

Local Ecological Knowledge of Ivory Gull Declines in Arctic Canada

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ABSTRACT. We gathered local ecological knowledge (LEK) on the ivory gull (*Pagophila eburnea*) from residents of three High Arctic communities in eastern Canada. This gull has always been uncommon, but Inuit had suggested that numbers of gulls were declining. LEK from Grise Fiord and Resolute Bay was clear and consistent, indicating that far fewer gulls are currently observed near the community compared to 25 years ago. The LEK from Arctic Bay was less consistent, although in general, community members thought that the species was less commonly observed. Observations from nonsystematic surveys by local wildlife officers corroborated the LEK data, and an aerial survey of the known colony locations on the Brodeur Peninsula (near Arctic Bay) found only one gull. Collectively, this information suggests that ivory gull populations are declining across the species' Canadian range. Systematic surveys will be needed to confirm these perceived declines.

Key words: ivory gull, *Pagophila eburnea*, local knowledge, population decline, interviews

RÉSUMÉ. On a recueilli du savoir écologique local (SEL) sur la mouette blanche (*Pagophila eburnea*) auprès de résidents de trois communautés de l'Extrême-Arctique situées dans l'est du Canada. Cette mouette a toujours été assez rare, mais, selon les Inuits, le nombre d'individus était en déclin. Le SEL de Grise Fiord et de Resolute Bay était clair et cohérent, révélant qu'actuellement, le nombre de mouettes observé près des communautés est bien plus faible qu'il y a 25 ans. Le SEL d'Arctic Bay était moins unanime, même si les membres de la communauté pensaient en général que l'espèce était aperçue moins fréquemment. Des observations tirées d'enquêtes non systématiques menées par les agents locaux de la faune corroboraient les données du SEL, et des relevés aériens des emplacements connus de colonies situées sur la presqu'île Brodeur (près d'Arctic Bay) n'ont repéré qu'une seule mouette. Ces renseignements conjugués suggèrent que la population de la mouette blanche est en baisse dans tout le territoire canadien de l'espèce. Des enquêtes systématiques seront nécessaires pour confirmer ce que l'on pense être un déclin.

Mots clés: mouette blanche, *Pagophila eburnea*, savoir local, déclin de la population, entrevues

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INTRODUCTION

The application of local indigenous knowledge to resource management is increasing internationally (Johannes, 1989; Huntington et al., 1999). Indigenous knowledge can be a useful source of information to complement Western scientific approaches to resource management (Abele, 1997; Berkes et al., 2000). Particularly useful is knowledge about wildlife populations that occur in remote locations, inhabited by indigenous peoples, where extensive scientific studies may be impractical (Wilhere, 2002). In Arctic Canada, indigenous knowledge (or Inuit *Qaujimajatuqangit*) is an important component of wildlife management (Gunn et al., 1988; Duerden and Kuhn, 1998; Government of Nunavut, 2002). It has been successfully used to gather information relevant to management of various terrestrial and marine mammals that are harvested by Inuit in the eastern Arctic (Stewart et al., 1995; Ferguson et al., 1998; Hay, 2000). The use of indigenous knowledge

for the management of migratory birds has been less extensive, except for certain species harvested by some communities (e.g., common eider ducks *Somateria mollissima sedentaria*; Nakashima and Murray, 1988).

In this study, we were interested in updating available information on an uncommon migratory seabird with a Holarctic distribution, the ivory gull (*Pagophila eburnea*). It is small and easily distinguished from other gull species by its pure white plumage, black eyes, and black feet (Haney and MacDonald, 1995). The ivory gull is rarely harvested by Inuit. In winter, it inhabits pack ice offshore between Greenland and Labrador, often in association with seal whelping patches (Orr and Parsons, 1982). During spring migration in April and May, gulls move north along floe edges and broken pack ice to their breeding grounds (Renaud and McLaren, 1982; Haney and MacDonald, 1995), and birds are often observed perched on multiyear sea ice. In Canada, ivory gulls breed in regions that are remote and difficult to survey: on nunatak

