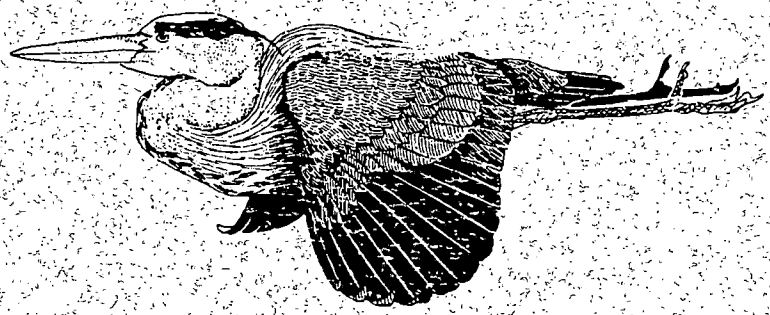
AVIFAUNA OF THE ELLESMERE ISLAND NATIONAL PARK RESERVE

R.I.G. MORRISON



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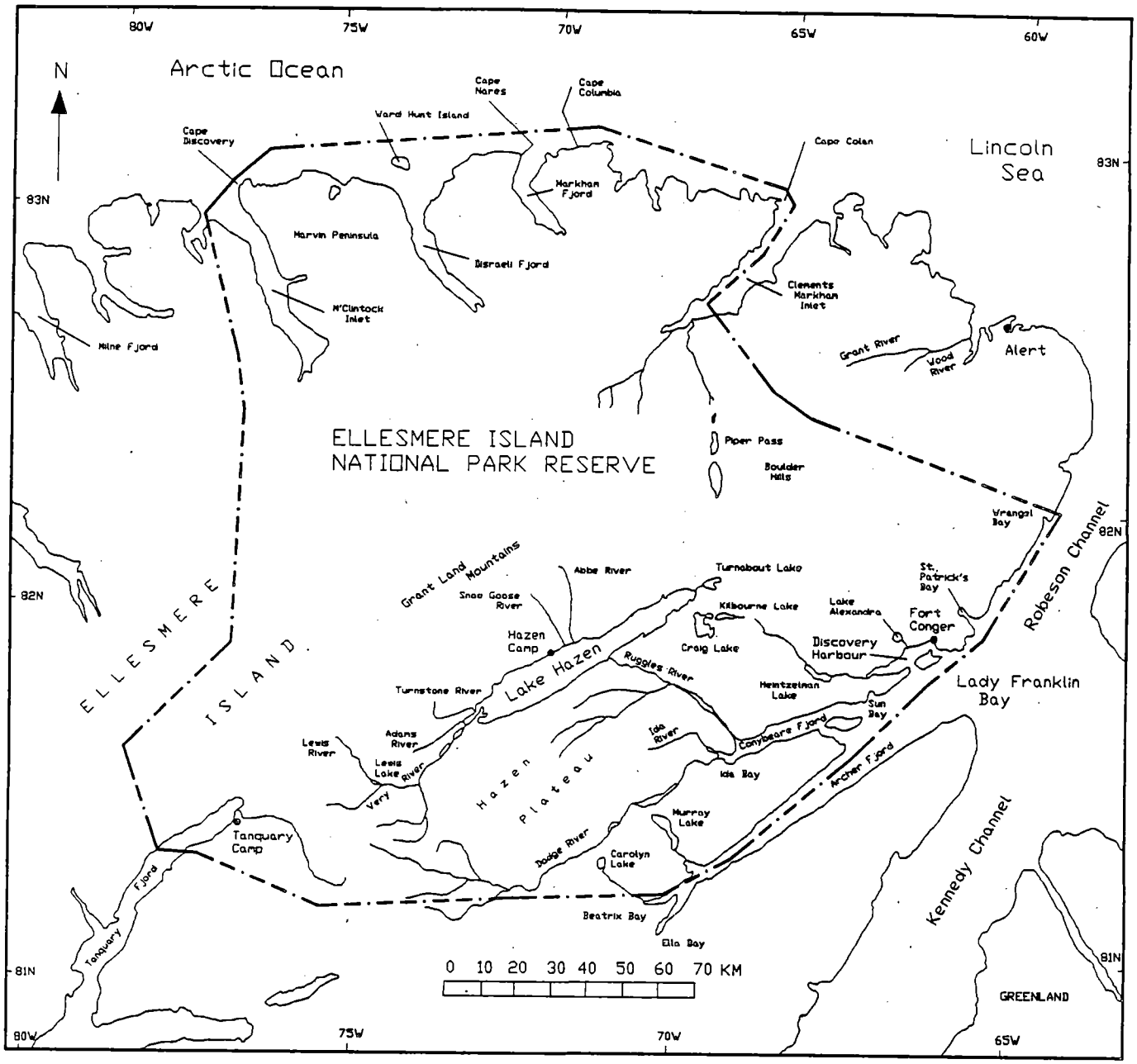

Frontispiece. Map of the Ellesmere Island National Park Reserve and northeastern Ellesmere Island.

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AVIFAUNA OF THE ELLESMERE ISLAND NATIONAL PARK RESERVE

Abstract

The Ellesmere Island National Park Reserve (EINPR) contains some of the most northerly land in the world, including the most northerly point of land in Canada. This report describes the occurrence and status of birds in the Ellesmere Island National Park Reserve and provides an overview of published bird observations from Ellesmere Island. Up to 1991, 46 species of birds had been reported to occur on Ellesmere Island, of which approximately 28 were regular breeders: in the EINPR, some 34 species had been recorded of which approximately 21 breed regularly. Birds breeding on northern Ellesmere Island disperse to many parts of the world. Although species diversity and numbers are generally low, the avifauna is of considerable interest genetically and ecologically in containing the most northerly components of many species populations adapted to breeding successfully in an extreme high arctic environment: it may also contain internationally significant portions of some populations of shorebirds migrating to European wintering grounds.

AVIFAUNE DE LA RÉSERVE DU PARC NATIONAL DE L'Île-D'ELLESMERE

Résumé

La réserve du parc national de l'île-d'Ellesmere contient certaines des terres les plus nordiques du monde, notamment la pointe de terre la plus au nord au Canada. Ce rapport décrit la présence et le statut des oiseaux dans la réserve du parc national de l'île-d'Ellesmere et passe en revue les mentions d'espèces d'oiseaux publiées pour l'île d'Ellesmere. Jusqu'en 1991, 46 espèces d'oiseaux ont été rapportées sur l'île, parmi lesquelles on retrouve environ 28 nicheurs réguliers. Dans la réserve elle-même, 34 espèces ont été relevées, desquelles environ 21 nichent régulièrement. Les oiseaux qui nichent dans le nord de l'île d'Ellesmere migrent ensuite vers plusieurs parties du monde. Quoique la diversité en espèces et les nombres d'oiseaux soient généralement faibles, cette avifaune présente un intérêt considérable autant au plan de la génétique que de l'écologie car elle comprend les composantes les plus nordiques des populations de plusieurs espèces. Ces nicheurs présentent des adaptations particulières nécessaires au succès reproducteur dans l'environnement extrême du haut arctique. Cette avifaune peut également contenir une portion significative internationalement de populations d'oiseaux de rivage qui migrent vers des aires d'hivernage européennes.

AVIFAUNA OF THE ELLESMERE ISLAND NATIONAL PARK RESERVE

R.I.G. MORRISON

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AVIFAUNA OF THE ELLESMERE ISLAND NATIONAL PARK RESERVE

R.I.G. MORRISON[1]

Introduction

The avifauna of the Ellesmere Island National Park Reserve (EINPR) is of special interest for a variety of reasons, relating mostly to the extreme northerly location of the area. The Reserve extends to the borders of the Arctic Ocean and contains some of the most northerly land in the world, including the most northerly point of land in Canada at Cape Columbia (83°07'N). While much of northern Ellesmere Island consists of mountains, ice-fields and polar desert, the relatively benign climate produced by the thermal oasis running through Lake Hazen has resulted in areas of habitat of considerable importance to a variety of wildlife, including birds. Although the number of species of birds breeding regularly (about 28) on Ellesmere Island is not large, those species that can survive and breed successfully so far north are of considerable interest because of the adaptations that enable them to do so.

This report provides a full account of the occurrence of those species that have been reported from Ellesmere Island, with particular reference to the Ellesmere Island National Park Reserve and northeastern Ellesmere Island. It was originally written as part of the Resource Description Analysis produced for the EINPR by Parks Canada, and draws extensively on material assembled during a period of study leave at the Scott Polar Research Institute, Cambridge. In addition to the species accounts, a brief history is provided of ornithological investigations on Ellesmere Island, and some comments made on the significance of the avifauna.

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A Brief History of Ornithological Investigations on Ellesmere Island, with Particular Reference to the Ellesmere Island National Park Reserve and Northeastern Ellesmere Island

Ornithological work on Ellesmere Island may be roughly divided into three phases. The first consists of the investigations carried out by the early classic exploratory expeditions of the late nineteenth and early twentieth centuries. Little else was done until the late 1940s and early 1950s, when the development of air travel and establishment of weather stations enabled further biological and geological investigations to be undertaken in various parts of the island. The construction of weather stations at Eureka in 1947 and Alert in 1949, for instance, provided bases for the work of Parmelee and MacDonald on the Fosheim Peninsula in 1955 and of MacDonald at Alert in 1951. Studies carried out at Hazen Camp in the late 1950s and early 1960s provided the first multi-year studies of the avifauna at an interior site and led to the development of work on particular species. With the general outline of the Ellesmere Island avifauna by then reasonably well established, more recent work has fallen into a variety of complementary categories, including expeditions to previously unexplored areas to fill in gaps in knowledge, avifaunal work conducted as part of wider ecological investigations, and research focussed on particular species or groups of species.

It should be emphasized that for both the Ellesmere Island National Park Reserve and for Ellesmere Island itself, current distributional knowledge is based on a series of studies at widely separated points, and that enormous tracts of land remain unexplored.

The early exploratory expeditions of necessity reached Ellesmere Island by sea, making their way north via the navigable waters off the west coast of Greenland to the "North Water", and thence northwards through the channel separating Greenland and Ellesmere Island - Smith Sound, the Kane Basin and the Robeson Channel. The Nares Arctic Expedition (Nares 1878, Moss 1878) visited the north coast of Ellesmere Island in 1875-76, the party wintering at Floeberg Beach in their flagship, HMS Alert, after which the present nearby military/weather station is named. The expedition ornithologist, Capt. H.W. Feilden, ranged westwards along the northern coast about as far as Cape Joseph Henry, and also provided information from areas on the east coast of the island gathered during the associated voyages. Feilden's observations were published in the form of avifaunal lists and an account of his travels (Feilden 1877, 1878, 1878a).

The United States Expedition to Lady Franklin Bay from 1882-1884 was based at Fort Conger, and although explorations were made of the interior of "Grinnell Land" as far west as Greely Fjord, most of the ornithological observations refer to work on the northeast coast in the vicinity of Fort Conger, but ranging north to the Alert area and southwards to the east-central coast during Greely's retreat. Greely, though not primarily an ornitholgist himself, published useful lists of the avifaunal observations (Greely 1886, 1888).

The Second Fram Expedition of 1898-1902 (the Norwegian Polar Expedition), led by Otto Sverdrup, was based near Cape Sabine on the east coast of Ellesmere Island during its first winter, and near the western end of the south coast during subsequent winters, and a general account of the bird life was given by Bay (1904), while Schaaning (1933) summarised the specimens collected and provided bird notes extracted from Sverdrup's diary. Miscellaneous observations on birds appear in Sverdrup's account of the expedition (Sverdrup 1904).

D.B. MacMillan's travels took him to the north coast of Ellesmere Island and to the west coast of the island during the Crocker Land Expedition of 1913-17, and he published two very similar bird lists containing relevant observations (MacMillan 1918, 1927).

Most early parties visiting Ellesmere Island travelled by dog sled before the spring thaw, including the Crocker Land Expedition, the Danish Thule-Ellesmere Expedition of 1939-41 and various R.C.M.P. patrols, so that few birds were seen or recorded. The birds of the west coast were therefore practically unknown before the establishment of the weather station at Eureka in 1947. This station served as the base for the extensive investigations of Parmelee and MacDonald in 1955, who spent the period 19 April to 27 September ranging widely over the Fosheim Peninsula, as well as making brief visits to the east coast of Axel Heiberg Island and to the Otto Fjord region along the Ellesmere coast of Nansen Sound. Parmelee and MacDonald's subsequent monograph (1960) brought together their own work and that of other investigators working in the general area of the Fosheim Peninsula. These included observations made by Duvall and Handley (1948) during brief visits to Slidre Fjord in August of 1947 and 1948, Hatfield's observations at Eureka made in 1948 and 1949, Tener's observations on wildlife made between 19 April and 24 August in 1951 (Tener unpublished manuscript, and see Godfrey (1953) for a discussion of the specimens), Bruggemann's (1953, 1954) notes on birds observed in 1953 and 1954, and Troelsen's (1952) reports from Canyon Fjord in 1952.

