

Glaucous Gulls Kleptoparasiting Arctic Foxes in Magdalenefjorden, NW Spitsbergen

LECH STEMPNIEWICZ^{1,2} and LECH ILISZKO¹

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ABSTRACT. Observations were made of glaucous gulls (*Larus hyperboreus*) stealing little auks (*Alle alle*) stored in a den by arctic foxes (*Vulpes lagopus*) in Magdalenefjorden, northwest Spitsbergen. Before stealing the spoil, the gulls observed and followed foxes transporting little auks hunted in a nearby colony. Skill in detecting and successfully taking over the food cached by arctic foxes may help glaucous gulls to survive critical periods of lowered prey availability and enhanced energy demands, such as the little auk incubation period, when the auks are well hidden in the nests and inaccessible for gulls feeding their own large nestlings. These observations are the first documented instances of the glaucous gulls kleptoparasiting arctic foxes and provide additional evidence of the complex nature of interactions occurring between these two opportunistic Arctic predators.

Key words: glaucous gull, *Larus hyperboreus*, arctic fox, *Vulpes lagopus*, kleptoparasitism, Magdalenefjorden, NW Spitsbergen

RÉSUMÉ. On a observé des goélands bourgmestres (*Larus hyperboreus*) en train de voler des mergules nains (*Alle alle*) qui avaient été placés dans une tanière par des renards arctiques (*Vulpes lagopus*) à Magdalenefjorden, dans le nord-ouest de Spitsbergen. Avant de voler les mergules, les goélands observaient les renards et les suivaient en train de transporter les mergules nains chassés dans une colonie située tout près. L'aptitude à détecter la nourriture cachée par les renards arctiques et à s'en accaparer pourrait aider les goélands bourgmestres à survivre pendant les périodes critiques où il y a peu de proies et où le besoin en énergie est plus grand, telle que la période d'incubation des mergules nains, soit lorsque les mergules sont bien cachés dans les nids et qu'ils ne sont pas accessibles aux goélands qui nourrissent leurs propres nichées d'envergure. Ces observations constituent les premiers cas documentés de goélands bourgmestres en train de faire du cleptoparasitisme chez le renard arctique, en plus de présenter des preuves supplémentaires de la nature complexe des interactions entre ces deux prédateurs opportunistes de l'Arctique.

Mots clés : goéland bourgmestre, *Larus hyperboreus*, renard arctique, *Vulpes lagopus*, cleptoparasitisme, Magdalenefjorden, nord-ouest de Spitsbergen

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INTRODUCTION

Kleptoparasitism, or stealing food captured by others, can be more profitable than capturing the same or other prey directly because less energy is expended during prey capture. This behavior is common, particularly in marine birds (Furness, 1987). Some seabirds (e.g., skuas, *Stercorarius* spp., and frigatebirds, *Fregata* spp.) specialize in kleptoparasitism and rely on piracy for most of their energy acquisition. Most (e.g., gulls), however, are opportunistic or facultative kleptoparasites: they have a range of foraging modes, and food theft is context-dependent, for instance, related to periods of relatively low availability of alternative food sources (Brockmann and Barnard, 1979). Also, within species, some individuals may specialize as kleptoparasites (Shealer et al., 2005).

Glaucous gull (*Larus hyperboreus*) and arctic fox (*Vulpes lagopus*) are considered the most important predators

on little auks (*Alle alle*), taking eggs, chicks, fledglings, and adult birds within their whole breeding range (Stempniewicz, 2001). Other avian predators, such as skuas, common raven (*Corvus corax*), peregrine falcon (*Falco peregrinus*), gyrfalcon (*F. rusticolus*), and snowy owl (*Nyctea scandiaca*), may also prey on the little auk to a lesser extent and have a local effect in some colonies (Evans, 1981; Roby et al., 1981; Stempniewicz, 1981, 1983, 1995). The polar bear (*Ursus maritimus*) has been reported a notable predator in Franz Josef Land (Stempniewicz, 1993).

