

## WINTER OBSERVATIONS OF BLACK GUILLEMOTS IN HUDSON BAY AND DAVIS STRAIT

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*Abstract.* Previous accounts of the habitat of Black Guillemots (*Cephus grylle*) demonstrated that species is common in coastal waters and at land-fast ice edges throughout the year. On aerial surveys over Hudson Bay in February 1981 and Davis Strait in March 1981 we found them common in winter among offshore pack ice, where there was some open water. We suggest that offshore pack ice is an important habitat for Black Guillemots wintering in the arctic.

*Key Words:* Black Guillemot; *Cephus grylle*; Arctic; ice.

The Black Guillemot (*Cephus grylle*) breeds on rocky coasts throughout eastern Canada, from Ellesmere Island to Nova Scotia, and over most of the Canadian arctic archipelago, Hudson Bay, Foxe Basin and Hudson Strait (Brown et al. 1975, Nettleship and Evans 1985). It is considered to be characteristic of shallow, inshore waters, where it feeds mainly on benthic fishes (Bradstreet and Brown 1985, Brown 1985, Cramp 1985, Nol and Gaskin 1987). Cairns (1987) showed that, during the breeding season, bottom-feeding Black Guillemots in north-east Hudson Bay fed almost exclusively in water less than 50 m deep. They are also known to feed along the margins of land-fast ice in arctic waters in spring and summer, including those formed over water more than 50 m deep (Bradstreet 1979).

During winter, Black Guillemots retreat from those parts of their breeding range where the sea freezes over completely, but if open water is present, some may remain as far north as 79°N (Renaud and Bradstreet 1980). In Hudson Bay and Foxe Basin the species is seen regularly along land-fast ice-edges throughout the winter (Sutton 1932, Ellis and Evans 1960, AJG pers. obs.). Aerial surveys carried out in May in the High Arctic demonstrated that Black Guillemots occurred in large numbers among broken pack ice far offshore (McLaren 1982). Similarly, Black Guillemots were seen frequently among mobile pack ice in the Chukchi Sea in September and October (Watson and Divoky 1972, Divoky 1987). However, it was not clear in either case whether these birds were merely passing through en route to their breeding areas, or whether pack ice constituted the preferred habitat at that season for a segment of the population.

To address this question we present data from an aerial survey carried out over Hudson Bay on 9 February 1981 and on a series of surveys over Davis Strait during 15-31 March 1981. On both surveys Black Guillemots were widespread in offshore waters, where the pack ice was mobile. Our observations, coupled with those of previous surveys over arctic waters in late winter (Renaud

and Bradstreet 1980), provide evidence that Black Guillemots occupy a wider range of habitats in winter than was previously thought.

### METHODS

#### HUDSON BAY

This survey was made by AJG from a Canadian Ice Survey Lockheed Electra. The survey route is shown in Figure 1. Counts of birds were made from 10:30 to 17:00 hr EST. The average flight speed was 300 km/h. Altitude was about 1500 m for most of the flight, descending periodically to about 300 m. A bubble window on the side of the aircraft allowed the observer to look vertically downwards. At altitudes above 500 m the sea was scanned through 8 × binoculars; using these, Black Guillemots, in their white winter plumage, were easy to pick out on the water. Observations were recorded on cassette. Scanning with binoculars was done for 1-2 min at a time, alternating with a minute of rest, to avoid fatigue. All open water areas within a strip estimated at 0.5 km wide were scanned. Ice conditions were recorded continuously by the ice recording team, using visual estimates and radar.

#### DAVIS STRAIT

Aerial surveys for marine mammals were performed by LGL Ltd. between 15 and 31 March 1981 and covered the whole of Davis Strait north of 65°N (Fig. 2). A de Havilland Twin-Otter aircraft was used, with two observers counting continuously, one on each side. Procedures were as described by McLaren (1982), except that the average ground speed was 222 km/h, the altitude was 150 m and observers scanned 800 m on each side of the flight path. Numbers of guillemots were recorded by two minute periods, corresponding to an area of about 12 km<sup>2</sup> scanned. For both surveys water depths at locations where Black Guillemots were recorded were determined by comparison with the appropriate hydrographic charts.