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cliffs in southeastern Ellesmere Island and Devon Island; on Seymour Island; and on the Brodeur Peninsula, northern Baffin Island (Thomas and MacDonald, 1987). On the Brodeur Peninsula, gull colonies are found among cobbles at the top of valleys steeply eroded through broad, level gravel and cobble plateaus. Because no other birds nest in these remote sites, ivory gull colonies are obvious in this Spartan landscape (M. Mallory and G. Gilchrist, pers. obs.). The world population of ivory gulls is estimated at 14 000 pairs (Volkov and de Korte, 1996), of which 2400 birds are thought to breed in Canada (Thomas and MacDonald, 1987). Because of its small population size in Canada, the ivory gull is listed as a species of "Special Concern" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2001).

In recent years, residents of several High Arctic communities in Canada have expressed to the Canadian Wildlife Service their concern about seeing fewer ivory gulls. These communities included Grise Fiord, Resolute Bay, and Arctic Bay, Nunavut. Hence, in this study our goal was to gather local ecological knowledge on these reported declines from available sources, and specifically to interview Inuit about their knowledge of this rare species. Here we present our findings regarding perceived population status and trend, and the timing and locations of ivory gull observations reported by Inuit.

METHODS

For this study, we considered local ecological knowledge to include concepts of traditional ecological knowledge, oral tradition, indigenous knowledge, and local or community knowledge (as defined by Berkes et al., 2000). Hence, we deemed current or recent observations to be as important as "traditional" information, and for this reason we applied the term "local ecological knowledge" (LEK) throughout the paper.

We gathered LEK between 1999 and 2002 through a variety of methods, almost all of which were individual interviews. We collected some information through eight telephone conversations with individuals who were lifelong residents of communities in the ivory gull's breeding range, namely Grise Fiord (Ausuittuq; 76°25' N, 82°53' W), Resolute (Qausuittuq; 74°41' N, 94°49' W) and Arctic Bay (Ikpiarjuk; 73°02' N, 85°10' W). In some instances, particularly for the communities of Grise Fiord and Resolute Bay, we also held informal discussions in person with local hunters or residents (twice in groups of two), which collectively provided interviews from five people in Resolute Bay and four people in Grise Fiord. These interviews did not have a fixed questionnaire; thus, the format was similar to the semidirective method used by Nakashima and Murray (1988) and Huntington (1998), which encourages group discussion and free-flow interaction. At the conclusion of these interviews, we reviewed the pertinent information with the individual or group.

We followed up these informal interviews with a more structured protocol in the community of Arctic Bay. We focused on this community in part because local mining exploration was causing some concern over disturbance to wildlife, and because Arctic Bay was located within 100 km of key known breeding sites on the Brodeur Peninsula. In this community, we gathered LEK through direct, individual interviews with 12 hunters and elders during 2–8 August 2001. We contacted the Ikajutiit Hunters' and Trappers' Organization (HTO) approximately one month before the interviews and had them review the interview questions in advance. We also asked the HTO to select appropriate hunters and elders that might have experience with this species. As a result, those interviewed were not a random sample of the community.

Interviews were conducted primarily in Inuktitut and rarely in English. For each interview, the interviewer (J. Akearok) took a list of questions, a notebook, a tape recorder, four 1:250 000 topographic maps covering the Arctic Bay region, and a picture of an ivory gull. Before the interview, all interviewees were shown a consent form in Inuktitut and English and asked to sign it, indicating whether they wished to be identified in publications resulting from this work. Interviews generally lasted one hour, although no time limit was specified in advance. We asked 15 brief, simple questions on ivory gulls that were based in part on the questions used in recent LEK studies (Hay, 2000; Mallory et al., 2001). Questions focused on the ivory gull's appearance, timing of its arrival and departure from the region, its diet, perceived changes in its numbers, and its interactions with other species. Approximately 15 questions were also asked about sea-ice patterns near the community, to gather information on perceived changes in the local marine environment (Akearok et al., 2002). To assess their relevant knowledge of the ivory gull, interviewees were asked whether they actively went out on the land and seas to hunt and camp currently, and whether they had done so in the past. Aside from specific questions, we also encouraged interviewees to elaborate on subjects in any way they felt comfortable. During the questions, we recorded on maps and in notebooks the locations where interviewees observed the species.

