

## Mitteilungen / Notes

### Comparison of Avian Species Richness and Abundance for Localized Oases on Ellesmere Island

By R. France\* and M. Sharp\*\*

Life in the High Arctic is nonrandomly distributed and often concentrated into relatively small and discrete localized areas which may have roles far more important than would be suggested by their physical size alone. Until now, five such centres of diversity and biological productivity have been identified on Ellesmere Island (Fig. 1). Three of these are the terrestrial oases of Lake Hazen (SOPER & POWELL 1985), Princess Marie Bay (WILLIAMS 1980), and Alexandra Fiord (SVOBODA & FREEDMAN 1981); and two, the polynyas of Flagler Bay (SCHLEDERMAN 1980) and the North Water as it abuts the southeastern corner of Ellesmere Island (McLAREN & RENAUD 1982).

Oases exist as a result of geographically ameliorated microclimates or zones of high moisture which promote extensive floral productivity. Polynyas are areas of open water surrounded by ice which are kept from freezing by the combined actions of wind, tidal fluctuations and upwellings. In both areas, avian communities are richer and more numerous here than in surrounding unproductive semi-desert or desert environments (e.g. HUSSELL & HOLROYD 1974, FREEDMAN & SVOBODA 1982, STIRLING & CLEATOR 1981, FRANCE & SHARP 1992).

Although several aerial surveys of avifauna have been conducted on, or along, Ellesmere Island (e.g. McLAREN & RENAUD 1982, McLAREN & McLAREN 1982), due to the biases, inconsistencies, and inaccuracies implicit in such studies (e.g. DIEM & LU 1960, STOTT & OLSON 1972, CAUGHLEY 1974, CONROY et al. 1988), ground-based surveys such as the present one (see FRANCE in press; FRANCE & SHARP in press) are recognized to be the most accurate means of identifying and enumerating species. Limitations of accuracy and precision in aerial surveys can be especially severe for areas of high abundance in the High Arctic (McLAREN 1982).

In the present study we document the avifaunal communities observed at four discrete locations on Ellesmere Island during the recent ski-traverse by the Arctic Light Expedition (FRANCE & SHARP in press). We then compare our findings with those obtained from previous ground-based studies, in order to generate, for the first time, a ranking of relative abundance for the most ubiquitous avian species inhabiting Ellesmere Island oases.

Locations (Fig. 1) and dates of inventory for the oases surveyed during the Arctic Light Expedition are: Flagler Bay Polynya: 79° 17' N, 75° 55' W, May 29-30; Makinson Inlet Head: 77° 40' N, 81° 50' W, June 15-16; Makinson Polynya: 77° 31' N, 81° 40' W, June 17-18 (cf. SADLER 1974); and the North Water near King Edward Point: 76° 08' N, 81° 05' W, June 29-30. These are the first biological observations from the Makinson Polynya, and the first putative identification of a nearby coastal oasis at the head of the same inlet. Locations of the previously visited oases (Fig. 1) are: Lake Hazen: 81° 50' N, 71° 25' W (SAVILE & OLIVER 1964, NETTLESHIP & MAHR 1973, GOULD 1988); Princess Marie Bay: 79° 25' N, 75° 45' W (WILLIAMS 1980); Flagler Bay Polynya: see coordinates above (SCHLEDERMAN 1980); and Alexandra Fiord: 78° 53' N, 75° 55' W (FREEDMAN & SVOBODA 1982). All were inventoried during June-July.

