

Breeding Habitats and New Breeding Locations for Ross's Gull (*Rhodostethia rosea*) in the Canadian High Arctic

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ABSTRACT. Published accounts list only four breeding sites for Ross's gull (*Rhodostethia rosea*) in North America, but the discovery of additional breeding sites in Queen's Channel, Nunavut, adds to growing evidence that this species is established as a regular breeder in the Canadian High Arctic despite its current status as a Threatened Species in Canada. We present nine breeding records of Ross's gull in Canada. Five are from Queen's Channel alone, and these include two new breeding records from 2011. The geographic proximity and similarity in topography, microhabitat, and interspecific nesting associations that characterize Ross's gull nesting sites in the Canadian High Arctic suggest that additional surveys of surrounding suitable habitat would confirm a stable and globally significant breeding population of this very poorly known species in North America.

Key words: Ross's gull, *Rhodostethia rosea*, breeding site, High Arctic, threatened species, polynya, biogeography

RÉSUMÉ. Selon des données déjà publiées, il n'existe que quatre lieux de reproduction de la mouette rosée (*Rhodostethia rosea*) en Amérique du Nord. Cependant, la découverte de nouveaux lieux de reproduction dans le chenal Queens, au Nunavut, vient renforcer les preuves selon lesquelles cette espèce est établie en tant qu'oiseau nicheur régulier dans l'Extrême-Arctique canadien, même si elle fait actuellement partie de la liste des espèces menacées au Canada. Nous présentons neuf enregistrements relatifs à la reproduction de la mouette rosée au Canada. Cinq de ces enregistrements sont relatifs au chenal Queens, dont deux nouveaux enregistrements de reproduction qui datent de 2011. La proximité géographique et les similitudes sur le plan de la topographie, du microhabitat et des associations de nidification interspécifiques caractérisant les lieux de reproduction de la mouette rosée dans l'Extrême-Arctique canadien laissent entendre que des levés supplémentaires d'habitats environnants convenables permettraient de confirmer une population d'oiseaux nicheurs stable et généralement importante de cette espèce très peu connue en Amérique du Nord.

Mots clés : mouette rose, *Rhodostethia rosea*, lieu de reproduction, Extrême-Arctique, espèces menacées, polynie, biogéographie

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INTRODUCTION

Although the type specimen of Ross's gull (*Rhodostethia rosea*) was secured in Foxe Basin, Nunavut, in 1823, the breeding grounds of the species remained unknown for more than 80 years until a few small colonies were discovered scattered across the Kolyma River Delta in Siberia (Buturlin, 1906). Other colonies were subsequently discovered in the deltas of the Alazeya, Yana, Indigirka, and Lena Rivers (Dementiev and Gladkov, 1969; Degtyarev et al., 1987). Breeding has also been recorded on the Taimyr Peninsula (Pavlov and Dorogov, 1976; Yésou, 1994) and the Chaun River Delta (Pearce et al., 1998). Several breeding records from Greenland and Canada have also been described, but were assumed to represent opportunistically nesting vagrant or nomadic birds rather than a stable and self-sustaining population (Blomqvist and Elander,

1981; Béchet et al., 2000). Egevang and Boertmann (2008) collected and presented an extensive list of previously unpublished or poorly documented breeding records from Greenland, suggesting that this species is a rare but regular breeder there. In Canada, Ross's gull is listed by the Committee on the Status of Endangered Wildlife in Canada as a threatened species (COSEWIC, 2007), but considerable evidence supports the hypothesis that a stable and possibly reproductively isolated breeding population of Ross's gulls exists in northern Canada. Known and suspected breeding sites are remote and difficult to access, and even casual surveys have been infrequent.

The Ross's gull is the least known of all Larids, and even basic information concerning the life history and general ecology of the species is largely lacking. It is still unknown where Ross's gulls spend the winter, and even descriptions of the breeding range of this species are highly

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speculative. The most recent and qualified estimate puts the Russian breeding population of Ross's gulls at a minimum of 45 000–55 000 adults, but less than 1% of this estimated population can be accounted for in known breeding colonies (Degtyarev, 1991). The geographic range and number of birds breeding in the Nearctic is unknown.

A better understanding of where Ross's gulls breed and what their habitat requirements are is a necessary first step in generating accurate population estimates and developing practical and relevant management plans in areas of their range where they may be susceptible to disturbance. Here, our objectives were to summarize previously known breeding records in the Nearctic, describe recently found breeding sites, and define a suite of specific habitat conditions characterizing all High Arctic breeding sites of Ross's gull that should be used as a basis for future surveys.

