatching dates observed at Seymour Island and the Brodeur Peninsula shows that there is no clear synchrony of nesting and laying behaviours, even among females of the same colony, making this an unusual phenomenon among arctic-nesting birds. This asynchronous laying may have little relation to predation, in that any predator would likely take eggs or progeny of any age.

The number of adult ivory gulls observed at active breeding sites from 1982 to 1985 at Seymour Island, Ellesmere Island and Brodeur Peninsula is about 1800-1900. These figures do not include the almost 300 adult breeding ivory gulls reported collectively at eastern Devon Island (Frisch, 1983) and Princess Marie Bay, Ellesmere Island (Witts and Morrison, 1980). We also banded 276 breeding adults and 374 chicks from 1982 to 1984. Thus there are at least 2400 adult, potentially breeding ivory gulls in known locations in the eastern Canadian High Arctic. This figure excludes immature and young-of-the-year cohorts. This minimal figure for adult breeders is very different from the estimated 35 000 ivory gulls (presumably including all





FIG. 9. Ivory gull chick at edge of a nest in limestone rubble on Brodeur Peninsula. When disturbed or alarmed, chicks leave the nest and may crouch in crannies among the rocks. Photo: R. Popko.

age groups) reported in Davis Strait in March 1978 (Orr and Parsons, 1982).

A relationship exists between the geology of a nesting location and the manner of nesting by breeding ivory gulls. In regions where eroded granites predominate (southeastern Ellesmere Island and northeastern Devon Island), breeding on narrow ledges of nunataks appears typical of the population. Where sedimentary rock formations constitute the surface (Brodeur Peninsula, South Cape Peninsula, Seymour Island, north-central Devon Island), nesting occurs on plateaus, and elevated nunatak sites are not occupied. The western coastline of Greenland is often topographically similar to that of eastern Ellesmere and Devon islands. Given that ivory gulls breed at different sites on Greenland (Salomonsen, 1967; Wright and Mathews, 1980), perhaps a much larger ivory gull population moves seasonally from Baffin Bay to the Labrador Sea and uses isolated land masses on the adjacent Canadian and Greenland coasts for breeding.

#### ACKNOWLEDGEMENTS

We are indebted to the Polar Continental Shelf Project of Energy, Mines and Resources, Ottawa, for their generous support of project no. 26-73. G. Hobson, F. Hunt, B. Hough and W. Presley arranged all logistic support and were instrumental in the success of our work. The research was ably assisted by D. Gill, S. Howkins, B. MacDonald and R. Popko. B. Jesudason, of Resolute Bay, generously allowed the use

of facilities at Grise Fiord. D. Pattie kindly accommodated us during our surveys of northeastern Devon Island. We acknowledge the cooperation and interest of A. Reed and T. Frisch regarding the locations of ivory gull colonies. The residents of Grise Fiord shared their knowledge of ivory gulls with us and provided much assistance with the banding of birds. W. Earl Godfrey, National Museum of Natural Sciences, Ottawa, assisted our preparation of this paper. The research was supported by the Vertebrate Zoology Division, National Museum of Natural Sciences, and grants from the Natural Sciences and Engineering Research Council of Canada and the Canadian Wildlife Service. The senior author gratefully acknowledges a Research Associateship with the National Museum of Natural Sciences, Ottawa.

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