Seven, 16, 12 and 9 species were respectfully observed in the Flagler Bay Polynya, coastal flats at the head of Makinson Inlet, the Makinson Polynya, and the North Water near King Edward Point (Tab. 1). In total, 1266

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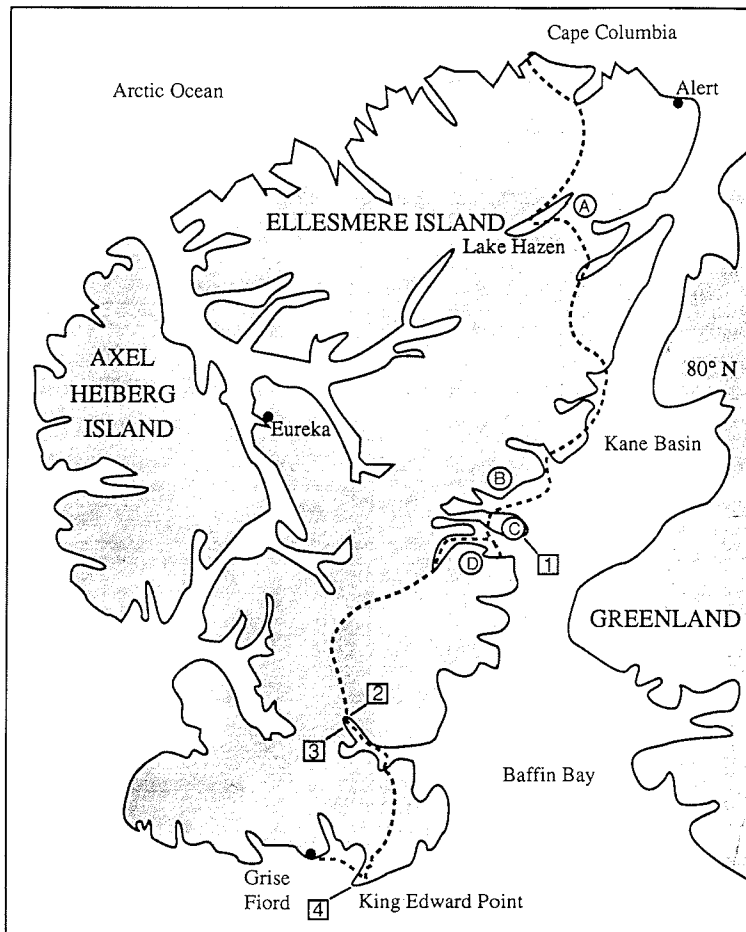


Fig. 1: Expedition route (dashed line) and location of oases on Ellesmere Island. Letters indicate previously visited oases: A = Lake Hazen, B = Princess Marie Bay, C = Flagler Bay Polynya, and D = Alexandra Fiord. Numerals denote oases surveyed in 1990 during the Arctic Light Expedition: 1 = Flagler Bay Polynya, 2 = Makinson Inlet Head, 3 = Makinson Polynya, and 4 = the North Water.

Abb. 1: Expeditionsroute (punktierter Linie) und Lage der Oasen auf Ellesmere Island. Buchstaben A-D bezeichnen früher besuchte Oasen; A = Lake Hazen, B = Princess Marie Bay, C = Flagler Bay Polynya, D = Alexandra Fiord. Ziffern bezeichnen die während der Arctic Light Expedition 1990 besuchten Oasen; 1 = Flagler Bay Polynya, 2 = Makinson Inlet Head, 3 = Makinson Polynya, 4 = North Water.

birds of 23 species were identified and categorized as being „Very Abundant“, „Abundant“, „Common“, „Rare“ and „Present“ based on numerical divisions of 150, 75, 30, 10 and one.

By synthesising these data with those obtained previously for other biologically productive regions on Ellesmere Island (Tab. 1), we established the rank ordering of overall relative abundance of the 10 most ubiquitous and dominant species for (a) polynyas: Black Guillemots > Thick-billed Murres > Common Eiders > Arctic Terns > Oldsquaws > King Eiders > Glaucous Gulls > Kittiwakes > Ruddy Turnstones > Red-throated Loons; and for (b) coastal and thermal oases: Common Eiders > Black Guillemots > Glaucous Gulls > Snow Buntings > Baird's Sandpipers > Rock Ptarmigan > Snow Geese > Oldsquaws > Red Knots > King Eiders.