METHODS

Records of Ross's gulls breeding in the Nearctic were collected from a variety of sources, including unpublished material, personal communications, and museum specimen histories.

In the field, we conducted targeted aerial and ground surveys in an area of suitable nesting habitat in Queen's Channel and Penny Strait, Nunavut (Fig. 1). Two aerial surveys were made from a Bell 407 helicopter, one on 26 June and the other on 3 July 2011. On 26 June, two of the authors (M. Maftei and S.E. Davis), assisted by another biologist, surveyed Crozier, Milne, Kalivik, and Emikutailaq Islands. Crozier and Milne Islands were surveyed from a height of approximately 50 m in parallel transects approximately 200 m apart. An area of Milne Island where Ross's gulls had been reported breeding in 1981 was surveyed on foot. No Ross's gulls were seen on Crozier Island or Milne Island. Kalivik and Emikutailaq Islands were surveyed from the air, but only partially surveyed on foot because of time constraints. Ross's gulls were observed on both islands. On 3 July, M. Maftei and four other biologists surveyed South Cheyne, Middle Cheyne, and Seymour Islands. South Cheyne and Middle Cheyne Islands were both surveyed on foot. An aerial survey of Seymour Island was curtailed on account of dense fog, and this island was only partially surveyed on foot in the area near a known ivory gull colony. No Ross's gulls were seen on any of the three islands.

RESULTS

To summarize breeding records of Ross's gull in the Nearctic, we retrieved information on 32 records from nine Canadian breeding sites, as well as 15 previously described Ross's gull records from nine additional breeding sites in Greenland (Table 1).

On 26 June 2011, while conducting an aerial survey for breeding Ross's gulls in Queen's Channel and Penny Strait,

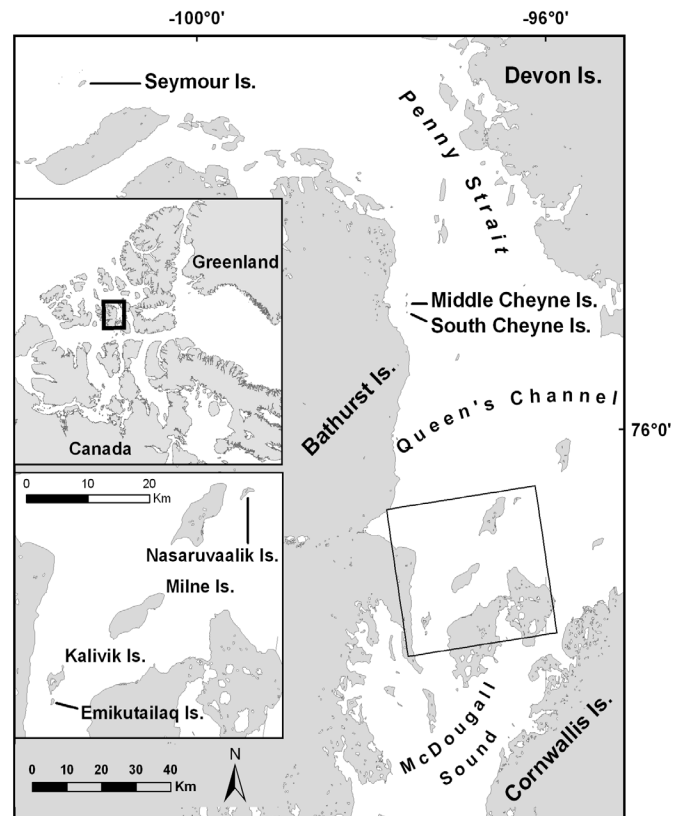


FIG. 1. Ross's gull (*Rhodostethia rosea*) breeding area in the Canadian High Arctic.

Nunavut, we discovered two pairs of Ross's gulls, one of which was associated with a nest, on Emikutailaq Island (75°29' N, 97°14' W), and we saw a single Ross's gull on Kalivik Island (75°32' N, 97°12' W). Eight individuals including a nesting pair were also observed on Nasaruvaaalik Island (76°49' N, 96°18' W), at a known breeding site that has previously been described in detail (Mallory et al., 2006). Emikutailaq and Kalivik Islands had never before been surveyed.

