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ERMINE VISITATION TO BLACK GUILLEMOT COLONIES IN NORTHEASTERN HUDSON BAY

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Because many seabirds depend on the inaccessibility of their breeding sites to deter terrestrial predators (Lack 1967), the effects of predator invasion of seabird colonies can be drastic. In this paper, I report visitation by ermine (*Mustela erminea*) to several Black Guillemot (*Cepphus grylle*) colonies at a low arctic site, and describe its consequences.

I studied the breeding and feeding habits of guillemots during the 1981–1983 nesting seasons at colonies near the juncture of Hudson Bay and Hudson Strait (62°23'N, 78°01'W). Islands used for nesting had low relief, and breeding populations ranged from a few to 190 pairs. Most work was done on Pitsulak City, but 11 other nesting islands were also visited. Laying peaked in late June–early July, with the hatching peak following one month later. Gaston et al. (in press) described the biota of the area, and named the islands here mentioned.

I saw no ermine in 1981 or 1982, and no sightings were reported from biologists' and Inuit camps on the mainland and on large islands in the area. In 1983, ermine were frequently seen around camps, and invaded several islands where guillemots nested. Table 1 summarizes evidence for ermine visitation of islands. Ermine presence was confirmed on three islands by direct sightings. On three other islands, low breeding success and other circumstantial evidence also suggested ermine visitation. On one of these islands (Black), I found plundered eggs inside nest cavities, where they could not have been reached by gulls, and, on Kingituayu, I found three carcasses of adult guillemots,

TABLE 1. Evidence for ermine presence on islands.

Island	Distance from mainland (km)[a]	Guillemot nesting status, ermine sightings	Ermine presence
Black I.	0.14	About 14 pairs nested in 1981. On 1 September 1983, I examined nine nest cavities which had been used in 1981. Three of these had eggs which had been opened from the side by a predator. The other six had no sign of recent use.	Probable
Qikita I.	0.19	Visited on 28 July 1983, when five nests with eggs were found. In three of these, the eggs were displaced from the nest cup, a situation which usually indicates desertion (pers. observ. on Pitsulak City).	Possible
Yellow I.	0.26	About 18 pairs nested in 1981. On 1 September 1983, I visited the island and saw an ermine. I checked six nest sites which had been used in 1981, and found no eggs, chicks, or any other sign of recent use.	Definite
Green I.	0.68	About 100 pairs nested in 1981 and 1982. On 21 July 1983, I could locate only 17 nests with eggs among 60 marked crevices that had been active in 1981 and 1982. On 4 August, 11 of these had eggs, one had dead chicks, one had a live chick, and four were empty. On 23 August, an ermine was seen on the island. On this date, five of the 17 nests had eggs or eggshells, one had a single live chick, and 11 were empty.	Definite
Pitsulak City	1.6	About 190 pairs nested in 1981 and 1982, when 0.56 and 0.51 chicks hatched per egg laid in the central part of the island (n = 20 and 52 nests, respectively). On 27 June 1983, an ermine was seen in the central part of the island. There were no subsequent ermine sightings although the island was continuously occupied until 8 September. About 130 pairs nested in 1983, when hatching success was 0.017 in the central part of the island and 0.51 in the southern part (n = 35 and 23 nests, respectively). Many nests in the central area had displaced eggs and appeared abandoned by late incubation in 1983.[b]	Definite
Piqiuliit 5	1.6	This island was visited seven times in July–September 1983, when 0.62 chicks hatched per egg laid (n = 23 nests).[b]	No evidence
Piqiuliit 2	2.1	About 12 pairs nested in 1982 and 1983. Breeding success was not monitored, but nests appeared to be normally maintained when checked in July 1983.	No evidence
Kingituayu I.	2.2	About 10 pairs nested in 1982. On 20 July 1983, I found three carcasses of adult guillemots. Five of 10 nests checked had broken or displaced eggs.	Probable
Piqiulik I.	2.6	Three nests were found on 9 and 18 July 1983. Nests appeared to be normally maintained.	No evidence
South Skerries 1	4.2	Seven nests were found on 13 and 14 July 1983. Nests appeared to be normally maintained.	No evidence
South Skerries 2	4.6	Four nests were found on 14 and 18 July 1983. Nests appeared to be normally maintained.	No evidence
South Skerries 4	5.2	Thirty-five nests were found on 13, 14, and 18 July 1983. Nests appeared to be normally maintained.	No evidence

[a] Mainland here includes several islands 3 km² or larger, which probably have permanent populations of small mammals.
[b] Hatching success for Pitsulak City Central 1981, 1982, and 1983, Pitsulak City South 1983, and Piqiuliit 5 1983 differs significantly ($G = 70.0$, $P < 0.005$). Hatching success does not differ when Pitsulak City Central 1983 is excluded ($G = 1.84$, $P > 0.05$).

including one inside a nest cavity. Six other islands showed no indication of abnormally low nesting success, and were probably not visited by ermine.