Stewart MacDonald carried out extensive investigations of birds and mammals while based at Alert from 14 April to 30 September 1951 (MacDonald 1953, and see Godfrey 1953).

Other material from Ellesmere Island then available included a few records of birds from Craig Harbour made during resupply voyages in August 1938 and 1939 by Shortt and Peters (1942), as well as information from wildlife surveys carried out by John Tener in the Queen Elizabeth Islands, including Ellesmere Island, in 1961; his report (Tener 1963), while concentrating on mammals, included a number of observations on the avifauna.

Up to 1955, therefore, the northeast corner of the island in the Alert/Fort Conger region and the west-central coast/Fosheim Peninsula area had received fairly extensive coverage, and a rather general and not very detailed account of bird life on the south coast had appeared, but for much of the island, very little information was as yet available.

The establishment of a research camp at Lake Hazen as part of the International Geophysical Year in 1958 led to a variety of ornithological investigations in the northern interior. General avifaunal accounts for the area were published by Savile and Oliver (1964) and Nettleship and Maher (1973) (and see Maher and Nettleship 1968). Studies on specific groups of birds included research on shorebirds, especially Red Knots and Ruddy Turnstones (Nettleship 1967, 1968, 1973, 1974), and jaegers (Maher 1970).

J.D. Heyland and H. Boyd carried out an extensive aerial reconnaissance of the eastern Canadian arctic, including many parts of Ellesmere Island, in July of 1968 and 1969 to investigate the distribution of Greater Snow Geese (Heyland 1968, Heyland and Boyd 1970).

On the north-central coast, the Royal Navy Ellesmere Island Expedition in 1972 produced avifaunal notes for the Milne Bay area, with some observations from Tanquary Fjord (Williams 1972).

George and Irene Waterston travelled extensively around the island carrying out aerial surveys and visiting various sites on the ground to carry out habitat surveys for the Canadian Wildlife Service between 28 June and 15 August 1972 (Waterston and Waterston 1972).

In 1973, R.D. Muir of the Canadian Wildlife Service carried out studies on a nesting pair of Gyr Falcons on the Fosheim Peninsula between 24 May and 21 August.

The Irish Arctic Expedition in 1981 reported bird observations from the northwest of the island from the Otto Fjord/Audhild Bay/Henson Bay region (Osbourne 1982). In 1988, a Joint Services Expedition spent three months in Borup Fjord studying the avifauna and shorebirds in particular (Hankinson 1990), extending previous observations from the area by Barsch and King (1981).

R.I.G. Morrison of the Canadian Wildlife Service, carried out work on shorebird migration at Alert during the latter part of May and early June in the years 1974-1976 and and 1986-1991, and visited Lake Hazen and Tanquary Fjord in May/June 1975 (Morrison 1975, 1976, 1977 and see Morrison 1984, Davidson and Morrison 1989, Morrison and Davidson 1990).

In recent years, several projects have extended knowledge of the previously little known east-central coast. The Joint Services Expedition to Princess Marie Bay in 1980 spent three months from late May to late August operating from a Base Camp to the north of the mouth of Copes Bay and ranged widely along the north shore of Princess Marie Bay (Williams 1982). Specific projects included work on shorebirds, seabird distribution, Snow Buntings and other avifauna, and the expedition resulted in the discovery of the one of the largest known colonies of Ivory Gulls in the Canadian Arctic. Follow-up work on shorebirds and the general avifauna was undertaken in 1981 by R.I.G. Morrison and B.F. Witts and in 1983 by B.F. Witts.

A multidisciplinary study of the High Arctic oasis ecosystem at Alexandra Fjord was started under the direction of J. Svoboda of the University of Toronto in 1980 and the results of the first two years of ornithological observations were published by Freedman and Svoboda (1982). H. Ouellet, of the National Museum of Natural Sciences in Ottawa, investigated bird life in the Flagler Bay polynya area and other parts of the east-central coast in 1979, and his observations were summarised in Schledermann (1980).

In the southeast, various aerial survey operations have considerably extended and clarified our knowledge of seabirds. D.N. Nettleship carried out surveys of seabird colonies in the Canadian Arctic in the early 1970's and the results appeared with associated information on pelagic distribution gathered under the direction of R.G.B. Brown, also of the Canadian Wildlife Service, in the CWS Seabird Atlas in 1975 (Brown et al. 1975, see also Nettleship 1974a). Further information on the pelagic distribution of seabirds in spring and autumn around the important colonies on Coburg Island and off the ice edge and coast of southeast Ellesmere Island were carried out in the late 1970s and early 1980's as part of environmental impact/baseline studies (McLaren 1982, McLaren and Renaud 1982, Renaud and McLaren 1979, McLaren and McLaren 1982). Aerial surveys of polynyas during the late winter have provided an assessment of the extent to which such areas harbour wintering birds (Renaud and Bradstreet 1980).

Various geological investigations covering the ice-fields of southeastern Ellesmere Island (and eastern Devon Island (Frisch 1979, Frisch and Morgan 1983)) led to the discovery of a number of Ivory Gull colonies and work on the species on Ellesmere

Island has been developed by S.D. MacDonald of the National Museum of Natural Sciences, with the collaboration of Vernon Thomas of the University of Guelph.

Various Canadian Wildlife Service personnel have undertaken work on the avifauna, particularly Brant, Snow Geese and Gyr Falcons. Results from banding studies on Brant were published by Maltby Prevett et al. (1975) and results of various investigations brought together in a map series outlining the more important habitat and wildlife areas by the CWS in 1972 (CWS 1972).

These studies, while not all directly concerned with the Ellesmere Island National Park Reserve itself, provide important information concerning species ranges and for assessing the likelihood that certain species may be found in the Park Reserve.

THE AVIFAUNA OF THE ELLESMERE ISLAND NATIONAL PARK RESERVE

Geographical setting

The extreme northerly location of the Ellesmere Island National Park Reserve is by far the most important factor determining the nature of the avifauna found within its boundaries. The EINPR contains some of the most northerly land in the world, including the most northerly point of land in Canada near Cape Columbia (83°07'N) (only parts of the north coast of Greenland lie further north), as well as the largest lake (Lake Hazen) in the entire circumpolar region north of 76°N latitude. The area is a true polar desert, which is unique in many ways, including climatically, edaphically, geologically and biologically, owing to parts of it having remained unglaciated for many tens of thousands of years (England et al. 1981). Several climatic and geographic factors are important in affecting the avifauna of the area. The thermal oasis running from Tanquary Fjord through Lake Hazen has led to the development of a particularly rich plant fauna for such a northerly region, though the highly arid climate combined with topographical influences result in a restricted distribution of well vegetated habitats. Coastal areas in the northeast are affected by the cooling effects of persistent sea ice, which are particularly severe along the north coast (England et al. 1981).

The avifauna

The avifauna of Ellesmere Island, including the Ellesmere Island National Park Reserve, contains a rather limited number of species compared with localities further to the south. A summary list of the species found on Ellesmere Island is given in Appendix II, and the status of species observed and breeding on Ellesmere Island and in the EINPR is provided in Appendix III.

Forty-six species of birds have been reported from Ellesmere Island, of which only 28 species have been observed regularly (status Common, Regular or Uncommon). The remaining 18 species have occurred much less frequently (Rare, Accidental and Hypothetical) (Table 1).

Thirty-four species of birds have been recorded within the boundaries of the EINPR, with a further 5 species considered likely to occur or to have occurred in the reserve based on the existence of sightings in nearby areas or considerations of the range of the species. Of the 34 confirmed species, only 22 have been observed regularly (status Common or Uncommon), the remaining 12 species being seen infrequently (Rare, Accidental or

Hypothetical) (Table 1).

The lower totals of species occurring in and breeding (see below) in the EINPR compared with Ellesmere Island itself result from the EINPR lying well to the north of the usual ranges of some species and to the lack of regularly occurring open (sea) water, such as that found around the coasts of southeast and southern Ellesmere Island.

Breeding has been confirmed for 28 species of birds on Ellesmere Island (with a further 2 possible/likely species), compared to 21 species (with a further 3 possible/likely species) in the EINPR (Table 2). Of these, 24 species may be considered to breed regularly (status Common, Regular or Uncommon) on Ellesmere Island, and 19 (with one more possible species) in the EINPR (Tables 2, 3).

Within the EINPR itself, Lake Hazen has the highest number of confirmed breeding species (18). Fewer confirmed breeding records exist for areas in the northeastern part of Ellesmere Island, such as Fort Conger (10 species) and Alert (11 species), where few studies have occurred during the nesting season. When likely breeding species are included (based on sightings or range considerations), rather little difference exists between Lake Hazen (19 species overall), Fort Conger (19 species) and Alert (20 species) (Table 2). There are, however, some differences in the composition of the breeding avifauna, with Fort Conger (and Alert) having a slightly higher complement of marine associated birds (e.g., Black Guillemot, Brant) and Lake Hazen more passerines (see species accounts and Table 3). No information is available on breeding densities in the northeastern parts of Ellesmere Island, though densities seem to be lower in the poorly vegetated areas around Alert (RIGM pers. obs.). Numbers of species breeding on the north coast of Ellesmere Island do appear to be considerably lower (Table 2), reflecting the very barren terrain (with sparse, moss-dominated vegetation) and the lack of open (sea) water throughout the summer.

The avifauna of Ellesmere Island/EINPR is typical of a high arctic area, being dominated by three major groups of birds: shorebirds, waterfowl and seabirds. Passerines are poorly represented. Of the 19 (plus one possible) species breeding regularly within the EINPR, 5 are shorebirds, 5 are waterfowl (2 geese and 3 ducks) and 4 (plus one possible) are seabirds (1 jaeger, 1 gull, 1 tern, 1 loon and 1 (possible) auk). A similar situation occurs for breeding species found on Ellesmere Island itself, and for species which have been observed within the reserve and on the island (see Table 3).

The majority of species found on Ellesmere Island and in the EINPR are highly migratory. The Rock Ptarmigan is perhaps the only species likely to winter regularly on Ellesmere Island.

Species which may winter occasionally include the Black Guillemot, which might be found in polynyas remaining open during the winter, and the Common Raven, which might winter in the vicinity of a settlement (Grise Fjord), but neither would occur in winter in the EINPR, and nearly all species are thought to move south to some extent.

Species breeding in the EINPR migrate to many parts of the world. Arctic Terns migrate as far as Antarctica. Some species of shorebirds migrate to southern South America while others fly to the European seaboard. Long-tailed Jaegers move to wintering areas in the Atlantic off Africa. Brant migrate to European wintering quarters. Other species move south to winter in areas extending from the ice pack in Baffin Bay to marine and terrestrial habitats throughout North America.

Breeding schedules of the principal species of birds breeding in the EINPR/on Ellesmere Island are shown in Figure 1. Phenological requirements of long-distance migration and the circumscribed availability of suitable habitats, food and climate on Ellesmere Island itself impose strict time constraints on the breeding season for many birds in the EINPR. Many species arrive in late May or early June, as temperatures rise above freezing and snow melt starts in earnest, with egg-laying occurring in June, and hatching and perhaps fledging taking place in July. Many shorebirds depart by mid July, leaving the young to follow in late July or early August before the weather deteriorates and autumn storms occur. Some predators, such as the Snowy Owl and Gyr Falcon, which can capture resident mammals such as Arctic Hares, are able to arrive earlier. Some seabirds or ducks, such as the Arctic Tern and Common Eider, which may require open water for feeding or breeding, do not start nesting until somewhat later in June. Some waterfowl (e.g., Snow Goose, Brant, Oldsquaw) delay departure until after moult in late August or September, and seabirds such as the Glaucous Gull and Black Guillemot, which are able to use marine habitats, also depart as late as September.