Emikutailaq Island is small (1 km²) and supports a lush, abundant substrate of mosses, sedges, and herbaceous vegetation. The name of the island is derived from the Inuktitut word for "tern," reflecting a long-term recognition of this site as an important arctic tern (*Sterna paradisaea*) colony. Extensive vegetation as well as Thule tent rings and scattered whale bones evince the historical importance of Emikutailaq Island as a base from which humans and birds alike could exploit the rich marine resources nearby.

After surveying about half of the island on foot, we observed a Ross's gull hovering, flying slow, tight circles in one spot, and subsequently alighting on a nest that contained three eggs. The nest was constructed on a gentle slope of gravel running up from an expanse of deep green moss to a low ridge that dropped abruptly off into a small pond on the far side. The substrate consisted of gravel interspersed with scattered pieces of dry, dead moss. The nest was lined with grass, feathers, and small fragments of lichen, consistent with other Ross's gull nests in the High

TABLE 1. Summary of Ross's gull (*Rhodostethia rosea*) breeding records in the Nearctic.

Country	Site	Year	# Adult birds	Source	Notes	With arctic terns
Canada						
Canada	Churchill	1978	1	S. MacDonald, in Chartier and Cooke (1980)	breeding unconfirmed	yes
		1980	6	Chartier and Cooke (1980)	breeding unconfirmed	yes
		1982	10+	R. Koes in EC (2007)	5 nests	yes ¹
		1992	4+	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		1993	4	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		1994	6	R. Koes and B. Chartier, in EC (2007)	1 nest	yes ¹
		1995	3	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		1997	2	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		1998	?	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		1999	1	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		2000	2	R. Koes and B. Chartier, in EC (2007)	breeding unconfirmed	yes ¹
		2001	3	R. Koes and B. Chartier, in EC (2007)	1 nest, 1 juvenile seen	yes ¹
		2002	10	COSEWIC (2007)	breeding unconfirmed	yes ¹
	2004	2	R. Koes and B. Chartier, in EC (2007)	breeding confirmed	yes ¹	
	2005	5	COSEWIC (2007)	1 nest, 1 juvenile seen	yes ¹	
	Middle Cheyne Is.	1974	1+	Mallory and Gilchrist (2003)	breeding unconfirmed	Yes
		1976	6	MacDonald (1978)	breeding unconfirmed	
		1978	12	MacDonald (1978)	breeding unconfirmed	yes ¹
		2006	8	Mallory et al. (2006)	breeding unconfirmed	yes ¹
	South Cheyne Is.	2006	2	M. Mallory, unpubl. data	breeding confirmed	yes
	Milne Is.	1981	7	M. Mallory, unpubl. data	breeding unconfirmed	yes
	Seymour Is.	1974	3	M. Mallory, unpubl. data	breeding unconfirmed	no
	Prince Charles Is.	1997	2	Béchet et al. (2000)	1 nest	yes
	Nasaruvaalik Is.	2005	9	EC (2007)	5 nests	yes
		2006	2	Mallory et al. (2006)	1 nest	yes
		2007	12	EC (2007)	2 nests, 1 chick	yes
		2008	6	This paper	2 nests	yes
		2009	6	This paper	1 nest	yes
		2010	5	This paper	2 nests	yes
		2011	8	This paper	1 nest	yes
	Emikutailaq Is.	2011	4	This paper	1 nest	yes
	Kalivik Is.	2011	1	This paper	breeding suspected	yes
Greenland						
Henrik Krøyer Holme	1993	2	Egevang and Boertman (2008)	1 nest	yes	
	2003	2	Gilg et al. (2003)	breeding suspected	yes	
Kilen	1984	2	T. Jensen, in Egevang and Boertman (2008)	breeding unconfirmed	unknown	
	1993	2	M. Elander, in Egevang and Boertman (2008)	breeding unconfirmed	unknown	
Kap Eiler Rasmussen	1979	2	Hjort (1980)	1 nest, 1 chick	no	
Godthaabsfjorden	1927	1	Egevang and Boertman (2008)	breeding unconfirmed	unknown	
Qasigiannnguit	1880	?	Egevang and Boertman (2008)	breeding confirmed	unknown	
Ikamuit	1885	?	Egevang and Boertman (2008)	breeding confirmed	yes	
Nuussuaq.	1973	?	Egevang and Boertman (2008)	breeding not confirmed	yes	
Kitsissunnguit	1979	2	Kampp and Kristensen (1980)	1 nest	yes	
	1996	2	A.S. Frich, in Egevang and Boertman (2008)	breeding not confirmed	yes	
	2004	2	L. Witting, in Egevang and Boertman (2008)	1 nest	yes	
	2006	6	C. Egevang, in Egevang and Boertman (2008)	1 nest, 3 chicks hatched	yes	
	2007	1	S. Holst and P. Larsson, in Egevang and Boertman (2008)	breeding not confirmed		
Aavertuut	1984	1	Egevang and Boertman (2008)	breeding unconfirmed	unknown	

¹ Assumed "yes" based on previous records.