The major effects of ermine on guillemot breeding appeared to be discouragement of egg-laying and a reduction of hatching success due to nest abandonment. Many cavities on Black, Yellow, and Green islands which were occupied in previous years were not used in 1983. Eggs laid on islands where ermine presence was confirmed or suggested were often displaced from the nest cup and lacked the shiny appearance which is normal for regularly incubated eggs (pers. observ.). Guillemots may have been reluctant to enter their nests if they had seen an ermine in the colony, which would explain the reduction in both egg-laying and hatching.

Ermine visited islands as far as 1.6 km from the mainland (Pitsulak City), and may have reached Kingituayu Island as well (2.2 km). This latter island is the highest of the 12 examined (22 m above sea level), which suggests that conspicuousness from the mainland may increase likelihood of visitation.

Ermine must have reached these islands either by crossing the ice or by swimming. If they came over the ice, they must have arrived at least two weeks before laying, since heavy ice disappeared from the area in early June. If ermine were on islands during the pre-laying period, they might have subsisted on eggs abandoned the previous year. Such food, however, would not have been available on Pitsulak City, because all unhatched eggs were cleared from the island the previous fall. Ermine may instead have reached the islands by swimming. A local Inuit told me of seeing an ermine swimming in salt water, and Seton (1929) reported anecdotal accounts of the species' ability to swim.

Ermine numbers are known to vary with those of lemmings (Finerty 1980), and the 1983 boom in ermine populations that led to the invasion of coastal islands in the study area may have been related to the lemming cycle. Although ermine and guillemots (*Cepphus* spp.) are broadly sympatric (Storer 1952, Banfield 1974), reports of predation by small weasels on guillemots are rare (e.g., Kartaschew 1960, Bianki 1967). The number of colonies penetrated in the present study, however, suggests that ermine are quite capable of reaching coastal islands in years when their populations are high, and that such invasions may be more frequent than the paucity of records suggests.

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OBSERVATIONS OF SCRUB JAYS CLEANING ECTOPARASITES FROM BLACK-TAILED DEER

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Instances of protocooperation between birds and other large animals are relatively uncommon, although certain examples are quite well-known. These include the Greater Honeyguide (*Indicator indicator*) leading the honey badger (*Mellivora capensis*) to a beehive (Skead 1951), the Egyptian Plover (*Pluvianus aegyptius*) picking leeches and small bits of food from the open mouths of crocodiles (Howell 1979), and the Small Ground Finch (*Geospiza fuliginosa*) grooming ticks from the skin of the marine iguana (*Amblyrynchus cristatus*; Amadon 1967). Uniquely among birds, the two African species of oxpeckers (*Buphagus* spp.) habitually associate with herds of large grazing animals and derive a major portion of their diet as ectoparasites taken from the skins of these animals (Mackworth-Praed and Grant 1955).

In North America, examples of such protocooperation are rare. Although Cattle Egrets (*Bubulcus ibis*), cowbirds (*Molothrus* spp.), and occasionally other blackbirds often perch on the backs of cattle or other large grazers, they are thought to use the cattle only as "beaters" to stir up insect food from the grass (Heatwole 1965, Dinsmore 1973). It is not clear that cowbirds or Cattle Egrets ever pick insects off the animals themselves. This behavior is, therefore, better considered an example of commensalism rather than protocooperation. In contrast, Black-billed Magpies (*Pica pica*) pick and eat ticks from the backs of elk (*Cervus canadensis*) and mule deer (*Odocoileus hemionus*), an example of true protocooperation (Linsdale 1946).

Here we report a series of observations of an apparently protocooperative association between Scrub Jays (*Aphelocoma coerulescens*) and Columbian black-tailed deer (*Odocoileus hemionus columbianus*) in which jays regularly picked ticks and perhaps other ectoparasites from the skin of deer. Dixon (1944) first reported such behavior between a Scrub Jay and a California mule deer (*O. h. californicus*) in Sequoia National Park, California. Schulz and Budwiser (1970) reported another Scrub Jay presumably taking ectoparasites from the back of a black-tailed deer 4 km northeast of Alpine Lake in Marin County,