All of the 24 species of birds which have bred or are likely to breed in the EINPR/northern Ellesmere Island are likely to be found in suitable habitats in coastal locations, and all but three in inland areas, the exceptions being Brant, Common Eider and Black Guillemot, which are associated with marine habitats (Table 4, Figure 2). Approximately half the species make use of water habitats, either freshwater or marine, during the breeding season, mostly for feeding, moulting or care of young. Again, about half the species are associated with one or more of the major terrestrial habitat classes, marshes (heavily vegetated graminoid areas associated with moisture), tundra (moderately vegetated areas) and barren (clay, sand, gravel etc.) areas. Within each major avifaunal group, some differences in use of habitat combinations occur. For instance, Common Ringed Plovers

use gravel delta areas, Red Knots and Turnstones nest on tundra but use marshes for feeding, Baird's Sandpipers nest mainly in barren areas, while Red Phalaropes are associated with marshes. Cliff ledges are used by Gyr Falcons and Glaucous Gulls, scree slopes provide nesting habitats for Snow Buntings and Hoary Redpolls, and Black Guillemots are found in bouldery areas near the sea.

Invertebrates, either terrestrial or marine, are the major food resource for over half the species of birds breeding in northern Ellesmere Island. Plants form the major food for geese and passerines and are an important component of the diet of some shorebirds. For instance, the Red Knot makes extensive use of vegetation early in the season after arrival on the breeding grounds before invetebrate material becomes readily available. Four species feed regularly on fish, though only the Red-throated Loon relies entirely on this resource. Five species are predators on vertebrates. They include the Snowy Owl, Gyr Falcon, Long-tailed Jaeger, Parasitic Jaeger and Glaucous Gull, which prey upon both mammals, especially lemmings, and birds, including adults, eggs and young. The Snowy Owl and Long-tailed Jaeger are thought to be principally dependent on lemmings for food, and both species may not breed in years when lemming populations are low. Jaegers may also prey more heavily on young shorebirds when lemming populations are low or intermediate. Arctic foxes are an important predator for many ground nesting birds occupying open habitats, and predation pressure may again be heavier during years when lemming populations are low. A simplified food web involving the major avifaunal groups breeding on northern Ellesmere Island is illustrated in Figure 3; note the wide range of groups utilized by the principal predators.

Availability and abundance of food influence the richness, distribution and breeding phenology of bird populations within the EINPR. Invertebrates do not generally become available until temperatures rise above freezing point in early June and snow melt is well under way, limiting the start of the breeding effort by many species. Shorebird breeding appears to be timed so that the hatching of young coincides with a peak in abundance of surface dwelling invertebrates (e.g., Nettleship 1973, 1974, Morrison and Witts unpublished results). Decreasing numbers of invertebrates as temperatures fall and the weather deteriorates in August may limit the time available for successful breeding by shorebirds. Species feeding on plant material, or in marine habitats, or by preying on other animals may be able to survive longer into the autumn before migration is necessary.

Moisture is the major factor affecting the distribution of vegetation and hence productive habitats capable of supporting birds and the food resources on which they depend. Within the EINPR, relatively well vegetated areas are found along the south-facing north shore of Lake Hazen in the vicinity of Hazen Camp,

where runoff streams and/or the topography of the landscape result in the accumulation of moisture. Many runoff streams dry up during the summer, though some areas may become wet again later in the season as the permafrost melts. Some notable wetlands occur between the Turnabout River and Piper Pass to the northeast of Lake Hazen, and support concentrations of loons (S. Edlund pers. comm.). Snow Geese breed regularly in habitats surrounding the lakes south of the east end of Lake Hazen and in some of the valleys to the southeast of the lake towards Conybeare Fjord and Discovery Harbour. The uplands of the Hazen Plateau are poorly vegetated and support relatively few birds, though some passerines and shorebirds breed in the better vegetated parts of the area (S. Edlund pers. comm.). Few birds are found in the poorly vegetated valleys of the north coast of Ellesmere Island. A more detailed assessment of the distribution of birds within the EINPR could be made when more detailed vegetation maps are available.

SPECIES ACCOUNTS

RED-THROATED LOON Gavia stellata

The Red-throated Loon breeds sparingly throughout much of Ellesmere Island as well as in the adjacent areas of northwest Greenland. It has been reported only in small numbers in most areas visited.

Red-throated Loons may be considered regular breeders in the EINPR, though numbers are low. At Lake Hazen, one pair nested in 1961 and two pairs in 1962 (Savile and Oliver 1964), 1965 and 1966 (Nettleship and Maher 1973). One bird was seen on a small lake east of Lake Hazen by Waterston and Waterston (1972) on 9 July 1972. The species was seen or heard daily at Hazen Camp from 15-20 June 1975 (Morrison, unpubl. data). In the Fort Conger area, Greely (1886, 1888) reported a pair at Dutch Island on 18 July 1883, and a specimen was collected at Cape Baird on 18 June 1883.

Recent observations (since 1988) indicate that the species occurs throughout the southern half of the Park Reserve at least; sightings have been reported from the Tanquary Camp area, both north and south sides as well as areas to the the northeast of Lake Hazen, Kilbourne Lake, Murray Lake and the Dodge River area, as well as around Fort Conger (Canadian Parks Service unpubl.

data). Loons were found to be very common in the well vegetated wetlands between the Turnabout River and Piper Pass (S. Edlund pers. comm).

On the north coast, no records currently exist within the boundaries of the EINPR. It was not recorded by Williams (1972) on the central north coast. MacMillan (1927), however, states that he found its nest and eggs on the northern shore of Grant Land, and in the northeast, MacDonald (1953) observed it regularly between 19 June and 22 August 1951 in the Alert area, where he found one nest containing two eggs.

Elsewhere on Ellesmere Island, the species also appears to be a regular, though not very numerous, breeder, with records from the south coast (Bay 1904, Schaaning 1933), the Fosheim Peninsula (Tener in Godfrey 1953, Bruggemann 1953, 1954, Parmelee and MacDonald 1960, D. Muir in Waterston and Waterston 1972), west-central (Thorsteinsson and Tozer 1957), northwestern (Osbourne 1982, Hankinson 1990), east-central (Morrison and Williams unpubl. data, Freedman and Svoboda 1982, Ouellet in Schledermann 1980) and southeastern (Morrison unpubl. data) Ellesmere Island. On the Fosheim Peninsula, records at Eastwind Lake indicated reuse of nests from year to year, as may occur on Southampton Island (Sutton 1932). Although nesting occurred at various sites on the peninsula, the species was 'conspicuously absent' at many areas of marshy ponds (Parmelee and MacDonald 1960).

Shallow, grassy tundra ponds or lakes appear to be the preferred nesting habitat of the species (Salomonsen 1950-51, Parmelee and MacDonald 1960, Davis 1972, Johnson and Herter 1989). Red-throated Loons generally favour small tundra ponds (less than 50m x 100m) (Davis 1972), possibly because ice clears from smaller ponds earlier than from larger ones. Nests are usually built up from mud and vegetation along the pond edge or on a marshy island. Clutch size is generally two eggs, sometimes one, and eggs are laid two days apart. Both adults incubate the eggs, which takes 24-26 days to hatching. Usually the first-laid egg hatches first and that chick has a better chance of survival than the second (Davis 1972, Johnson and Herter 1989).

Egg-laying in the western Arctic generally occurs around the last week of June and hatching begins from the third week of July into early August (Johnson and Herter 1969). Young hatching later than this are unlikely to fledge before ponds become covered with ice (MacDonald 1954, Savile and Oliver 1964, Johnson and Herter 1989).

Arrival dates on Ellesmere Island and in northwest Greenland are generally somewhat before the middle of June (Parmelee and MacDonald 1960, Salomonsen 1950-51). Early dates recorded in EINPR include 10 June 1966 (Nettleship and Maher 1973) and 9 June

1986 and 11 June 1990 (Morrison unpubl. data) at Lake Hazen. The species was first seen on 18 June 1883 at Cape Baird opposite Fort Conger (Greely 1886, 1888). Arrival was recorded on the Fosheim Peninsula between 11 and 19 June in the years 1951-1955 (Godfrey 1953, Parmelee and MacDonald 1960), on 13 June 1988 at Borup Fjord (Hankinson 1990) and on 19 June 1951 at Alert (MacDonald 1953).

Open patches of water may be especially important during the arrival period in providing habitats where the birds may feed. At Lake Hazen, early season records have occurred at the persistently open patch of water that occurs at the mouth of the Ruggles River. On the northeast coast, small polynyas have developed by early June around the bases of large capes, such as Cape Frederick VII, Distant Cape and south of Cape Defosse, and may provide feeding habitat for arriving birds. Birds breeding near the coast may use coastal waters for feeding, while inland breeders must rely on lakes or ponds large enough to support a suitable population of fish.

Moult is thought to take place on the wintering grounds (Palmer 1962).

Departure appears to occur during the first half of September (Parmelee and MacDonald 1960). The latest sighting recorded at Lake Hazen was 10 August 1962 (Savile and Oliver 1964). Other dates of last sighting include 10 September 1955 on the Fosheim Peninsula (Parmelee and MacDonald 1960), and 2 September 1875 (Feilden 1877, 1878) and 22 August 1951 (MacDonald 1953) in the Alert area.

Banding has shown that Red-throated Loons from west Greenland go to Europe for the winter, a surprising fact in view of the shorter distance to the eastern seaboard of North America, where the species is a common winter resident (Salomonsen 1967, 1981). It is not known whether birds from Ellesmere Island also go to Europe or join the other Canadian populations off eastern North America.

NORTHERN FULMAR Fulmarus glacialis

The Northern Fulmar may be an infrequent visitor to the northeastern coastline of Ellesmere Island, though no records currently exist within the boundaries of the EINPR. Feilden (1877, 1878) reported seeing a bird at 82°30'N on 26 June 1876, and Lt. Egerton found a dead fulmar a few days later near the same place. MacMillan (1918, 1927) reported seeing "several", also at 82°30'N, in July 1909. A freshly dead apparently starved

female Northern Fulmar with brood patches was found in Ella Bay, off the southern end of Archer Fjord just outside the boundary of the Park Reserve, on 30 June 1988 (Canadian Parks Service unpubl. data). Neither MacDonald (1953), who worked in the Alert area, or Greely (1886, 1888), at Fort Conger, observed the species, and it was not recorded on the east-central coast of Ellesmere Island at Princess Marie Bay (Burton in Williams 1982), Alexandra Fjord (Freedman and Svoboda 1982) or the Flagler Bay polynya (Ouellet in Schledermann 1980). Feilden (1877, 1878) reported individual birds following his ship from the North Water until entering the ice pack off Cape Sabine, and the likelihood of appearance on the northeastern coast may be related to the availability of open water along the east coast of Ellesmere Island. Fulmars are abundant off the south and southeast coasts of Ellesmere Island during spring, summer and autumn (Bay 1904, Shortt and Peters 1942, McLaren 1982, McLaren and Renaud 1979, 1982), and large breeding colonies are found on Devon Island, Coburg Island (Brown et al. 1975) and possibly on the mainland near Grise Fjord (Waterston and Waterston 1972). Fulmars have not been observed on the west coast of Ellesmere Island (Parmelee and MacDonald 1960, Waterston and Waterston 1972), nor in the northwest (Osbourne 1982), nor central parts of the north coast (Williams 1972).

In northwest Greenland, the Northern Fulmar breeds in large colonies, the most northerly one being on Saunders Island (Salomonsen 1950-51, 1967, 1981, Brown et al. 1975). Northerly records of wandering birds extend to Hall Land, where it occurs rarely (Bessels 1879).

SNOW GOOSE Anser caerulescens

The Greater Snow Goose has been recorded as breeding in nearly all areas of Ellesmere Island. Despite its widespread occurrence, nesting does not occur every year in a particular place, and reports from a given locality consistently indicate that breeding may take place in some years but not or only partially in others. In 1961, for instance, Tener (1963) observed only 6 juveniles with 2320 adult Snow Geese counted during aerial surveys of the island. Breeding generally occurs in widely scattered small numbers rather than in colonies.

Lake Hazen is an important breeding and moulting area for Snow Geese on Ellesmere Island. Twelve pairs with goslings and 220 moulting birds were been seen in the Lake Hazen area during surveys by H. Boyd and D. Heyland in 1969 (Heyland and Boyd 1970, Heyland in CWS 1972), and it is likely that several hundred may nest regularly in the area. Waterston and Waterston (1972)

reported 21 pairs at nests on the large ponds at the east end of Lake Hazen on 9 July 1972: a total of 36 birds was also seen on a flight up the Dodge River from Fort Conger to Tanquary Fjord on the same day. At the west end of Lake Hazen, up to 12 Snow Geese were reported in the area between the Adams and Turnstone rivers as early as 9 June 1988 (Capt. Carrier, pers comm.). Ekblaw Lake, to the northeast of Tanquary Fjord, is believed to be frequented by Snow Geese (Nassichuk in CWS 1972). Snow Geese breed in the area northeast of Lake Hazen running towards Alert and extending northwards to include the James Ross River and the Feilden Peninsula (Muir in CWS 1972). MacDonald (1953) reported that Snow Geese were uncommon in the vicinity of Alert, small numbers breeding around the head of Hilgard Bay, with records between 13 June and 10 August 1951.