Arctic (Mallory et al., 2006; Egevang and Boertmann, 2008). While on Emikutailaq Island, we also observed a second pair of Ross's gulls that were bathing, preening, and displaying to each other in a pond close by the first nest, but because of time constraints, we were unable to search the island to locate more birds or nests.

Kalivik Island (9 km²) is mostly unvegetated gravel, but a small (0.5 km²), sparsely vegetated gravel dome is connected to the main island by a very narrow isthmus. This part of the island contained a dense colony of arctic terns, Sabine's gulls (*Xema sabini*), and at least single pairs of long-tailed duck (*Clangula hyemalis*) and red-throated loon (*Gavia stellata*). One breeding plumage Ross's gull was seen exhibiting nest defense behaviour, but despite a brief search, we were unable to find a nest or a second bird.

We have surveyed the Cheyne Islands each year since 2002 and observed one nesting pair of Ross's gulls in 2006 (Table 1). None were observed when we visited the islands on 3 July 2011. Similarly, Ross's gulls were observed nesting among terns on Milne Island in the 1980s, but we saw none on the island on 26 June 2011, although terns still nested there.

Ross's gulls have been observed nesting on Nasaruvaalik Island every summer since 2005, when the island was first surveyed, and up to five pairs have nested there in a given year (EC, 2007). In 2008, two male Ross's gulls were trapped during the breeding season and marked with unique colour bands. One of these birds has been seen every year since it was banded. In 2011, it was observed mating with a female while on Nasaruvaalik Island, and presumably it nested nearby, as it returned to Nasaruvaalik Island in August. The second bird was not seen in 2009 or 2010, but it returned to breed in 2011.

DISCUSSION

Throughout their range, Ross's gulls nest in remote areas that receive little attention from biologists, and prior to our discovery of breeding birds on Kalivik and Emikutailaq Islands, every North American nesting site had been discovered opportunistically during surveys for other species. Although determining the breeding distribution and habitat requirements of this species is a recognized conservation science priority in Canada, where Ross's gull is listed federally as a threatened species (COSEWIC, 2007), the high cost and considerable logistical difficulty inherent in flying aerial surveys in the High Arctic pose a great challenge. Our observations of returning, colour-marked birds on Nasaruvaalik Island indicate that individuals are annual breeders and faithful to nesting islands, although we speculate that they may nest on neighbouring islands in response to yearly fluctuations in snow and ice cover or the presence of arctic foxes (*Alopex lagopus*) early in the season.

Ross's gull breeding sites in the High Arctic are characterized by several notable similarities. On a large scale, all breeding sites in the High Arctic in both Canada and

Greenland are located near polynyas or consistent leads in the sea ice (Stirling, 1995). Ross's gulls breeding on Nasaruvaalik Island and Emikutailaq Island make extensive use of a small polynya in Crozier Channel for up to two weeks before breeding, during which time they engage in extensive courtship displays, mating, feeding, and nest-site prospecting (M. Maftei, pers. obs.).

The association between Ross's gulls and arctic terns has been well documented in the High Arctic (Mallory et al., 2006; Egevang and Boertmann, 2008). Even in Siberia and Churchill, Manitoba, where Ross's gulls nest inland, they are invariably found in association with terns (Buturlin, 1906; Chartier and Cooke, 1980; Densley, 1999). In North America, this nesting association extends to a guild of species that includes Sabine's gulls, red phalaropes (*Phalaropus fulicarius*), red-throated loons, and common eiders (*Somateria mollissima borealis*) (e.g., Mallory and Gilchrist, 2003), which most likely reflects the general paucity of favourable nesting sites in the High Arctic and the lack of territorial and resource competition between these species.