All interviews but one were tape recorded and later transcribed and translated (Akearok et al., 2002). Data from maps were transferred to a geographic information system (GIS) database using ArcView 3.2 software.

Following the LEK interviews, J. Akearok and J. Coutu conducted a three-hour survey of the known breeding range of the ivory gull on the Brodeur Peninsula, using a Bell 206B helicopter. Unlike previous surveys, which had examined some fixed transects (Thomas and MacDonald, 1987) or encountered colonies by chance (Reed and Dupuis, 1983), our survey went directly to the colony locations, but observers also recorded any birds seen during the trip. Flight altitudes of 25–50 m above ground level and speeds of approximately 50 km/h were maintained near colony locations.

RESULTS

Resolute Bay

Ivory gulls do not nest close to this community, but they have traditionally passed by this area, presumably on their way to northern breeding locations such as the colony at Seymour Island (Haney and MacDonald, 1995). The garbage dump at Resolute Bay was a location where ivory gulls could commonly be observed in spring migration, and where birds were banded in the 1970s and 1980s (Haney and MacDonald, 1995). Thirty-six birds (1.5% of the known Canadian population) were banded there between 1982 and 1984 (Thomas and MacDonald, 1987). Since then, however, Inuit have noticed declining numbers of ivory gulls at the community dump, and in 2000–02 none were observed. Other gulls and ravens (*Corvus corax*) remain common at the dump.

Grise Fiord

This community is located within 100 km of many known ivory gull colonies on Ellesmere Island, Nunavut (Thomas and MacDonald, 1987). In the past, local residents observed ivory gulls at the nearby dump from early spring (May) through September. Ten to 20 birds were commonly observed around the community, whereas other gulls (glaucous gulls, *Larus hyperboreus* or Thayer's gull, *L. glaucoides thayeri*) were rare. Between 1982 and 1984, 240 adult ivory gulls (10% of the Canadian population) were banded at the dump (Thomas and MacDonald, 1987). Following these studies, residents reported that ivory gull numbers declined through the 1980s and into the 1990s. At maximum, 50 ivory gulls have been observed at the landfast ice edge by hunters in the summer months since 2000, notably in 2001, which corresponded to the year with more multiyear ice near the community (Table 1). Ivory gulls no longer occur at the local garbage dump as they did in the 1970s, while other gull species and ravens are more common now.

Arctic Bay

We interviewed 12 Inuit, 11 (92%) of whom stated that they actively went out on the land to hunt and camp at present and had done so in the past as well. All interviewees were familiar with the ivory gull, and all provided information on the timing of their observations and the habits of this species.

Most interviewees (92%) said that ivory gulls were observed at the floe edge in the spring, and nine people (75%) said that this species was rarely observed in the summer. Respondents were mixed in their description of fall patterns, with two people (17%) suggesting that the species was rare at this time, one (8%) indicating that it was most commonly observed in the fall, and two people (17%) noting that young birds were observed during fall migration. In general, birds were observed near Arctic Bay

as early as April, but were more commonly seen during May and June, when puddles formed on the surface of the ice. Interviewees indicated that gulls began to depart in August, but usually migrated through September and were gone by October.

The locations where residents of Arctic Bay observed ivory gulls varied. Birds were most commonly observed at the floe edge, the location of which differs each year, but is often near the mouth of Admiralty Inlet. In summer, birds were not common, but when observed, they were usually near multiyear ice, and along western Admiralty Inlet or islands in the Inlet. In the fall, ivory gulls were observed scavenging seal or whale carcasses, or were found near forming ice.