Small numbers of Snow Geese breed in the vicinity of Fort Conger and in the valley near Mount Beaufort some 25 km further north along the coast (Muir in CWS 1972). Greely (1886, 1888) reported a pair near Fort Conger on 12 June 1882, and another pair at Sun Bay (near Fort Conger) on 13 June 1882.

Recent observations (since 1988) have confirmed the regular occurrence of the species throughout the Lake Hazen/Fort Conger areas (Canadian Parks Service unpubl. data). Small numbers have been observed on both north and south shores of Lake Hazen, in many of the river valleys and lakes between Lake Hazen and Fort Conger/Conybeare Fjord (e.g., around Kilbourne Lake and Heintzelman Lake), and especially in the areas northeast of Lake Hazen around Turnabout Lake and towards the Piper Pass.

The species is not mentioned by Feilden (1877, 1878) or Williams (1972), and it seems unlikely that it would be found breeding on the central parts of the northern coast of Ellesmere Island within the EINPR.

Greater Snow Geese have been recorded breeding in most other parts of Ellesmere Island. The better vegetated valleys of the south and southwest coasts are heavily used for breeding and moulting (Sverdrup 1904, Heyland in CWS 1972). The species is abundant on the Fosheim Peninsula (Parmelee and MacDonald 1960, Waterston and Waterston 1972), which was estimated to support a population of well over 1000 birds in 1970 (Heyland in CWS 1972). Parmelee and MacDonald (1960) reviewed records in the area up to 1955, and drew attention to the highly variable breeding success observed in different years. Other important areas include the lower stretches of Tanquary Fjord and adjacent shoreline along Greely Fjord, and especially the area on the north shore of Greely Fjord around Borup Fjord. This area is approximately similar to the Fosheim Peninsula in its quality for Snow Geese: valleys in this area tend to be richer in vegetation than in the interior plateau towards Lake Hazen owing to a more favourable

microclimate (Inglis in CWS 1972). Scattered pairs of Snow Geese nest in east-central and southeastern Ellesmere Island (unpubl. obs., Freedman and Svoboda 1982, Ouellet in Schledermann 1980, Waterston and Waterston 1972).

The species also breeds in northwest Greenland, where Salomonsen (1950-51, 1967) reported it nesting at two locations. Heyland and Boyd (1970) reported totals of 27 pairs with goslings and 320 moulting birds in surveys of the coast between Inglefield Land and McCormick Bay in 1969, most of the birds occurring in the latter location.

Arrival on Ellesmere Island is generally in early June, with egg laying around mid June, hatching around mid July and departure in late August (Parmelee and MacDonald 1960). Arrival has been recorded as early as 31 May (1956) (Thorsteinsson and Tozer 1957). Non-breeders and subadults probably begin moult in early July well before breeders, which start in late July or early August. A similar schedule occurs in northwest Greenland (Salomonsen 1950-51) and at the major breeding colonies on Bylot Island further south. In the latter area, most birds arrive in the first week of June (Ellis 1956, Lemieux 1959), egg-laying occurs from the second to the last week of June, hatching during the second and third weeks of July, and most young have fledged by late August (Lemieux 1959, Hussell and Holroyd 1974). Adults and broods move inland after the hatch to feed, returning towards coastal areas in late August after the young have grown and the moult has been completed (Lemieux 1959). Adults moult before the young can fly, from mid July to late August (Lemieux 1959). Most birds have left the area by the first week of September (McLaren and Renaud 1979).

BRANT Branta bernicla

Brant breed throughout Ellesmere Island, although they appear to be more common in the coastal areas of the south and north than in the middle and interior parts of the island.

Brant are likely regular breeders in small to moderate numbers in the EINPR in coastal areas around Fort Conger. Greely (1886) described the species as comparatively numerous at Discovery Harbour (Fort Conger) in 1881-82, though more recent records are not available. Breeding does not appear to take place in the interior at Lake Hazen, and the species was not recorded there in 1958, 1961, 1962, 1965 or 1966 (Savile and Oliver 1964, Nettleship and Maher 1973).

Brant appear to be more common towards the northeast corner of Ellesmere Island. Feilden (1877) reported finding nests at 82°33'N in 1876 and MacMillan (1918, 1927) collected eggs at 82°30'N in 1909. Brant were seen in small numbers at Alert (82°30'N) by MacDonald (1953) in 1952 and Morrison (unpubl.) in 1974 and 1988, and are thought to breed in the area in some years (Harington in CWS 1972). On the north coast, Williams (1972) did not oberve Brant in the vicinity of Milne Fjord (82°29'N 81°W) in 1972, and it is not known if the species occurs on the north coast within the boundaries of the EINPR.

Elsewhere on Ellesmere Island, Brant have been recorded fairly frequently on the south and southwest coasts (Bay 1904, Davis et al. 1973, Heyland and Boyd 1970), though on the west-central coast the species appears to be rather uncommon (Parmelee and MacDonald 1960, Waterston and Waterston 1972). In the northwest, Brant have been recorded breeding in Henson Bay, Yelverton Bay, Audhild Bay and Emma Fjord (Osbourne 1982), as well as in Borup Fjord (Hankinson 1990). The species appears to be uncommon on the east-central coast (Burton in Williams 1982, Freedman and Svoboda 1982, Ouellet in Schledermann 1980).

The species also breeds in northwest Greenland (Salomonsen 1950-51, 1967, 1981).

Arrival dates are as early as late May on the south coast (Bay 1904) and around the first week of June in the northeast and northwest (Greely 1886, 1888, Osbourne 1982). Breeding takes place in June and non-breeders moult and are flightless during July (IAE 1982). Departure occurs in September (Salomonsen 1950-51).

Brant breeding in northeastern Ellesmere Island belong to the subspecies B. b. hrota (Parmelee and MacDonald 1960, Smith 1973). They most likely migrate to Europe for the winter, rather than to areas on the east coast of North America (see Salomonsen 1950-51, 1967, Heyland in CWS 1972, Maltby-Prevett et al. 1975, Boyd and Maltby 1979, H. Boyd pers. comm.).

NORTHERN PINTAIL Anas acuta

The Pintail has been reported on only one occasion from Ellesmere Island, and this involved the breeding attempt by a pair of birds at Lake Hazen in 1966 (Maher and Nettleship 1968), some 700 miles north of previously known breeding records for the species. The pair was observed frequently from 11-19 June 1966, after which the male disappeard. The female was seen not seen from 20 June until 10 July, and was then found with nine young

about 1-2 days old on 13 July 1966; she had moved the brood to another pond one mile distant by the next day. The female was seen once more on 23 July, but no young were observed and no evidence of their having survived was obtained. Maher and Nettleship 1968) suggested that Pintails might occur as a "sparse marginal breeding population far north of their presently known range" where suitable habitat occurs. The birds might also have come from the European Pintail population, considering that the two most common shorebirds at Lake Hazen, the Red Knot and Ruddy Turnstone, derive from European populations (see species accounts and Morrison 1984).

COMMON EIDER Somateria mollissima

The Common Eider may be a regular breeder in the EINPR in coastal areas around Fort Conger/Discovery Bay in the northeast of Ellesmere Island, though nesting is likely to be limited by the availability of open water. Greely (1886, 1888) reported that the species occurred in considerable numbers at Discovery Harbour, and it also breeds at similar latitudes (81°40'N) in Hall Land in northwest Greenland (Salomonsen 1950-51, 1967). To the north, Greely (1886, 1888) reported seeing a flock at 82°30'N (Dumbell Bay) late in the season on 5 September 1875 and MacMillan (1927) mentions it was seen repeatedly at Cape Sheridan (82°30'N). MacDonald (1953), however, did not record the species in the Alert area. Extensive sea-ice cover and lack of nesting islands indicate that the species is very unlikely to breed on the north coast within the EINPR boundaries, and no breeding records exist for this area, or for the northwestern or west-central coasts (Parmelee and MacDonald 1960, MacDonald 1953, Feilden 1877, 1878, Osbourne 1982, Williams 1972, Greely 1886, 1888, MacMillan 1918, 1927). In contrast, the species is a regular breeder and numerous on the east and south coasts of Ellesmere Island south of the EINPR (Burton in Williams 1982, Freedman and Svoboda 1982, Ouellet in Schledermann 1980, Schaaning 1933).

In the Coburg Island/southeast Ellesmere Island area, Common Eiders arrive about mid May (McLaren and McLaren 1982), though arrival along the eastern and northeastern coastlines does not occur until later in June when leads and meltwater pools become more extensive (see Burton in Williams 1982). Laying probably occurs in the latter part of June, with hatching from the latter part of July. Males and females remain together during egg laying and for a few days thereafter; males subsequently gather in flocks at favoured loafing areas (Cooch 1965). On the east-central coast, males appeared to move away from the shore by early August, when females predominated in flocks with young.

Males generally appeared to be in summer plumage, with only a few records of moulting birds in early August. Salomonsen (1950-51) describes drakes as attaining their eclipse plumage in late July and the first half of August in Greenland.

Most eiders appear to depart from northern Ellesmere Island and high arctic Greenland in September (Greely 1886, 1888, MacMillan 1918, 1927), although there are occasional records in October and November (Greely 1886, 1888, Bay 1904), and a few eiders may winter as far north as the Thule District if open water is available (Salomonsen 1950-51).

Common Eiders breeding on Ellesmere Island have been referred to the subspecies S. m. borealis (AOU 1983, Abraham and Finney 1986).

KING EIDER Somateria spectabilis

The King Eider appears to be a regular breeder in the EINPR. Small numbers of nests were recorded at Lake Hazen in most, but not all, years between 1958 and 1966 (Savile and Oliver 1964, Nettleship and Maher 1973). Greely (1886, 1888) reported the species at Fort Conger, though no definitive evidence of breeding was given. In the northeast, Feilden (1877, 1878) reported that several nests were found in the vicinity of Floeberg Beach, near Alert; MacDonald found the species quite common around Alert, though no specific evidence of breeding was obtained. Recent records (since 1988) in or near the EINPR have included sightings in Tanquary Fjord, near Hazen Camp, and in the Archer Fjord/Ella Bay area (Canadian Parks Service unpubl. data).

The King Eider has a more extensive range than the Common Eider on Ellesmere Island, also being reported as breeding on the Fosheim Peninsula (Parmelee and MacDonald 1960, Waterston and Waterston 1972); it is common on the east and south coasts (Bay 1904, Freedman and Svoboda 1982, Morrison and Williams unpubl., Ouellet in Schledermann 1980), though it has not been reported from the northwest (Osbourne 1982, Williams 1972) and is unlikely to occur as a breeding bird on the north coast owing to lack of open water.

The species breeds extensively in northwest Greenland, from the Thule District northwards around the north coast (Salomonsen 1950-51, 1967, Greely 1886, 1888, Gibson 1922).

King Eiders move north from the wintering grounds as the ice melts and shore leads open, and arrival dates reported from the east coast range from 26 May 1884 at Cape Sabine (Greely 1886),

17 June 1980 at Princess Marie Bay (Burton in Williams 1982), 11 June 1883 and 16 June 1884 at Discovery Harbour (Greely 1886) to 19 June 1951 at Alert (MacDonald 1953). Arrival dates at Lake Hazen are around mid June (18 June 1962, 19 June 1966, Savile and Oliver 1964, Nettleship and Maher 1973; present 15 June 1975, RIGM pers. obs.). The species differs from the Common Eider in that it normally breeds non-colonially and nests on the inland tundra. Egg-laying on Ellesmere Island and in northwest Greenland appears to occur from late June to mid July, with eggs hatching from late July onwards (Salomonsen 1950-51, Parmelee and MacDonald 1960, Savile and Oliver 1964, Feilden 1877, 1878, Lamothe 1973). Incubation takes 23 days (Palmer 1977). The males depart after the eggs have been laid (Salomonsen 1950-51) and often undertake a moult migration (see Johnson and Herter 1989, Palmer 1976). Females lead the young to the sea or may move between tundra lakes and ponds (Parmelee et al. 1967). Departure from northwest Greenland is generally in late August or early September (Salomonsen 1950-51). Males become uncommon on Ellesmere Island after early July (Godfrey 1953, Nettleship and Maher 1973, Parmelee and MacDonald 1960), and most birds probably leave by mid September, the latest recorded being 21 September 1854 at Cape Peary (Greely 1886). King Eiders from Ellesmere Island winter off west Greenland (Salomonsen 1967).