Glaucous gulls are omnivorous and opportunistic, and their diet changes seasonally and locally. Summer food consists of birds (eggs, chicks, fledglings, and adults of small species), offal, and carrion (Barry and Barry, 1990; Samelius and Alisauskas, 1999). The gulls feed both on land and in the sea, where they take fish and invertebrates in the intertidal zone (wading) and from the sea surface (surface seizing) (Schmutz and Hobson, 1998; Wojczulanis et al.,

¹ Department of Vertebrate Ecology and Zoology, University of Gdańsk, Legionów 9, 80-441 Gdańsk, Poland

² Corresponding author: biols@univ.gda.pl



FIG. 1. Arctic fox carrying two adult little auks to the den.

2005). Moreover, gulls sometimes steal food dropped by kittiwakes (*Rissa tridactyla*) that are being harassed by arctic skuas (*Stercorarius parasiticus*) (Stempniewicz, 1983).

Arctic foxes are predators and scavengers that rely first of all on small rodents such as lemmings (*Dicrostonyx* spp., *Lemmus* spp.) and voles (*Microtus* spp.) (Anthony et al., 2000; Elmhagen et al., 2000). However, birds (eggs and adults), marine invertebrates, fish, and carcasses of sea mammals are important food items for foxes belonging to the coastal ecotype in the areas where rodents are rare or absent, as in the case of Spitsbergen (Summers, 1986; Fay and Stephenson, 1989; Stickney, 1991; Bantle and Alisauskas, 1998; Dalerum and Angerbjörn, 2000; Samelius and Alisauskas, 2000). They often follow polar bears or wolves to scavenge remains of their hunting (Chesemore, 1975) and occasionally kill pups of ringed seal (*Phoca hispida*) (Smith, 1976) and reindeer (*Rangifer tarandus*) calves (Prestrud, 1992). At human settlements, arctic foxes take a variety of items from garbage dumps (Garrott et al., 1984).

This paper describes observations made of glaucous gulls stealing little auks stored in a den by arctic foxes in Magdalenefjorden, northwest Spitsbergen. The observations were made opportunistically during a seabird study project.

DESCRIPTION OF OBSERVATION

On 1–3 August 2008, a hunting camera (HC-50) taking three photos in five-second intervals immediately after inducing and pausing for at least 30 seconds was set c. 10 m in front of an arctic fox den in Magdalenefjorden, northwest Spitsbergen (79°35' N, 11°00' E). The den was located among many scattered little auk subcolonies. No other seabird colony in the range of fox exploration constituted an important alternative source of food. The den was occupied by a pair of adults, one of them belonging to a blue form, and three young, of which one was blue.

The camera recorded a series of pictures showing behavioral interactions between adult glaucous gulls and arctic



FIG. 2. Glaucous gull waiting for the arctic fox to leave the den (note abundant gull droppings on the boulder overhanging the den).



FIG. 3. Glaucous gull entering the fox den.

foxes. On the basis of camera photos and additional observations made on several occasions, we reconstructed the following sequence of events. The gulls often accompanied foxes transporting the spoil they had gained in one of the little auk subcolonies situated c. 0.5 to 3 km from the den. From time to time, they performed apparent attacks to frighten the fox and force it to drop a prey. On 1 August, when a fox successfully brought a little auk to the den (Fig. 1), a gull perched on the top of the boulder under which the den was situated, apparently waiting for a proper moment to steal the spoil (Fig. 2). When all the foxes had left the den, the gull carefully approached the hole, entered it (Fig. 3), caught the stored birds and drew them out. It then started to eat the spoil within one meter of the den entrance (Fig. 4). All the prey items brought by foxes and then drawn out from the den by gulls (at least eight birds) were recognized as adult little auks on the basis of the camera pictures and analysis of remnants left by gulls near the den. We recorded such gull behavior at the fox den three times during the three days of our camera work.



FIG. 4. Glaucous gull eating the little auk drawn out from the den.