Eleven (92%) of the local Inuit reported that ivory gulls scavenged seal or whale fat or meat, both from polar bears (*Ursus maritimus*) and from human hunters. Six people (50%) indicated that the gulls fed on fish, and four people (33%) indicated that zooplankton and shrimp were important parts of their diet.

Five interviewees (45%) said that their ancestors had eaten ivory gulls or their eggs, and one of these (8%) said that Inuit ate ivory gulls, as well as northern fulmars (*Fulmarus glacialis*), in times of food scarcity. Interestingly, several interviewees (as well as people in Grise Fiord) noted that the ivory gull is a popular bird with Inuit because of its tame nature and its habit of accompanying hunters at the floe edge.

We obtained mixed opinions on the trends in ivory gull numbers near Arctic Bay. Four people (33%) thought that numbers were clearly declining, while another four thought that numbers were unchanged. Only one person (8%) thought numbers might be increasing. Three interviewees (25%) indicated that they didn't know what way local population sizes might be trending, although two (17%) of these people thought they saw fewer gulls currently than in the past. Six hunters (50%) remarked that they saw fewer ivory gulls now than in the past. These interviews were conducted individually, but we strongly suspect that if we had used a group format similar to that advocated by Huntington (1998), where interviewees could exchange thoughts and experiences, there would have been more concurrence on declines. We suggest this because one interviewee indicated that he never really thought about this species much (because it is not harvested), but now that he had been asked to do so, he realized that he did not see it as often.

In trying to explain their responses, several interviewees offered opinions on how populations might be changing. Two people (17%) thought that the birds had moved to a new breeding area, while two others (17%) thought that the population probably went through cycles of abundance.

Given that ivory gulls were most commonly observed near ice edges or multiyear ice, we asked local Inuit about sea-ice patterns near their community. All (100%) of the interviewees said that they had observed changes in sea ice, with 11 (92%) indicating that sea ice was thinner now than in the past (an observation consistent with LEK from

other Arctic communities, cf. Krupnik and Jolly, 2002). Other comments included their observations that nowadays the ice forms later and breaks up earlier, and that seabirds now arrive earlier in the spring. Ship captains in Lancaster Sound have told the wildlife officer in Arctic Bay that the amount of multiyear ice in Lancaster Sound decreased between 1999 and 2001.

Other Data Sources

In addition to the interviews with local community members, we also received information on ivory gulls from territorial wildlife officers in the communities of Arctic Bay and Grise Fiord (Table 1). During patrols on the land and directed surveys, relatively few ivory gulls were observed between 2000 and 2002. Small flocks were observed near multiyear ice along the southern coast of Devon Island, as well as near Grise Fiord, but very few were found near Arctic Bay. The officer in Arctic Bay, J. Coutu, had previously spent four years in this community (1979–83). She noted that at that time, there were many more gulls near the community itself, and that multiyear ice was also more common.

On 8 August 2001, following the local LEK interviews, we flew a helicopter survey of the 10 known and three suspected colony locations on the Brodeur Peninsula. Young gulls should still have been in the nest at this time, but we observed only one ivory gull in flight, and no birds were found at any of the colony sites.

DISCUSSION

LEK and Arctic Birds

We found that the LEK resulting from interviews with residents of High Arctic communities provided good data on the locations and timing of ivory gull movements near these communities, particularly during migration, and suggested broad population declines. Although these LEK data were generally qualitative, the observations were supported by other anecdotal sources of data from nonsystematic surveys, as well as by data from one thorough survey of a region known to support at least 10 colonies (Thomas and MacDonald, 1987). This is consistent with our earlier experience (Robertson and Gilchrist, 1998; Mallory et al., 2001), supporting the conclusion that LEK can serve as an important tool in the Arctic, both to alert wildlife managers to population trends and distributions of various species and to help focus detailed survey efforts.