OLDSQUAW Clangula hyemalis

The Oldsquaw is a regular breeding bird in the EINPR, probably nesting throughout the area, with the possible exception of the central north coast. Nesting has been recorded regularly at Lake Hazen (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). Greely (1886, 1888) describes the species as not uncommon in the vicinity of Discovery Harbour (Fort Conger) and in the interior of Grinnell Land (northeastern Ellesmere Island). Feilden (1878), MacMillan (1927) and MacDonald (1953) all recorded nests in the area of Alert. Stewart and Hourston-Wright (1990) reported finding a specimen estimated to be 6500 years old in Clements Markham Inlet on the north-central coast.

Recent records (since 1988) have included sightings of the species in the Tanquary Fjord area, west of Lake Hazen, in the Murray Lake/Archer Fjord area, and near Fort Conger (Canadian Parks Service unpubl. data).

Oldsquaws have been reported as nesting in all other areas of Ellesmere Island (Parmelee and MacDonald 1960), except in the northwest, where they have been seen but evidence for breeding not established (Osbourne 1982). They are common nesting birds in northwest Greenland (Salomonsen 1950-51).

Arrival on Ellesmere Island occurs in early to mid June (Parmelee and MacDonald 1960), the early date of 28 May 1951 reported by MacDonald (1953) at Alert probably being exceptional. The species is found in open shore leads before dispersal to the breeding areas, which occurs during June. Ice conditions and weather/climate may be important in determining the number of birds in a given area from year to year (Salomonsen 1950-51). Egg-laying occurs in early to mid July, with the young hatching during the latter part of July and early August. The young may be taken to the coast or remain on the lakes: fledging generally occurs during late August, though flightless young have been observed as late as early September. Males gather on the coast from early August and moult earlier than females, which remain with the brood. Large coastal flocks may build up before departure (e.g. Parmelee and MacDonald 1960), which occurs during early to mid September.

WHITE-TAILED EAGLE Haliaeetus albicilla

The White-tailed (Gray Sea) Eagle is listed as of only hypothetical occurrence in Canada, with a small number of alleged sightings and breeding records on Baffin Island and in Labrador (Godfrey 1986). The species breeds in west Greenland, where a small population, estimated at between 50 and 100 pairs over the last 30 years, is restricted to the Low Arctic zone (Salomonsen 1950-51, 1967, 1981). Under the circumstances, its occurrence on Ellesmere Island would be exceptional.

The occurrence of the White-tailed Eagle on Ellesmere Island and in the EINPR should also be considered hypothetical. The only reports of the species are those of Greely (1876, 1878), who stated that it was seen several times on the shores of the Robeson Channel in 1882. A single bird was reported near Cape Beechey (about 81°55'N) on 4 April 1882 and identified by an Eskimo, who apparently knew the species well. The bird, evidently a straggler, was also seen near Fort Conger seven days later. A further sighting was listed on the Greenland side near Repulse Harbour (about 82°58'N) on 18 April 1882. Salomonsen (1950-51) commented that "these records, coming from non-ornithologists, are extremely dubious and have not been accepted in the American check-list": indeed, they are not even mentioned by Godfrey (1986).

PEREGRINE FALCON Falco peregrinus

The only records of the Peregrine Falcon on Ellesmere Island were made at Borup Fjord in 1988, when a pair was seen on 23 June and a female was seen attacking a Red Knot on 30 June (Burton 1990). Ellesmere Island is well north of the usual breeding range of the species, which extends northwards to approximately Lancaster Sound (Godfrey 1986).

GYR FALCON Falco rusticolus

The Gyr Falcon has been widely reported on Ellesmere Island (Parmelee and MacDonald 1960, Godfrey 1986, Waterston and Waterston 1972), and it probably breeds in scattered pairs throughout the EINPR. At Lake Hazen, white phase birds have been seen and are suspected of breeding in the highlands on the northwest side of the lake (Harington in CWS 1972). Nettleship and Maher (1973) reported sightings at Lake Hazen in 1965 and 1966 which they considered suggested breeding in the area, though no sightings of the species were obtained during earlier work in 1961 and 1962 (Savile and Oliver 1964). Gould (1988) reported two sightings in the Hazen Camp area in 1982. Recent records in the EINPR have included sightings of the species at the Very River and Ruggles River in 1988 and at the west end of Lake Hazen and at Tanquary Fjord in 1989 (Canadian Parks Service unpubl. data).

Greely (1886, 1888) reported a number of sightings of Gyr Falcons in the area of Fort Conger, and the species has also been observed northwards to Alert (MacMillan 1918, MacDonald 1953), where is was considered rather rare. The nearest known breeding record on the east coast appears to be at Cape Hayes (79°42'N), just north of Princess Marie Bay. It breeds commonly in northwest Greenland in the Thule District, becoming scarcer along the north coast (Salomonsen 1950-51, 1967).

Muir (1975) studied the breeding biology of a pair of Gyr Falcons nesting on the Fosheim Peninsula between late May and late August 1973. Incubation was underway when the study started on 24 May, and hatching of the four egg clutch took place between 25 June and 1 July. Three young fledged successfully on 9 August and were last seen flying strongly on 20 August 1973. Arctic hares made up the bulk (over 90%) of the diet, with shorebirds, mostly knots and turnstones, comprising most of the rest; relatively few passerines or ptarmigans were taken.

Arrival dates for northwest Greenland are in late April or early May, with nesting following by the end of May (MacMillan 1918, Salomonsen 1950-51). Arrival at Princess Marie Bay in east-central Ellesmere Island was recorded on 28 May 1980 (Burton in Williams 1982), and MacDonald (1953) observed one bird at Alert on 23 May 1951. Observations of birds carrying food on 12 August 1980 at Princess Marie Bay suggesting nesting in the area: if egg-laying to hatching takes some three months (Salomonsen 1950-51, Platt 1976), this would suggest a laying date around mid May. Migration southwards from northwest Greenland takes place from early September until late October (Salomonsen 1950-51).

The white phase Gyr Falcons occurring on Ellesmere Island have been referred by Salomonsen (1950-51, 1967) to the race F. r. candicans.

ROCK PTARMIGAN Lagopus mutus

The Rock Ptarmigan has been reported from all coasts and areas of Ellesmere Island, and the species may be regarded as a regular breeder and possible resident in the EINPR.

The species is said to be common in the area around the head of Tanquary Fjord (Nassichuk in CWS 1972), and has been reported from various localities in the northwest of the island (Osbourne 1982, Williams 1972, Hankinson 1990). There seems little reason to doubt that the species breeds right to the northern limit of land: Feilden (1877, 1878) mentioned that traces of ptarmigans were found at Cape Columbia, the most northerly point of land on Ellesmere Island, and MacMillan (1918) found it at Ward Hunt Island on 21 March 1909. A female and young were found near Milne Fjord on 24 July 1972 (Williams 1972).

At Lake Hazen, the species has been recorded breeding in small numbers in most, but not all years; it was scarce to absent in the five seasons for which observations were available between 1958 and 1966 (Savile and Oliver 1964, Nettleship and Maher 1973). Gould (1988) reported two and three pairs nested in the Hazen Camp area in 1981 and 1982, respectively.

Feilden (1877, 1878) and Greely (1986, 1888) list various records of the species in both interior and coastal areas of northeastern Ellesmere Island, including Fort Conger, where it was seen regularly. MacDonald (1953) considered the species rare around Alert itself, though more common in valleys to the west.

Recent sightings (since 1988) have been reported from the north and west sides of Lake Hazen, as well as in the Ella Bay and Fort Conger areas (Canadian Parks Service unpubl. data).

Early authors often stated that the species probably remains during the winter in the northern part of the island (Greely 1886, 1888, MacMillan 1918, 1927), based on observations occurring late in the autumn and early in the spring; there are no midwinter records to support these statements, which is not surprising in view of the difficult winter conditions and darkness. However, Salomonsen (1950-51) stated that the majority of birds in the far north of the range in Greenland almost certainly move south during the winter, and Bay (1904) also considered that many of the ptarmigans in southern Ellesmere Island move south for a while before an early return. Salomonsen (1950-51) indicated that some birds winter in similar latitudes in the Thule District and Inglefield Land in northwest Greenland. The latest records for the north and east coasts of Ellesmere Island are 29 September 1875 at 82°40'N (Feilden 1877) and 12 October 1882 at Discovery Harbour (Greely 1886), respectively. Whether the birds move away for the winter or not, they return early in the spring. MacMillan (1918, 1927) reports one was shot at Etah in northwest Greenland on 13 February 1916, five days before the return of the sun, and other early records on Ellesmere Island include a bird at 4700 ft above sea level on the Beitstadt Glacier on 19 March 1914, and one on the north coast off Ward Hunt Island (83°07'N) on 21 March 1909. Greely's (1886, 1888) earliest record at Discovery Harbour was 9 March 1882.

Nesting generally appears to occur at low densities and in variable numbers in different years (Parmelee and MacDonald 1960, Nettleship and Maher 1973, see Salomonsen 1950-51, 1967). Ptarmigan numbers are known to vary enormously in Greenland, possibly on a cyclic basis of about ten years (Braestrup 1941, Salomonsen 1950-51), and the same phenomenon apparently occurs elsewhere in the Canadian Arctic (Parmelee et al. 1967).

Salomonsen (1936, 1950-51) and Browning (1979) have reviewed the taxonomic status of the Rock Ptarmigan and have concluded that specimens from the High Arctic regions of northwest Greenland may be referred to the race Lagopus mutus captus. Birds on Ellesmere Island most clearly resemble this form though they are not identical with it (Parmelee and MacDonald 1960, Godfrey 1986): L. m. captus is somewhat larger than other races (Salomonsen 1950-51, Browning 1979).

Rock Ptarmigans moult through three distinct plumages during the course of the year: a winter plumage, a summer plumage and an autumn plumage (Salomonsen 1950-51). In low arctic Greenland,

these moults are spread over the summer months from about mid April until around mid October, whereas in the High Arctic region, the time schedule is compressed, the moult not starting until late May and winter plumage being assumed again from mid August to late September. Males generally lag well behind females in assuming winter plumage, and the schedules for the two sexes on the east-central coast at Princess Marie Bay (Morrison unpubl.) appeared similar to those for ptarmigan on west-central Ellesmere Island (Parmelee and MacDonald 1960) and High Arctic Greenland (Salomonsen 1950-51).

Egg-laying on the east-central coast in 1980 appeared to take place from the first week of June onwards, with some nests not being completed until near the end of the month; nesting habitats varied from high, barren terraces to marshy ground (Burton in Williams 1982, Morrison unpubl.). Eggs are laid a day apart and incubation takes about 21 days (Pedersen 1934, Salomonsen 1950-51). It appears likely that males leave the territory and female during incubation before hatching and make their way to higher ground where they moult (Salomonsen 1950-51, Parmelee and MacDonald 1960). Salomonsen's (1950-51) statement that many males return to accompany the brood when the young are about two-thirds fully grown did not appear to apply to any great extent on east-central Ellesmere Island (Morrison unpubl.). During late July and early August, broods in marshy areas fed on the bulbils of Polygonum and heads of Carex stans. Foods taken in areas of hummocks or on terraces included buds of arctic willow Salix arctica, as well as the seed heads of Draba sp., louseworts (Pedicularis sp.) and Carex sp.. Parmelee and MacDonald (1960) stated that autumn flocks are common in west-central Ellesmere Island in late August and early September.

SANDHILL CRANE Grus canadensis

The Sandhill Crane may occur accidentally in the EINPR.

Two reports in the literature indicate that the Sandhill Crane has occurred on Ellesmere Island. Savile and Oliver (1964) reported finding the distinctive tracks of a crane at Lake Hazen on 24 June 1962, but the birds were not seen. The second record was reported by Greely (1886, 1888), though a positive identification was not made and the species was only "mentioned doubtfully". The observation was made by one of his "most reliable and observant men", and involved two birds whose colour, long legs and slow, heavy takeoff and flight strongly suggested the birds were cranes. A second observation of a flock of cranes passing southwards over Fort Conger in July 1883, mentioned only in the 1888 paper, however, seems less likely. The species

breeds in various localities across the Canadian Arctic, including Banks Island (Manning et al. 1956), Victoria Island (Parmelee et al. 1967) and southeastern Devon Island (Dundas Harbour) (Godfrey 1986), and the species has been seen on the Truelove Lowland on northern Devon Island (Pattie 1977). In view of this distribution, it is entirely possible that strays might be expected on Ellesmere Island, as pointed out by Savile and Oliver (1964).