This ranking information can be used to correct some previous misconceptions made about avian diversity and relative abundance obtained from the more commonly undertaken aerial surveys; for example, the belief of

	HAZEN OASIS (1)	PRINCESS MARIE BAY (2)	FLAGLER POLYNYA (3)
VA	—	Common Eider	—
A	—	Black Guillemot	Common Eider
C	—	Glaucous Gull Red Knot Baird's Sandpiper Rock Ptarmigan	—
R	—	Snow Goose  Oldsquaw	Ruddy Turnstone
P	Snow Bunting (9) Northern Redpoll Long-tailed Jaeger Arctic Tern Rock Ptarmigan Oldsquaw Snow Goose	Red-throated Loon Brent Goose King Eider Gyr Falcon Ringed Plover (10) Golden Plover Sanderling (10) Purple Sandpiper (10) Ruddy Turnstone Long-tailed Jaeger Ivory Gull Arctic Tern Dovkie (10) Snowy Owl Northern Raven Lapland Longspur (10)	Snow Bunting Glaucous Gull Northern Raven Ivory Gull King Eider
	FLAGLER POLYNYA (4)	ALEXANDRA FIORD (5)	MAKINSON HEAD (6)
VA	Common Eider Oldsquaw Black Guillemot	—	—
A	King Eider	—	—
C	Glaucous Gull Arctic Tern	Common Eider („R“) Glaucous Gull („R“)	Snow Bunting
R	Dovekie	Snow Bunting (B)	Glaucous Gull Snow Goose
P	Long-tailed Jaeger Snow Bunting Thick-billed Murre	Northern Redpoll (B) Baird's Sandpiper (B) Arctic Tern (B) Lapland Longspur (B) Rock Ptarmigan (B) Oldsquaw (B) Snow Goose (B) Parasitic Jaeger (B) Red-throated Loon King Eider Gyr Falcon	Oldsquaw Baird's Sandpiper King Eider Brent Goose Ruddy Turnstone Common Eider Rock Ptarmigan Ivory Gull Snowy Owl Long-tailed Jaeger Parasitic Jaeger

		Ringed Plover(10)	Ruddy Turnstone
		Ruddy Turnstone	Rough-legged Hawk
		Purple Sandpiper (10)	
		Long-tailed Jaeger	
		Thayer's Gull	
		Ivory Gull	
		Snow Owl	
		Horned Lark (10)	
		Northern Raven	
	MAKINSON POLYNYA (7)	NORTH WATER (8)	
VA	Arctic Tern	Thick-billed Murre	
		Black Guillemot	
A	—	—	
C	Oldsquaw	Kittiwake	
	King Eider	Glaucous Gull	
	Common Eider	Common Eider	
R	Snow Bunting	Brent Goose	
	Red-throated Loon	Snow Bunting	
P	Red Knot	Ivory Gull	
	Glaucous Gull	Gyr Falcon	
	Rock Ptarmigan		
	Northern Raven		
	Parasitic Jaeger		
	Ruddy Turnstone		

Tab. 1: Avian inventory for seven oases on Ellesmere Island ranked: VA = very abundant, A = abundant, C = common, R = rare, P = present. (1) SAVILE & OLIVER 1964, NETTLESHIP & MAHR 1973, GOULD 1988; (2) WILLIAMS 1980; (3) This study; (4) SCHLEDERMAN 1980; (5) FREEDMAN & SVOBODA 1982; „R“ = „regular“, B = breeding confirmed, other species present but no evidence of breeding; (6), (7), (8) This study; (9) Species identifications in Table 2; (10) Species not found during the Arctic Light Expedition: Ringed Plover (*Charadrius hiaticula*), Purple Sandpiper (*Calidris maritima*), Horned Lark (*Eremophila alpestris*), Greater Golden Plover (*Pluvialis apricaria*), Sanderling (*Calidris alba*).