During the same period, our camera also registered at least two visits by reindeer, which intensively ingested soil close to the arctic fox den (Fig. 5).

DISCUSSION

Timing of little auk availability to glaucous gulls and arctic foxes differs. Foxes hunt little auk eggs, chicks, fledglings, immatures, and adults efficiently throughout the little auk breeding season. Moreover, the foxes' caching behavior makes them much less vulnerable to fluctuations in prey availability. Gulls, however, prey effectively only on chicks testing wings outside the nest and young leaving the colony. The departing young constitute the most abundant and easiest prey for both glaucous gulls and arctic foxes. During the incubation period, little auks are least accessible to gulls: eggs, small chicks, and incubating or brooding adults are usually well hidden, so they do not make any significant contribution to the gulls' diet. This incubation period coincides with the highest energy demands of glaucous gulls, who are feeding their own nearly full-grown nestlings (Stempniewicz, 1995).

Glaucous gulls associated with large little auk colonies feed almost exclusively on the little auks (Stempniewicz, 2001). Ability to detect and successfully pilfer food cached by arctic foxes may help glaucous gulls to survive critical periods of lowered prey availability and enhanced energy demands. In wild Arctic areas with no human settlements or scientific stations, such as Magdalenefjorden, glaucous gulls have little choice of alternative food during periods of food shortage. On the other hand, the considerable losses to gull pilfering of food stored by arctic foxes may influence the survival rate of young foxes, especially when the theft takes place in the period of their transition to independence. In other areas (e.g., the Canadian High Arctic), food caches made by arctic foxes are known to be explored by wolverines (*Gulo gulo*; Samelius et al., 2002) and common ravens (Careau et al., 2007).



FIG. 5. Reindeer ingesting soil in front of the arctic fox den.

Optimal foraging theory predicts that the foraging mode that maximizes net energy intake will be chosen (Emlen, 1966; Thompson, 1986), so in the vicinity of a large little auk colony that constitutes a staple food source for both gulls and foxes, glaucous gulls should steal prey cached by foxes most intensively when little auks are absent or inaccessible and abandon or weaken kleptoparasitism when other food sources allow higher energy intake. Hence, the extent of kleptoparasitism may serve as an indicator of the availability of alternative food sources.

Trophic relationships between glaucous gulls and arctic foxes on Spitsbergen appear to be complex and comprise at least competition, predation, and kleptoparasitism. Foxes and gulls compete for the same food resources—little auks, in this case—though use of different hunting methods makes the competition uneven, and as a result, different little auk age groups are taken by the two predators with different efficiency. Arctic foxes also explore glaucous gull nests and take eggs and chicks (occasionally immature and adult birds) (L. Stempniewicz, pers. observ.); therefore, the glaucous gulls exhibit antipredatory behavior, mobbing and harassing the foxes that approach their nesting territory. However, similar behavior is observed in their common hunting areas, such as the little auk colony, as well as outside these areas, if only the fox is carrying the spoil. Kleptoparasitic interactions between the two species are bilateral. Arctic foxes often take little auks being chased by glaucous gulls, especially fledglings that were forced to land on tundra after performing a diving maneuver (Stempniewicz, 1983, 1995). Glaucous gulls, however, can successfully find and explore the foxes' food caches and take the food foxes have stored there. Such gull behavior at fox dens seems to be quite common, as it was recorded at least three times during our three days of camera work. Abundant bird excrement left on the overhanging boulder (Fig. 2) suggests frequent gull visits to the den.

Because of soil enrichment by food remnants and fox excrement, as well as aeration caused by digging, a characteristic plant community develops around den sites

(Skrobov and Shirokovskaya, 1968; Chesmore, 1975; Garrott et al., 1984; Smith et al., 1992). Observations of reindeer intensively ingesting soil near the fox den suggest that they could be supplementing microelements in their diets. The potential for arctic fox dens to attract reindeer further hints at the complexity of interactions among species in this relatively simple ecosystem.

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