Ivory Gull Ecology

The natural history descriptions of the species' habits were consistent with the limited information available in the scientific literature (Haney and MacDonald, 1995), suggesting that Inuit are astute observers of their environment, even for

species that have never been important in their diet. Clearly, most information on ivory gulls came from observations made when gulls were either in migration or feeding away from nesting colonies, near pack ice or the floe edge, but we did record information on one colony. Ancestors of the Inuit from Arctic Bay had discovered an ivory gull colony far inland, where the area appeared white because of the large number of gulls. This was probably one of the colonies rediscovered in the 1980s during aerial surveys (Reed and Dupuis, 1983; Thomas and MacDonald, 1987), and the LEK presented to us was undoubtedly a recounting of the report published by Bray (1943) and noted by MacDonald and Macpherson (1962). The known colonies on the Brodeur Peninsula previously supported about 550 birds (Thomas and MacDonald, 1987), so if the description by the Inuit ancestors was accurate—that is, if the colonies were white from many birds—it suggests that some of the colonies may once have been much larger.

The greatest consistency in LEK came from questions related to where and when birds were observed and what the birds ate. Because LEK is based on Inuit observations, we caution that the distribution of ivory gull observations is biased by the locations where Inuit travel. For the ivory gull, much of the LEK would have been gathered opportunistically during hunting trips (e.g., at the ice floe edge where Inuit hunt whales and seals) or, for Resolute Bay and Grise Fiord, from observations of birds at dumps near the community. Less consistent information was gathered on questions relating to population status, breeding locations, and breeding biology of ivory gulls. These findings, along with those of previous studies, suggest that more detailed, thorough, and consistent LEK exists for species that Inuit hunt (e.g., caribou; Ferguson et al., 1998), and for those seasons when Inuit interact most with the species in question (e.g., during spring, when ivory gulls occur at ice floe edges).

Although there was consistency among interviewees on the ecological habits of the species, we also noted that Inuit observed variation in the timing of the gulls' arrival. We suspect that this reflects annual variation in the extent, location, and movement of sea ice, which affects migration (Haney and MacDonald, 1995). Interestingly, some Inuit reported the timing of gull arrival in relation to ice conditions rather than by calendar dates (Akearok et al., 2002). Some of these conditions correspond to dates when seal carcasses are still available near the community before ice breakup, and to places where gulls have been reported previously (Renaud et al., 1979). Both LEK and scientific investigation indicate that the climate, in terms of sea ice conditions, is changing in this area (Krupnik and Jolly, 2002; this study). This change might affect the migration and reproductive ecology of the ivory gull and other seabirds in the High Arctic.

Population Trend of Ivory Gulls

For some Arctic species, LEK information has been used to assess population status (Ferguson et al., 1998;

TABLE 1. Observations of ivory gulls (or failure to observe them) during air, water, and land surveys in eastern Lancaster Sound and Jones Sound in the summers of 2000–02.

Location	Nearby Community	Observer	Type of Survey	Date	Duration of Survey	Reports of Ivory Gulls
Northwest Admiralty Inlet	Arctic Bay	Resources Officer	Helicopter	July 2000	2 hours	None observed
Admiralty Inlet	Arctic Bay	Resources Officer	Helicopter	July 2000	2 hours	None observed
– Cape Crawford and Elwin Inlet						
Greenland to Beechey Island	Arctic Bay, Resolute Bay	RCMP Officer	Ship	August 2000	Approx. 1 week	5 adults at Croker Bay 7 adults at Cape Horne 20 adults at Maxwell Bay 3 adults at Beechey Island 1 adult
Yeoman Island, – western Brodeur Peninsula	Arctic Bay	Resources Officer	Land	Summer 2000	1 month	None observed
Dundas Harbour to Croker Bay	Arctic Bay	Resources Officer	Ship	September 2000	6 days	50 birds on an iceberg, including juveniles
20 km northwest of Grise Fiord	Grise Fiord	Resources Officer	Land	August 2000	> 1 week	None observed near 15 narwhal carcasses
West Admiralty Inlet	Arctic Bay	Resources Officer	Land/Boat	August 2001	1 week	More birds than in recent years, near multiyear ice
Northern Jones Sound	Grise Fiord	Resources Officer	Land	Summer 2001	Several days	Some birds observed
Kane Basin	Grise Fiord	Ship Captain	Boat	Summer 2001	Several days	1 bird observed flying
Brodeur Peninsula	Arctic Bay	Resources Officer; CWS Biologist	Helicopter	August 2001	3 hours	4 birds observed on small iceberg
Grise Fiord floe edge	Grise Fiord	Resources Officer	Snowmobile	July 2002	1 day	