Tab. 1: Vogel-Zählungen in sieben Oasen auf Ellesmere Island. VA = sehr häufig, A = häufig, C = vorhanden, P = vereinzelt. (1) SAVILE & OLIVER 1964, NETTLESHIP & MAHR 1973, GOULD 1988; (2) WILLIAMS 1980; (3) Diese Arbeit; (4) SCHLEDERMAN 1980; (5) FREEDMAN & SVOBODA 1982; B = sicher brütend, andere Arten vorhanden aber ohne Brutnachweis; (6), (7), (8) diese Arbeit; (9) Artenverteilung in Tabelle 2; (10) Arten während der Arctic Light Expedition nicht festgestellt: *Charadrius hiaticula*, *Calidris maritima*, *Eremophila alpestris*, *Pluvialis apricaria*, *Calidris alba*.

McLAREN & McLAREN (1982) that „in the High Arctic common eiders are considerably less abundant than king eiders“.

The present results can also be placed in broader context in relation to the total richness and abundance of all birds observed during the 96 day, 1300 km crossing of Ellesmere Island (Tab. 2), possibly the longest ground survey of wildlife undertaken in the High Arctic. Here, the importance of the four visited oases can be clearly seen, in that over half of all birds observed, and almost all species that were identified, occurred within these few very small regions (which in fact comprise less than 3 to 8% of the total expedition distance and observation time). Continued recognition and documentation of such „centres of organization“ (*sensu* STEEDMAN & REGIER 1987) or „nodes of diversity“ (*sensu* NOSS & HARRIS 1986) are sorely needed in an age of increasing development pressures within the High Arctic. Because polynyas and terrestrial oases are so biologically (FRANCE & SHARP in press, FRANCE in press) and historically (SCHLEDERMAN 1980; P. Sutherland, National Museum of Canada, pers. comm.) important, their candidacy as World Heritage Sites or National Parks should be seriously considered.

<i>Larus hyperboreus</i>	Glaucous Gull	386
<i>Pagophila eburnea</i>	Ivory Gull	355
<i>Somateria mollissima</i>	Common Eider	228
<i>Cephus grylle ultimus</i>	Black Guillemot	220
<i>Sterna paradisaea</i>	Arctic Tern	200
<i>Plectrophenax n. nivalis</i>	Snow Bunting	191
<i>Uria l. lomvia</i>	Thick-billed Murre	170
<i>Clangula hyemalis</i>	Oldsquaw	80
<i>Somateria spectabilis</i>	King Eider	73
<i>Rissa t. tridactyla</i>	Black-legged Kittiwake	60
<i>Lagopus mutus rupestris</i>	Rock Ptarmigan	42
<i>Branta bernicla</i>	Brant Goose	34
<i>Arenaria i. interpres</i>	Ruddy Turnstone	30
<i>Chen hyperborea</i>	Snow Goose	29
<i>Calidris c. canutus</i>	Red Knot	24
<i>Corvus corax principalis</i>	Common Raven	17
<i>Erolia bairdii</i>	Baird's Sandpiper	13
<i>Gavia stellata</i>	Red-throated Loon	12
<i>Charadrius h. hiaticula</i>	Common Ringed Plover	12
<i>Stercorarius parasiticus</i>	Parasitic Jaeger	9
<i>Larus thayeri</i>	Thayer's Gull	9
<i>Falco rusticolus canicans</i>	Gyrfalcon	4
<i>Pluvialis squatarola</i>	Black-billed Plover	4
<i>Nyctea scandiaca</i>	Snowy Owl	3
<i>Stercorarius longicaudus</i>	Long-tailed Jaeger	1
<i>Phalaropus fulicaria</i>	Red Phalarope	1
<i>Buteo lagopus s. johannis</i>	Rough-legged Hawk	1

Tab. 2: Species identification and total number of birds observed for both oases and non-oases regions during the 96 day (March - July), 1300 km Arctic Light Trans-Ellesmere Island Expedition (see Fig. 1 for route).

Tab. 2: Artenverteilung und Gesamtzahl der beobachteten Vögel in den Oasen und während der 96 Tage (März - Juli) über die Gesamtdistanz von 1300 km der Arctic Light Trans-Ellesmere Expedition (vgl. Abb. 1).

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