BLACK-BELLIED PLOVER Pluvialis squatarola

The Black-bellied Plover has not been observed in the EINPR, and its occurrence on Ellesmere Island appears to be accidental. Godfrey (1986) shows the breeding range of the Black-bellied Plover extending to the north coast of Devon Island (Godfrey 1966), where it is a regular breeder on the Truelove Lowland (Hussell and Holroyd 1974, Pattie 1977). Jones Sound appears to be the effective northern limit of its distribution and there are remarkably few records from Ellesmere Island. The only observations of the species come from the north coast at Alert, where MacDonald (1953) saw 2, 1 and 1 birds on 23, 25 and 27 June 1951, respectively, and Morrison (unpubl.) recorded a single adult on 13 June 1974. These spring sightings are presumably of birds which have overshot their normal breeding range; they suggest the possibility that the species may occur accidentally in the EINPR.

LESSER GOLDEN-PLOVER Pluvialis dominica

The Lesser Golden Plover appears to occur only accidentally on Ellesmere Island, and it may be regarded as an accidental visitor to the EINPR. The only records for Ellesmere Island are of a single bird flying near Cape Baird on the south side of Lady Franklin Bay (Greely 1886), and of three birds seen at Princess Marie Bay on the east-central coast on 20-21 June 1980 (Morrison unpubl., Witts in Williams 1982).

Godfrey (1986) shows the breeding range extending to Devon Island. It was been recorded breeding occasionally at the Truelove Lowland on the north coast of Devon Island by Hussell and Holroyd (1974), where numbers increased substantially in the 1980s (Pattie 1990); this site is the most northerly known breeding locality for the species in Canada.

COMMON RINGED PLOVER Charadrius hiaticula

The Common Ringed Plover appears to be a scarce bird over much of Ellesmere Island, breeding locally in small numbers where suitable habitat occurs, usually barren gravel outwashes or ridges or braided river systems. It may be considered a regular, if uncommon, breeding bird in the EINPR.

The braided river system at Tanquary Fjord appears to be a favoured area: Williams (1972) reported the species was seen frequently in this area and seven fledglings were found. Morrison (unpubl.) recorded the early arrival (one bird) of the species at Tanquary Fjord on 29 May 1976. The species was observed at Lake Hazen in 1965 and 1966 (Nettleship and Maher 1973), though not in 1962 (Savile and Oliver 1964) nor in 1981-1982 (Gould 1988). It was reported to breed at the Very River southwest of the lake by Greely (1886) in 1882, and a nest with four eggs in this area on 23 June 1989 (Canadian Parks Service unpubl. data). Although Greely (1886, 1888) did not record the Common Ringed Plover at Discovery Harbour (Fort Conger), Nettleship and Maher (1973) observed one at this location on 30 July 1966. There appear to be no records for the central north coast.

In the northeast, MacDonald (1953) collected a male with brood patches from a pair at Parr Inlet near Alert, but the species is otherwise scarce in the area (MacDonald 1953, Morrison unpubl.).

On the east-central coast, Feilden (1877, 1878) reported collecting a breeding bird in Buchanan Strait on 4 August 1875, and the species has also been seen, though not breeding, nearby at Alexandra Fjord (Freedman and Svoboda 1982). The species also breeds in small numbers at Princess Marie Bay (Morrison unpubl., Witts in Williams 1982).

Breeding records exist from most other parts of Ellesmere Island, including the Fosheim Peninsula (Bruggemann in Parmelee and MacDonald 1960), west coast (Waterston and Waterston 1972), and the northwest (Parmelee and MacDonald 1960, Osbourne 1982). There are no records of the bird on the south coast (Bay 1904, Schaaning 1933), though the species is likely to occur in suitable habitat.

In northwest Greenland, the species is a common breeder in the Thule District, though much scarcer further north (Salomonsen 1950-51).

RUDDY TURNSTONE Arenaria interpres

The Ruddy Turnstone is a common breeding bird in the EINPR. The species appears to be one of the most abundant and widespread shorebirds on Ellesmere Island, having been reported from every area visited, usually as a breeding bird.

At Tanquary Fjord, the species is common in late May and early June and appears to be a common breeder, though specific breeding evidence is lacking (Morrison unpubl., Williams 1972, Nettleship and Maher 1973). The Ruddy Turnstone was described as the most abundant breeding species at Lake Hazen in 1961-62 by Savile and Oliver (1964), when an estimated 30 pairs bred in the vicinity of Hazen Camp, and in 1981-82 by Gould (1988). The breeding ecology of the Ruddy Turnstone at Lake Hazen has been described by Nettleship (1967, 1973). Greely (1886, 1888) described the species as a quite abundant breeder at Fort Conger in 1882-1883.

Feilden (1877, 1878) reported it was tolerably abundant and MacMillan (1918, 1927) reported it was seen frequently along the northern shores of Ellesmere Island in June 1909. Williams (1972) observed the species near Milne Fjord. MacDonald (1953) found it a common breeder at Alert: it was one of the commonest shorebirds found in this vicinity in the early summer in 1974-1976 and 1986-1990 (Morrison, unpubl.). The migration, behaviour and energetics of turnstones have been studied at Alert during the arrival and pre-breeding periods in late May/early June by Morrison and Davidson (1990, and Davidson and Morrison 1989).

On the east-central coast, turnstones bred at Princess Marie Bay in 1980 and probably in other years, though the species was not especially common in the study area (Morrison unpubl., Witts in Williams 1982); it has also been reported from Alexandra Fjord (Freedman and Svoboda 1982).

Elsewhere on Ellesmere Island, the turnstone has been consistently described as a common breeder, including on the south (Bay 1904), the northwest (Parmelee and MacDonald 1960, Osbourne 1982, Whitfield and Brade in Hankinson 1990), and the west-central coast, where it was considered the most common breeding shorebird, being outnumbered overall only by the Snow Bunting (Parmelee and MacDonald 1960, Waterston and Waterston 1972).

In Greenland, the Ruddy Turnstone is restricted to the High Arctic zone: it is fairly common in the northwest in the Thule District and is one of the only species with a continuous breeding distribution along the entire north coast, becoming one

of the commonest breeding shorebirds on the east coast (Salomonsen 1950-51, 1967, 1981).

Taxonomic work on Turnstones breeding in High Arctic Greenland (Salomonsen 1950-51) and Ellesmere Island (Godfrey 1953) indicated that the birds could be referred to the nominate race Arenaria interpres interpres, which winters in the Old World, and a number of band recoveries have been obtained demonstrating that the wintering grounds are mostly on the northwestern seaboard of Europe (Parmelee and MacDonald 1960, Nettleship 1967, 1967a, Salomonsen 1967, Morrison 1975, 1976, 1984, Meltofte 1976, Morrison and Davidson 1990). Many birds migrate northwards via Iceland during May (Morrison 1971, 1975, Morrison et al. 1971, Wilson 1981), reaching Ellesmere Island in the last few days of May or first few days of June (see Morrison and Davidson 1990).

Egg-laying at Lake Hazen occurred in mid June, with hatching occurring from early to mid July. Both birds incubate the eggs, though the female takes the greater share, particularly during the middle of the incubation period, and tends to be on the nest during the 'day'. The male becomes more attentive around the time of hatching, and remains with the young until fledging, while the female departs earlier, well before fledging (Witherby et al. 1948, Parmelee and MacDonald 1960, Nettleship 1967, 1973, Bergmann 1946, Meltofte 1976, Skipnes 1979). The first flying young at Lake Hazen were seen in early August. Flocks of adults occurred from late July, and most turnstones had departed by mid August. Post-breeding flocks may be quite large: 80-100 turnstones were observed at Lake Hazen on 30 July 1965 (Nettleship and Maher 1973) and 31 on 13 July 1982 (Gould 1988). Late dates for Ruddy Turnstones include 5 September 1875 (82°30'N) and 11 September 1875 (82°45'N) on the north coast (Feilden 1877, Greely 1886), and 1 September 1951 at Alert (MacDonald 1953).

Turnstone behaviour during the nesting period can be quite variable. At Lake Hazen, nesting pairs often reacted noisily and aggressively to human (or other) intruders in their territories, whereas the lone pair at Princess Marie Bay was quiet and discrete around the nest (Morrison unpubl., and see Nettleship 1967a, Parmelee and MacDonald 1960, Sutton 1932). This variability in behaviour during incubation has also been commented on by Meltofte (1976, 1979): after hatching, the birds generally make their presence known when with young (Meltofte 1979).

RED KNOT Calidris canutus

The Red Knot is a common breeding bird in the EINPR. The species is, with the Ruddy Turnstone, one of the commonest and most widespread shorebirds breeding on Ellesmere Island, having been recorded from all parts of the island.

Knots are quite common and breed in the Tanquary area (Morrison unpubl., Williams 1972). They are abundant and regular breeders in the Lake Hazen area; an estimated 20 pairs nested in the vicinity of Hazen Camp in 1962 (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). The breeding ecology of knots at Lake Hazen has been described by Nettleship (1967a, 1974). Hobson (1972) has also reported observations on the breeding biology of the Knot from Ellesmere Island. They are also common around Fort Conger, Discovery Bay (Greely 1886, 1888).

The species occurs regularly on the north coast (Feilden 1877, 1878, Williams 1972), and likely breeds in the northern fjords of the EINPR. MacDonald (1953) describes it as a common nesting bird in the vicinity of Alert, though densities are much lower than at Lake Hazen (Morrison unpubl.). The first recorded nest of the Knot was, in fact, found by Peary near Cape Sheridan on 26 June 1909 (Feilden 1920, and see MacMillan 1917, 1927).

Knots are also common breeders in northwest Greenland (Salomonsen 1950-51).

Knots have also been described as common breeding birds in southern Ellesmere Island (Bay 1904, Schaaning 1933), on the Fosheim Peninsula (Parmelee and MacDonald 1960, Waterston and Waterston 1972) as well as in the northwest of the island (Parmelee and MacDonald 1960, Osbourne 1982).

Knots breeding in both High Arctic Greenland and on Ellesmere Island were once referred to the nominate race Calidris canutus canutus (Conover 1943, Salomonsen 1950-51, Godfrey 1953), but are now generally considered as a separate subspecies C.c. islandica (Roselaar 1983, Cramp and Simmons 1983, Godfrey 1991).

Knots breeding on Ellesmere Island and in Greenland migrate to wintering areas in Europe, as shown by a variety of banding, morphometric and taxonomic studies (see Salomonsen 1967, Morrison 1975, 1977, 1984, Morrison and Davidson 1990, Davidson and Wilson 1991). Most birds migrate northwards in the spring via Iceland, though some may travel via northern Norway. Details of the southward migration are less clear, though many fewer birds appear to use Iceland during the return migration. The observation of more than 75 knots departing from Lake Hazen in a

northeastwards direction on 5 August 1962 suggests that some may return to Europe via the north coast of Greenland (Savile and Oliver 1964).

Many arrival dates have been reported and they are generally in the last few days of May or first few days of June. On the Fosheim Peninsula, arrival dates have included 27 May 1951, 27 May 1953 and 30 May 1955 (Tener in Godfrey 1953, Parmelee and MacDonald 1960), in the northwest on 29 May 1966 (Nettleship 1974), on 27 May 1981 near Yelverton Inlet (Osbourne 1982), on the north coast on 5 June 1876 at 82°33'N (Feilden 1877, 1878) and at Alert on 31 May 1951 (MacDonald 1953) and 29 May 1975 (Morrison unpubl.). In the northeast, arrival at Fort Conger occurred on 3 June 1883 (Greely 1886) and 30 May 1915 (Ekblaw in Bent 1927). At Lake Hazen, arrival has generally been by early June (Savile and Oliver 1964, Nettleship and Maher 1973, Nettleship 1974), and at Tanquary Fjord, Knots arrived on 29 May 1976 (Morrison unpubl.). The first knot was heard on 26 May 1980 at Princess Marie Bay (Witts in Williams 1982).