### RESULTS

#### HUDSON BAY

Weather conditions were perfect throughout the survey, with clear skies, and little or no wind at sea level, judged from a lack of ripples on the water. Thin fog over some open water areas reduced visibility periodically, but never for more

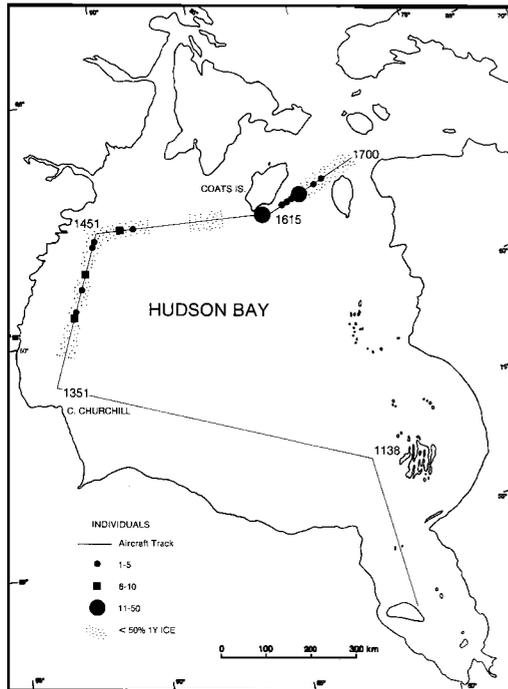


FIGURE 1. Map of survey route on 9 February 1981, showing the position of Black Guillemot sightings and the type of ice encountered.

than a minute. After 16:00 hr light conditions were poor, the sun being very low, and the detectability of the birds was probably much reduced.

Ice cover was almost 100%, except for occasional leads up to about 200 m in width. The proportion of young ice (mainly less than 30 cm thick), ranged from 30% to 100%. The rest was thicker, first-year ice. During the period up to 13:50 hr, cover was entirely first-year ice, but after 13:50 it was much more variable. No solid, land fast ice was encountered after 13:50, and none of the birds seen was associated with land-fast ice edges.

Black Guillemots were seen from 14:10 hr onwards and a total of 61 was counted, including one group of 21 on a large expanse of open water about 200 × 800 m, south of Coats Island. Most other sightings were of one or two birds, often on leads estimated to be less than 5 m in width. Most birds were seen either in the western part of Hudson Bay, in an area of young ice with numerous areas of open water, or south and east of Coats Island (Fig. 1). Water depths in areas where Black Guillemots were seen were never less than 80 m.

Allowing for breaks, watching lasted for about 2 h between 13:50 and 17:00 hr, and hence a

TABLE 1. DENSITIES OF BLACK GUILLEMOTS RECORDED DURING AERIAL SURVEYS OF NORTHERN DAVIS STRAIT IN RELATION TO ICE COVER

Ice cover (%)	No. of transect segments	Proportion with guillemots (%)	Density birds km <sup>-2</sup>
0-25	139	5	0.103
26-50	51	6	0.029
51-75	87	10	0.044
76-90	317	15	0.038
91-100	896	21	0.076

maximum area roughly 300 km<sup>2</sup> was scanned. The total area of Hudson Bay north of Cape Churchill (approximately the area crossed after 13:50 hr) normally covered by mobile pack ice during the winter is about 250,000 km<sup>2</sup> (Markham 1986). Hence, even in the unlikely event that all the Black Guillemots passing through the field of the glasses were detected, there must have been at least some thousands wintering in the mobile pack ice of Hudson Bay.

#### DAVIS STRAIT

Black Guillemots were widespread throughout northern Davis Strait during 15-31 March, with 1101 being seen on transect and a further 210 off-transect during 48 h of flying, giving a mean density estimate of 0.068 birds/km<sup>2</sup>. Densities were higher on the west side of the strait than on the east side (Fig. 2), and were probably related to ice conditions. Maximum bird densities, away from open water, were recorded where ice cover exceeded 90% (Table 1). There was a significant positive correlation between ice cover and the proportion of two-minute periods during which guillemots were recorded (Spearman rank correlation,  $r_s = 1.0$ ,  $P = 0.01$ ).

All Black Guillemots seen in areas of 0-25% ice cover were recorded on seven transect segments flown within 50 km of the Greenland coast south of 68°N. No ice was present in that area. Most of the water covered during these transects was reddish in color, perhaps indicating the presence of pigmented plankton. This was the only area where guillemots were seen in open water. As in Hudson Bay, virtually all observations of guillemots were made in water more than 80 m deep.

Similar surveys were flown over the western portion of Davis Strait south of 65°N between 25 March and 5 April 1981, and over the Labrador Sea up to 170 km offshore between 1 and 9 April. In southern Davis Strait densities of Black Guillemots were lower than in the northern sector, averaging 0.016 birds/km<sup>2</sup> (128 birds seen). Only 17 birds were seen in the Labrador Sea, all in areas with more than 50% ice cover.