All known Ross's gull nests in the High Arctic are situated on near-level ground, usually in mossier areas of islands (COSEWIC, 2007). The apparent association of Ross's gulls with moss may be an artifact of their habit of nesting within the outer periphery of arctic tern colonies, which are invariably characterized by such vegetative growth, fertilized through biotransport of nutrients in droppings and food waste (Michelutti et al., 2010). Proximity to freshwater does not seem to be a major factor affecting nest placement. Ross's gulls nesting in the High Arctic do not appear to feed in freshwater ponds, and they apparently feed exclusively on marine invertebrates during breeding. In contrast, Ross's gulls breeding near Churchill nest in a wet and boggy area of inland coastal taiga (Chartier and Cooke, 1980). This site closely resembles the nesting habitat used by Ross's gulls in Siberia, where they form small colonies in areas of polygon ponds in taiga floodplains and feed almost exclusively in freshwater during the breeding season (Buturlin, 1906; Densley, 1999).

Ross's gulls seem to prefer nesting on small islands surrounded by mostly ice-free waters. This is true for most sites in Greenland (Egevang and Boertmann, 2008) and Canada (MacDonald, 1978; Chartier and Cooke, 1980; Béchet et al., 2000; Mallory et al., 2006). Mammalian predators such as arctic fox and polar bear (*Ursus maritimus*) are purportedly less likely to pose a risk to ground-nesting birds breeding on smaller islands. However, in five years of monitoring breeding birds at Nasaruvaalik Island, we noted frequent visits from bears, which swam considerable distances across open water before they came ashore and subsequently ate significant numbers of eggs and fledglings, mostly of common eiders. Although nesting on islands may reduce the risk of predation by mammalian predators like foxes (Clark and Shutler, 1999), an alternative explanation for the general preference Ross's gulls and many other species show for nesting on small Arctic islands is that they offer the greatest available area for foraging within a

minimum radius around a nesting site. Our observations of arctic terns, Sabine's gulls, and Ross's gulls at Nasaruvaaalik Island indicate that the vast majority of individuals of all three species forage within a few hundred meters of the colony. Minimizing commuting time between feeding areas and nesting sites is especially important for arctic terns, since their inability to swallow and regurgitate food for their chicks makes them particularly susceptible to kleptoparasitism. Ground-nesting arctic Larids show a preference for nesting on peninsulas and points, even when better or safer alternatives are available farther inland on the same islands. This preference suggests that the benefits of a nest site with access to the ocean in multiple directions and a larger area of shallow water with abundant prey within a minimum radius outweigh the cost of nesting on low-lying and exposed areas, which are almost invariably where predators make landfall.

Indirect support for this theory can be inferred from the primary defensive strategy of terns and small Arctic gulls, which consists of colony-wide mobbing of predators and is most effective if a large number of birds are present at all times. This advantage is quickly lost if much of the nesting population of a colony and many non-breeding birds, which also participate in defensive mobbing, are foraging too far from the colony to be able to react quickly to a disturbance.

Typically, Ross's gulls arrive at breeding sites up to two weeks before all other species except common eiders and king eiders (*Somateria spectabilis*), and they subsequently lay their eggs approximately 7 to 11 days ahead of Sabine's gulls and arctic terns. Why Ross's gulls arrive and start nesting so far in advance of other species is unclear, but their early arrival may result from a shorter travel distance from nearby Arctic wintering areas (K. Boadway and M.L. Mallory, unpubl. data).

Given that all currently known Ross's gull nesting sites in the High Arctic exhibit a suite of conspicuous and easily assessed physical and ecological characteristics, we propose that future surveys of appropriate habitat within the currently known range of this species in the Canadian High Arctic should be undertaken with the confidence that they will reveal a significant breeding population. The two areas that show the greatest potential to host significant numbers of breeding Ross's gulls in the Canadian Arctic are the islands in Foxe Basin and the islands in Queen's Channel, Penny Strait, and McDougall Sound (Fig. 1). Within these areas, surveys should focus on small islands that arctic terns are known or suspected to use, particularly those that are located in or around polynyas or consistent leads in the ice.

To maximize chances of detecting Ross's gulls, surveys should be conducted in the early season (25 May–15 June) to exploit the gulls' early arrival at breeding sites. During this time, they are among the few birds present and perform conspicuous aerial and ground-based courtship displays. While Ross's gulls are easily observed at a distance from the air, they are susceptible to disturbance caused by fixed-wing aircraft and helicopters (Degtyarev, 1991;

K. Boadway and M.L. Mallory, unpubl. data). They react by flying away a considerable distance, and they return only after the engine noise has subsided. We recommend ground-based surveys on foot as a more reliable and less disturbing method of locating Ross's gulls at nesting sites.