The sexes appear to arrive together and the birds may or may not be mated on arrival (Salomonsen 1950-51, Parmelee and MacDonald 1960). Quite large flocks may occur in the days following the first sightings - flocks of up to 60 and 75 have been reported from the Fosheim Peninsula (Parmelee and MacDonald 1960), and a roosting flock of 150 birds was found at Lake Hazen on 5 June 1966, with other flocks of up to 60 birds seen on the same date (Nettleship 1974). At Alert, many birds gathered at the garbage dump after arrival and counts of 118 knots were recorded on 9 June 1974, 34 on 1 June 1975, 89 on 2 June 1976 and approximately 50 on 4-5 June 1987 (Morrison and Davidson 1990).

The birds disperse rapidly after arrival and courtship and display flights begin immediately, though small groups may be encountered feeding on marshes or at ponds (Nettleship 1974). Egg-laying may occur fairly soon after arrival, as indicated by a nest found at Mokka Fjord, Axel Heiberg Island, on 11 June 1975 with a complete clutch of four eggs (Morrison unpubl.). Allowing six days for laying a four egg clutch (Nettleship 1974), this clutch would have been initiated on 5 June 1975. Most clutches are probably started somewhat later. Parmelee and MacDonald (1960) estimated egg laying began around 10 or 11 June 1955, culminating in mid June and extending into late June, and clutch completion dates given by Nettleship (1967a, 1974) fall in the period 20-28 June; this compares with 11-25 June 1980 for nests at Princess Marie Bay (Witts in Williams 1982). Hobson (1972) reported clutch completion dates of 12-17 June for four nests from Ellesmere Island and northwest Greenland.

Both sexes incubate, and nests are difficult to find owing to the dispersed population, the tendency of the incubating bird to sit extremely tightly and the absence of the non-incubating

bird, which feeds away from the territory (Parmelee and MacDonald 1960, Nettleship 1967, 1974, and see Flint 1972). Incubating birds have been captured by hand on the nest (Parmelee and MacDonald 1960, Morrison pers. obs., Hobson 1972, Nettleship pers. comm.). Incubation is shared by both sexes and takes 21-22 days (Bird in Salomonsen 1950-51, Nettleship 1967, 1968), and hatching occurred in early to mid July on the Fosheim Peninsula in 1955 (Parmelee and MacDonald 1960), and during the period 12-20 July (most 12-15 July) 1966 at Lake Hazen (Nettleship 1967, 1974). Males and females generally both attend the brood initially, though the female departs, probably well before fledging, the male remaining with the young until they fledge (Parmelee and MacDonald 1960, Nettleship 1967, 1974, Nettleship and Maher 1973), which takes about 18 days (Parmelee and MacDonald 1960). The young are led from the breeding places to the shores of lakes, rivers or the sea. Flying young generally appear in late July or early August (Parmelee and MacDonald 1960, Nettleship 1967, 1974, Savile and Oliver 1964, Nettleship and Maher 1973). Females depart from mid July and males somewhat later as the broods fledge, with most adults leaving by early August. Flocks may gather along lakes or coastal shorelines: a flock of 75 was seen departing northeastwards from Lake Hazen on 5 August 1962 (Savile and Oliver 1964), and 54 were seen departing from coastal feeding areas in a southeasterly direction on 3 August 1980 at Princess Marie Bay (Witts in Williams 1982). Adults have been seen as late as 5 August 1951 at Alert (MacDonald 1953), 11 August 1962 and 12 August 1966 at Lake Hazen (Savile and Oliver 1964, Nettleship 1967, 1974) and 8 August in northwest Greenland (Salomonsen 1950-51): the latest record of an adult at Princess Marie Bay was 17 August 1980 (Witts in Williams 1982). Juveniles generally depart around mid August (Parmelee and MacDonald 1960, Nettleship 1967, 1974), with latest records of 25 August 1951 at Alert (MacDonald 1953), 25 August 1875 at Discovery Bay (Feilden 1877, 1878, Greely 1886), and on the Fosheim Peninsula as late as 8 September 1953 and 31 August 1955 (Parmelee and MacDonald 1960).

Plant material is important in the early season food of the Red Knot before insect food becomes available. By the end of June, increasing numbers of caterpillars, chironomids and other flies is followed by a change to an insect diet. Insect larvae are also important (see Nettleship 1974, Morrison and Williams unpubl.). Many of the earliest arriving birds at Alert carried considerable body reserves of both fat and protein, and such reserves may be important for early season survival if feeding conditions are difficult and/or for successful breeding (Morrison and Davidson 1990, Davidson and Morrison 1989).

SANDERLING Calidris alba

Sanderlings appear to be rather uncommon throughout Ellesmere Island; it is a regular though scarce breeding bird in the EINPR.

At Lake Hazen, Sanderlings are fairly scarce though regular breeding birds: four pairs were thought to nest in the area in 1962, and Tener observed an adult with four flightless young on 30 July 1958 (Savile and Oliver 1964). The species was not thought to breed in 1965 or 1966, or in 1981-81, though there was a handful of sightings in those years (Nettleship and Maher 1973, Gould 1988). At Fort Conger, Greely (1886) did not obtain any breeding records, though Feilden (1877, 1878) reported recently flying, though still partially downy juveniles with their parents along the shores of the Robeson Channel on 8 August 1876.

Feilden (1877, 1878) described the bird as "by no means abundant" along the coasts of Grinnell Land; he reported seeing several pairs and discovering one nest at 82°33'N on 24 June 1876. MacDonald (1953) found the species very rare in June and July in the Alert area, though he presumed it bred in the area.

Elsewhere on Ellsemere Island, the species appears to be uncommon or absent. Sanderlings were not recorded in the southern part of the island in 1900-1902 (Bay 1904, Schaaning 1933). On the Fosheim Peninsula, the Sanderling appears rare, though nests and young have been found (Godfrey 1953, Parmelee and MacDonald 1960, Waterston and Waterston 1972). The species was not recorded in the northwest around Emma Fjord/Audhild Bay/Henson Bay in 1981 (Osbourne 1982) or in the Yelverton Bay/Milne Bay area in 1972 (Williams 1972) or at Borup Fjord in 1980 (Hankinson 1990). On the east-central coast at Princess Marie Bay, breeding occurred in 1980 and 1981, though the species was very uncommon (Witts in Williams 1982, Morrison unpubl.), and it was not recorded at all at Alexandra Fjord in 1980 or 1981 (Freedman and Svoboda 1982).

In Greenland, the Sanderling is a common breeding bird on the east coast, including Peary Land (Meltofte 1976) and breeds along much of the north coast as far west as Hall Land, but apparently not in the Thule District (Salomonsen 1950-51, 1967, 1981).

Few arrival dates have been reported. The earliest involve a single bird seen in the company of recently arrived Ruddy Turnstones and a Ringed Plover at Tanquary Fjord on 29 May 1976, a single bird seen with knots and turnstones at Alert on 30 May 1976, as well as another single bird on 1 June 1976 at Alert (Morrison unpubl.). Feilden (1877, 1878) reported the arrival of the species as 5 June 1876 with Red Knots and Ruddy Turnstones in

Grinnell Land and Greely (1876) first saw the species on 4 June 1876 at Depot Point.

In northern Greenland, adults depart from late July to mid August, with young birds following from the latter half of August to mid September (Salomonsen 1950-51), and a similar schedule probably occurs on Ellesmere Island. Adults were recorded up to 5 August 1951 at Alert (MacDonald 1953), 8 August 1876 along the Robeson Channel by Feilden (1877, 1878), and 30 July 1958 at Lake Hazen by Tener (in Savile and Oliver 1964). Parmelee and MacDonald (1960) give 23 July (1955) as the latest date for an adult Sanderling on the Fosheim Peninsula. One adult Sanderling was seen on at Princess Marie Bay on the east-central coast during the period 15-17 August 1983 (Morrison unpubl.).

Despite their scarcity in June and July in most areas, flocks of Sanderlings, mostly juveniles, become relatively common during August. Flocks ranging from 1-5 were seen between 3 and 31 August 1955 on the Fosheim Peninsula (maximum 9 on 17 August) by Parmelee and MacDonald (1960), and MacDonald (1953) reported groups until 3 September 1951 at Alert, with a maximum of 40 juveniles on 10 August 1951 and 28 on 24 August 1951.

The wintering area used by Sanderlings breeding on Ellesmere Island has not been determined directly through banding. However, the relatively early arrival on the north coast in company with other species known to be from European wintering grounds, suggests that European wintering areas are used. There is some suggestion from the distribution in Greenland, including relative lack of records from the west coast and lack of breeding records around Thule, that Sanderlings may reach northern Ellesmere Island via the north coast of Greenland; records do suggest that Sanderlings are somewhat more common in the northern parts of Ellesmere Island than in the south. Banded Sanderlings have been seen in Peary Land on 4 and 6 June 1973 (Meltofte 1976) and at Princess Marie Bay on 1 August 1980 (Witts in Williams 1982), but in neither case could the band be obtained.

BAIRD'S SANDPIPER Calidris bairdii

The Baird's Sandpiper appears to be near the northern limit of its range in the EINPR, and breeds in small numbers in the vicinity of Lake Hazen and perhaps Tanquary Fjord.

Williams (1972) reported 2-3 pairs near Tanquary Fjord in August 1972, though no signs of breeding were observed. At Lake Hazen, it breeds in small numbers in some years: Tener (1961)

observed the species four times between 29 June and 3 August in 1958, finding an adult and flightless young on 28 July 1958 and another bird apparently with young on 3 August 1958. Sporadic records were made between 18 June and 11 August in 1962 (Savile and Oliver 1964), three were seen in 1965 and none in 1966 (Nettleship and Maher 1973), and there was no indications of breeding in those years or in 1981-1982 (Gould 1988).

The species was not seen at Fort Conger by Greely (1886, 1888), nor was it recorded on the north coast by Feilden (1877, 1878), Greely (1886, 1888), MacMillan (1918, 1927) or Williams (1972), nor at Alert by MacDonald (1953). One was observed at Alert on 8 June 1988 by Morrison (unpubl.)

The Baird's Sandpiper is by no means evenly distributed across Ellesmere Island. It appears to be common only in the east-central, and perhaps southern, parts of the island. Baird's Sandpipers were the most common breeding shorebird at Princess Marie Bay (Witts and Morrison) and at Alexandra Fjord (Freedman and Svoboda 1982) on the east-central coast. On the south coast, eggs were recorded in Stordalen on 20 June 1900 (Schaaning 1933) and Morrison (unpubl.) found one addled egg in a nest cup near Grise Fjord on 16 August 1983. In northwest Greenland, the species breeds in the Thule District, as well as in Inglefield Land and probably north to Washington Land (MacMillan 1918, 1927, Vibe 1938, Salomonsen 1950-51, 1967, 1981). On the west-central coast, it appears to be very uncommon or absent in much of the Fosheim Peninsula (Parmelee and MacDonald 1960, Waterston and Waterston 1972). The species nested at Borup Fjord in 1988 (Hankinson 1990), and was thought to breed in the northwest near Emma Fjord in 1980 (Osbourne 1982).

Few details have been published on the breeding cycle of Baird's Sandpipers on Ellesmere Island, though certain aspects of its breeding biology have been described from the central and western arctic (Dixon 1917, Bent 1927, Parmelee et al. 1967, Norton 1972), and observations made on Devon Island (Drury 1961). At Princess Marie Bay, on the east-central coast of Ellesmere Island, the species arrived on 14 June 1980; display flights were common during the subsequent week. Sixteen nests were found, all but two of which were in dry, poorly vegetated terrain. Both the male and female incubated the eggs. Clutches were completed from 24-27 June 1980 and hatching occurred from 13-17 July 1980 (Witts in Williams 1982). Incubation lasted 20 days. Although some feeding took place on the territory, most birds appeared to feed off the territory in communally used areas. Both adults initially attended the brood, although females became noticeably absent approximately ten days after hatching. Juveniles could fly when 12-14 days old. Flocks increased from early August and by 20 August 1980 departure was completed.

After arrival in mid June, the main food source consisted of scattered seeds of Carex nardina, Pedicularis lanata, Dryas integrifolia, and Equisetum sp. By the end of June, caterpillars were being taken from Dryas clumps and for most of the summer adult chironimids and flies were the most important items in the diet. From the beginning of August, both adults and juveniles fed on the abundant nematoceran larvae along stream banks. Adults and young fed on crustaceans in tidal pools at the coastal delta.

PECTORAL SANDPIPER Calidris melanotos

No records exist of the Pectoral Sandpiper within the EINPR. The species has been recorded twice on Ellesmere Island, single birds being seen at Alert on 9 June 1987 and on 8 June 1988 (Morrison unpubl.).