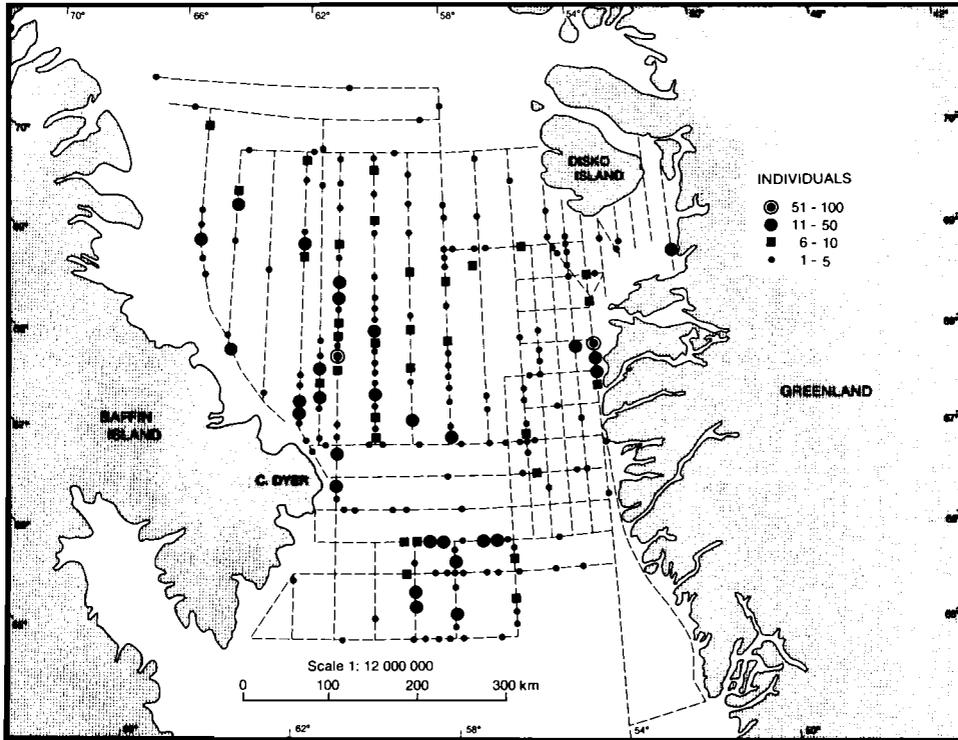


FIGURE 2. Map of surveys during 15–31 March 1981, showing the position of 2-min periods when Black Guillemots were recorded.

In both areas comparison of sightings with bathymetric charts showed that the majority of birds seen were in water more than 100 m deep.

The total area of Davis Strait between 65° and 70°N is about 230,000/km<sup>2</sup>, yielding an estimate of 16,000 guillemots in that area during the surveys. As in the case of the Hudson Bay estimate, this is a minimum figure, because not all birds present are seen (McLaren 1982, Gaston and Smith 1984). We think that the true figure was probably in the low tens of thousands.

#### DISCUSSION

The total population of Black Guillemots in Hudson Bay is unknown, although Hudson Bay, Hudson Strait and Foxe Basin have been estimated to hold 13,000–26,000 breeding birds (Nettleship and Evans 1985). However, population densities are higher in Hudson Strait than in Hudson Bay (Gaston 1982, Morrison and Gaston 1986). If we assume that no Black Guillemots move into Hudson Bay during the winter, it follows that in February 1981 a considerable proportion of the local population was wintering offshore amid mobile pack ice.

Black Guillemots wintering in Baffin Bay and Davis Strait, on the other hand, may include many from the large high arctic colonies in Barrow Strait and Jones Sound (Renaud and Bradstreet 1980). Nettleship and Evans (1985) estimated the population of that area at 55,000 breeding pairs. Even if we assume that most of the Black Guillemots breeding in the eastern High Arctic and the northern part of West Greenland winter in Baffin Bay and Davis Strait, the several tens of thousands of guillemots estimated to be present offshore in late March represents a significant fraction of the entire wintering population.

On the basis of aerial surveys of the North Water polynya of Baffin Bay in March and April, Renaud and Bradstreet (1980) estimated 3900 Black Guillemots in mobile pack ice away from fast ice edges and in water more than 100 m deep. Similar numbers were estimated to be present at land-fast ice edges in the same area. A survey of western Hudson Strait in April 1982 also revealed some Black Guillemots in deep water, more than 10 km from shore, amid mobile pack (0.08/km<sup>2</sup>, AJG pers. obs.). Because winter ice

conditions throughout the eastern arctic persist until at least early May (Smith and Rigby 1981), we think that distributions observed in February to April are representative of those existing throughout the winter.

In summary, observations from aerial surveys suggest that many Black Guillemots that winter in arctic waters probably do so among mobile pack ice, in water sufficiently deep to prevent them from foraging on the bottom. As shallow coastal waters in the arctic are mainly covered in solid, land-fast ice in winter, this switch must result in changes in foraging behavior and diet. It also enables them to remain in the area, and thus provides them with an alternative to migration, the strategy preferred by most birds that breed in the arctic.

On both our surveys we found only small numbers of Black Guillemots away from pack ice, and in Davis Strait the frequency of sightings was positively correlated with pack ice cover. Although the cause of this association is unknown (e.g., the distribution of prey organisms, the influence of ice on sea conditions), we consider Black Guillemots to be 'pagophilic' rather than truly pelagic in winter.

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