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REFERENCES

- Béchet, A., Martin, J.-L., Meister, P., and Rabouam, C. 2000. A second breeding site for Ross's gull (*Rhodostethia rosea*) in Nunavut, Canada. *Arctic* 53(3):234–236.
- Blomqvist, S., and Elander, M. 1981. Sabine's gull (*Xema sabini*), Ross's gull (*Rhodostethia rosea*) and ivory gull (*Pagophila eburnea*). *Gulls in the Arctic: A review*. *Arctic* 34(2):122–132.
- Buturlin, S.A. 1906. The breeding-grounds of the rosy gull. *Ibis* 48:131–139, 333–337, 661–666.
- Chartier, B., and Cooke, F. 1980. Ross's gulls (*Rhodostethia rosea*) nesting at Churchill, Manitoba, Canada. *American Birds* 34(6):839–841.
- Clark, R.G., and Shutler, D. 1999. Avian habitat selection: Pattern from process in nest-site use by ducks? *Ecology* 80:272–287.
- COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2007. Ross's gull. Ottawa: Government of Canada.
- Degtyarev, A.G. 1991. A method of airborne census of Ross's gull (*Rhodostethia rosea*), in Yakut tundras USSR (In Russian). *Zoologičeskij žurnal* 70:81–85.
- Degtyarev, A.G., Labutin, Y.V., and Blohin, Y.Y. 1987. Ross's gull (*Rhodostethia rosea*): Migration and breeding cycle near the border of the range (In Russian). *Zoologičeskij žurnal* 66:1873–1885.
- Dementiev, G.P., and Gladkov, N.A. 1969. *Birds of the Soviet Union*. Jerusalem: Israel Program for Scientific Translations. 756 p.
- Densley, M. 1999. In search of Ross's gull. Leeds, United Kingdom: Peregrine Books.
- EC (Environment Canada). 2007. Recovery strategy for the Ross's gull (*Rhodostethia rosea*) in Canada. *Species at Risk Act Recovery Strategy Series*. Ottawa: Environment Canada.
- Egevang, C., and Boertmann, D. 2008. Ross's gulls (*Rhodostethia rosea*) breeding in Greenland: A review, with special emphasis on records from 1979 to 2007. *Arctic* 61(3):322–328.
- Gilg, O., Sabard, B., Sittler, B., Mariaux, F., Leguesdron, P., and Gilg, V. 2003. *Ecopolaris 2003: Ecological expedition to North*

- Greenland & Dove Bugt: North-east Greenland National Park. Francheville, France: Groupe de Recherches en Ecologie Arctique.
- Hjort, C. 1980. Ross's gull *Rhodostethia rosea* breeding in Peary Land, North Greenland, 1979. Dansk Ornithologisk Forenings Tidsskrift 74:75–76.
- Kampp, K., and Kristensen, R.M. 1980. Ross's gull *Rhodostethia rosea* breeding in Disko Bay, West Greenland, 1979. Dansk Ornithologisk Forenings Tidsskrift 74:65–74.
- MacDonald, S. 1978. First breeding record of Ross's gull in Canada (Abstract). Proceedings of the Colonial Waterbird Group 2:16.
- Mallory, M.L., and Gilchrist, H.G. 2003. Marine birds breeding in Penny Strait and Queens Channel, Nunavut, Canada. Polar Research 22:399–403.
- Mallory, M.L., Gilchrist, H.G., and Mallory, C.L. 2006. Ross's gull (*Rhodostethia rosea*) breeding in Penny Strait, Nunavut, Canada. Arctic 59(3):319–321.
- Michelutti, N., Blais, J.M., Mallory, M.L., Brash, J., Thienpont, J., Kimpe, L.E., Douglas, M.S.V., and Smol, J.P. 2010. Trophic position influences the efficacy of seabirds as metal biovectors. Proceedings of the National Academy of Sciences of the United States of America 107(23):10543–10548.
- Pavlov, B.M., and Dorogov, V.F. 1976. The Ross's gull (*Rhodostethia rosea*) in the Taimyr (In Russian). Ornitologia 12:240–241.
- Pearce, J.M., Esler, D., and Degtyarev, A.G. 1998. Birds of the Indigirka River Delta, Russia: Historical and biogeographic comparisons. Arctic 51(4):361–370.
- Stirling, I. 1995. The importance of polynyas, ice edges, and leads to marine mammals and birds. Journal of Marine Systems 10:9–21.
- Yésou, P. 1994. Contribution a l'étude avifaunistique de la péninsule du Taïmyr. Alauda 62(4):247–252.