Hay, 2000). For other uncommon and infrequently harvested species, LEK on distributions can be very informative, but data concerning abundance are often qualitative rather than quantitative and may not be suited to population monitoring (Mallory et al., 2001).

For ivory gulls in the High Arctic, the most common sightings occurred in the spring near the floe edge, or when birds stopped to forage at dumps near the community. Because the migration of Arctic birds is affected by annual patterns of ice breakup (McLaren, 1982; Renaud and MacLaren, 1982), it was not surprising that we found variation in the assessment of population trends from hunters at the floe edge. The location of the edge varies each year, and hence the location, timing, and occurrence of gulls probably vary as well. Nonetheless, there was a tendency for hunters to suspect declines. Information from communities observing ivory gulls at the dump (a more predictable location) indicated much more clearly that numbers of gulls have declined dramatically over the past 30 years. Although there may have been some changes in waste management practices at dumps, it is difficult to believe that scavenging ivory gulls would not still use these ready food sources, if the birds were around. Communities are larger now, with more hunters, and dumps are visited by numerous other gulls and ravens. It may be that increased numbers of these other species are outcompeting ivory gulls at dumps (Haney and MacDonald, 1995), perhaps contributing to their apparent local declines.

Despite some inconsistencies in LEK on population trends, we interpreted the overall comments as indicative of population declines near all three communities. The LEK was strongly supported by the observations of government officials and ship personnel (Table 1), who had numerous opportunities to observe ivory gulls in habitats that Inuit identified as good locations for this species. Other than the adult birds observed along southern Devon Island and one large group (50 adults and juveniles) on an iceberg near Grise Fiord, very few ivory gulls have been observed since 2000 in Lancaster and Jones Sounds, areas where they were often seen in the past (Haney and MacDonald, 1995). Around the Brodeur Peninsula in particular, no birds were observed near a traditional, late-summer foraging site in western Admiralty Inlet, where ivory gulls (including young) had annually scavenged narwhal (*Monodon monoceros*) carcasses from the Inuit hunt. The suggestions of declines on the Brodeur Peninsula were supported by the failure to find any nesting birds during the helicopter survey of known colony locations. This survey was conducted almost exactly 20 years after two of these colonies were rediscovered (Reed and Dupuis, 1983).

All together, LEK results and other anecdotal reports from Grise Fiord, Resolute Bay, and Arctic Bay suggest that local populations of ivory gulls are in decline, and a survey of colony locations on the Brodeur Peninsula supported these observations. Undoubtedly we do not know of all ivory gull colonies in the area; in the early 1990s, the Arctic Bay wildlife officer found three small colonies farther inland from the known sites, and two of these may be the ones observed by a Canadian Wildlife Service scientist flying over the Brodeur Peninsula in 2001. Nonetheless, the fact that community members have recently observed few gulls suggests that any remaining colonies in each region must be small. Given that the population of ivory gulls nesting in Canada is only about 2400 birds (Thomas and MacDonald, 1987), perceived declines in colonies across its known breeding range may prove problematic for this species.

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