PURPLE SANDPIPER Calidris maritima

The Purple Sandpiper may occur as an occasional visitor within the EINPR. The only records within the park reserve boundaries are those of Greely (1886, 1888), who stated that a few specimens were seen and obtained by his party in 1882-1883 (at Lady Franklin Bay).

Ellesmere Island appears to be at the very northern limit of the breeding range of the Purple Sandpiper in the Canadian Arctic islands. The only record of breeding on Ellesmere Island occurred near Goose Fjord in southern Ellesmere Island (Schaaning 1933). In Greenland, the Purple Sandpiper breeds abundantly on the west coast, reaching its northern limit around the Thule District or possibly Inglefield Land (Salomonsen 1950-51, 1967, 1981, Vibe 1938, MacMillan 1918, 1927). Records from the remainder of Ellesmere Island show a rather clear pattern, with the species being seen sporadically along the eastern side of the island, but being absent in the west, northwest and central northern coasts. Thus, Purple Sandpipers have been recorded on the east coast at Alexandra Fjord (Freedman and Svoboda 1982), at Princess Marie Bay in 1980 (Witts in Williams 1982), at Lady Franklin Bay (Greely 1886, 1888) and as far north as Cape Sheridan (MacMillan 1918, 1927), but were not reported from the Fosheim Peninsula on the west-central coast (Parmelee and MacDonald 1960, Waterston and Waterston 1972), from Lake Hazen in the northern interior (Savile and Oliver 1964, Nettleship and

Maher 1973), or from the northwest (Osbourne 1982) or northern coasts (Williams 1972, Feilden 1877, 1878). On the Greenland side, sight records have been reported as far north as Thank God Harbour (Bessels 1879, Greely 1886).

The species is well known to be closely associated with littoral habitats, and the pattern of sightings indicates that records on the east coast of Ellesmere Island and along northwest Greenland result from the species moving northwards into the channel separating the two countries to an extent that patterns of ice break-up, snow melt and distance may allow.

DUNLIN Calidris alpina

No records of the Dunlin exist in the EINPR, and there is only one record for Ellesmere Island, a single bird in breeding plumage at Princess Marie Bay on the east-central coast on 22 July 1981 (Morrison unpubl.).

COMMON SNIPE Gallinago gallinago

One record of the Common Snipe has occurred within the EINPR at Lake Hazen, a single bird seen on 31 July 1962: this bird was very likely a wind blown stray brought in by a gale on 23 July 1962 (Savile and Oliver 1964). Considering that the Common Snipe generally does not breed north of the Boreal Zone (Godfrey 1986), the record at Lake Hazen was quite exceptional, and certainly "the surprise of the season" (Savile and Oliver 1964). No other records exist for Ellesmere Island.

RED PHALAROPE Phalaropus fulicarius

The Red Phalarope may occur as an uncommon bird in the EINPR in coastal areas in the northeast of Ellesmere Island; there is suggestive evidence that it may breed in some places in some years, though nesting has never been proven, and its status remains uncertain.

In the area of Fort Conger, Greely (1886, 1888) reported collecting a specimen on 26 June 1883 at Distant Cape and another

on 2 July 1883 at Cape Baird. The earliest record was 18 June 1883, but few birds were seen in the area.

Feilden (1877, 1878) reported collecting a female at 82°27'N on 30 June 1876 and finding a pair near a small fresh-water pond at 82°30'N on 1 July 1876 which were "apparently breeding". Other sightings were made in the vicinity of his winter quarters at 82°27'N. MacDonald (1953) only observed the species on one occasion in the Alert area, when he collected three adult males and six adult females from a flock of 10 birds, found feeding with 35 knots on a small lake near Cape Belknap on 23 June 1951. Morrison (unpubl.) observed a single female Red Phalarope at Alert on 6 June 1990.

Elsewhere on Ellesmere Island, the species has only been reported from the south coast (Bay 1904, Schaaning 1933, Shortt and Peters 1942), and in small numbers by some but not all observers on the Fosheim Peninsula (see Parmelee and MacDonald 1960). It was not found in the northwest (Osbourne 1982) or in the central part of the north coast (Williams 1972), nor from the northern interior at Lake Hazen in 1962-1966 (Savile and Oliver 1964, Nettleship and Maher 1973) or in 1981-1982 (Gould 1988), nor from the east-central coast around Princess Marie Bay (Morrison unpubl.), Alexandra Fjord (Freedman and Svoboda 1982) or the Flagler Bay polynya area (Ouellet in Schledermann 1980).

These observations indicate that the occurrence of the bird is linked with the presence of open water along the coast, so that its likely occurrence in the EINPR may depend on sea ice conditions in a given year.

The species arrives very late, often not until after 10 June in Greenland, with the earliest Ellesmere Island date being 6 June 1990 at Alert: open water was exceptionally extensive in the Alert area in 1990 (Morrison unpubl.). Egg-laying occurs in the latter half of June, incubation takes 18-19 days (Parmelee et al. 1967), perhaps longer (Palmer 1967, Salomonsen 1950-51). Males alone incubate, the females departing after laying the clutch of four, occasionally three, eggs. Accounts of the breeding biology of the species have been given by Salomonsen (1950-51), Parmelee et al. (1967), Bengtson (1968), Höhn (1971) and Kistchinski (1975). Males form flocks at about the time the young fledge, and in Greenland, adults depart by the beginning of August and the young by mid August (Salomonsen 1950-51, 1967).

The principal wintering areas appear to be off the bulge of West Africa in the upwellings of the Canary and Guinea currents, especially off Mauritania, and further south in the Benguela Current off Namibia and South Africa (Cramp and Simmons 1983). There is another major wintering area in the Pacific Ocean off the west coast of South America, in the Humboldt Current, especially off Chile.

POMARINE JAEGER Stercorarius pomarinus

The Pomarine Jaeger appears to be accidental on Ellesmere Island and there have been no records in the Ellesmere Island National Park Reserve itself. The only record involves a single adult seen at Alert on 9 and 10 July 1992 by R.I.G. Morrison and N.C. Davidson. The bird was seen at the dump in company with up to 43 Glaucous Gulls, 46 Long-tailed Jaegers, 4 Thayer's Gulls and 1 Ivory Gull.

PARASITIC JAEGER Stercorarius parasiticus

The Parasitic Jaeger may occur occasionally in the EINPR in coastal areas of northeastern Ellesmere Island; there have been no recent records of its occurrence, and its current status is uncertain.

Greely (1886, 1888) reported only two sightings of the species in the northeast at Fort Conger, of single birds on 18 and 20 June 1883. MacMillan (1918, 1927), however, reported finding a nest at about 82°N between Lady Franklin Bay and Cape Sheridan. Reports of its occurrence at Thank God Harbour in Greenland (Bessels 1879, see Greely 1886, 1888) were dismissed by Salomonsen (1950-51) as due to confusion with the Long-tailed Jaeger. Although not observed at Princess Marie Bay from 1980-1983 (Morrison unpubl.), the species did nest at Alexandra Fjord in 1980 and 1981 (Freedman and Svoboda 1982) (a single territory), and a single bird was reported at the Flagler Bay polynya on 10 July 1979 by Ouellet (in Schledermann 1980).

The Parasitic Jaeger is also known to breed in southern Ellesmere Island (Schaaning 1933, Godfrey 1986, Salomonsen 1981, Morrison unpubl.). The only records of Parasitic Jaegers on the Fosheim Peninsula are of two seen at Eureka, with Long-tailed Jaegers, on 26 July 1969 (Heyland and Boyd 1970); there are no other records on the west-central coast (Parmelee and Macdonald 1960, Waterston and Waterston 1972), in the northwest (Osbourne 1982), or on the north coast (Williams 1972, Feilden 1877, 1878, MacDonald 1953, Morrison unpubl.), or as might be anticipated, in the interior at Lake Hazen (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). Its breeding distribution therefore appears to be restricted to those areas influenced by the North Water or other polynyas and which regularly become ice-free in the summer. It does not, however, appear to be abundant anywhere on the island.

In northwest Greenland, the breeding range extends through

the Thule District as far north as MacCormick Bay, with occasional records north to Washington Land involving stragglers (Salomonsen 1950-51).

LONG-TAILED JAEGER Stercorarius longicaudus

The Long-tailed Jaeger is widely distributed throughout Ellesmere Island, and probably breeds in all areas of the EINPR in years when conditions and food supplies are suitable.

At Lake Hazen, numbers of pairs nesting in the vicinity of Hazen Camp in the years 1958 and from 1961-1968 varied from 0 (in 1961) to 12 (in 1966) (Savile and Oliver 1964, Nettleship and Maher 1973, Maher 1970); two and one pair bred in the area in 1981-1982 (Gould 1988). The species also nested in 1975, when Morrison and Pittaway (unpubl.) found 7 nests between 14 and 20 June. The extent to which breeding takes place and its success appear to depend on the abundance of lemmings (on Ellesmere Island, collared lemmings Dichrostonyx groenlandica); although this was questioned by Parmelee and MacDonald (1960), various studies have shown it to be the case at Lake Hazen (Maher 1970) and elsewhere (e.g. Løppenthin 1943, Salomonsen 1950-51, Hussell and Holroyd 1974, Andersson 1971, 1976, 1980). It is possible that this may be moderated by the intensity of predation by arctic foxes (Alopex lagopus) (Meltofte et al. 1981). Little quantitative information is available on the annual abundance of lemmings on Ellesmere Island and in any case, few are seen unless the population is extremely high (see Meltofte 1976, Anderssen 1971), leading Meltofte (1976) to comment that it is no doubt easier to estimate the number of lemmings on the basis of the jaegers' breeding activity than vice versa!

Greely (1886, 1888) reported that it was the commonest bird at Discovery Harbour (Fort Conger), where it nested, and was also very common in the interior. Feilden (1877, 1878) reported it nested along the north coast; it was collected near Alert by MacMillan (1918, 1927) and was described by MacDonald (1952) as "amazingly abundant" during June 1951, though no evidence of breeding was obtained. Morrison (unpubl.) found a nest with two eggs at Alert on 24 June 1975. The species very likely breeds along the north coast of Ellesmere Island in areas within the EINPR. In 1972, several pairs were resident in a valley between Yelverton Inlet and Milne Bay, though lemmings were scarce and the jaegers did not appear to breed: an old nest was found and a variety of food debris noted nearby, much of it consisting of lemming bones (Williams 1972). Recent records (since 1988) have included sightings in most areas of the Park Reserve except the north coast (Canadian Parks Service unpubl. data).

Arrival occurs in late May or early June, depending on ice conditions (see Maher 1970). Arrival dates within the EINPR have included 31 May 1966 at Tanquary (Nettleship and Maher 1973), and 3 June 1882 and 4 June 1883 at Discovery Harbour (Greely 1886, 1888). The species was already present at Lake Hazen when observers arrived on 29 May 1963, 2 June 1965 and 31 May 1966 (Maher 1970). In the northeast, arrival has been recorded in the Alert area during the first week of June (Feilden 1877, 1878), on 31 May 1951 (MacDonald 1953) and 29 May 1975 and 2 June 1976 (Morrison unpubl.). Greely (1886, 1888) reported the species was seen on 6 June 1876 at Depot Point (82°40'N).

Migration and arrivals continue until mid June (Parmelee and MacDonald 1960) and large concentrations may occur during this period. At Alert, numbers reached 150 on 23 June 1975, 138 on 9 June 1974 and 115 on 7 June 1976 (Morrison unpubl.). The abundance of the bird in the northeast is reflected in Greely's (1886, 1888) statement that nearly 200 were killed at Fort Conger in 1882. In west-central Ellesmere Island, Parmelee and MacDonald (1960) observed some 200 or more Long-tailed Jaegers gathering near Eureka and departing northwestwards on 14 June 1955. Arrival in High Arctic Greenland is also late May/early June (Salomonsen 1950-51).

Egg-laying on Ellesmere Island takes place from somewhat before mid June to around the end of the month, similar to the period given by Salomonsen (1950-51) for High Arctic Greenland. The incubation period has been reported as 23-25 days (average 24.2 days for 5 eggs) by Maher (1970) at Lake Hazen, and as 23 days by Manniche (1910) and Parmelee and MacDonald (1960). The interval between eggs in two-egg clutches is 36-48 hours (Manniche 1910). Laying dates for first eggs covered the period 10-27 June 1966 for 14 nests at Lake Hazen, with a similar range in other years (Maher 1970). There was no obvious tendency for synchronisation of breeding effort to occur, although this has been reported to occur in northern Sweden in years with abundant lemming populations (Andersson 1971); some late clutches may represent replacements where early predation has occurred (Meltofte et al. 1981). Clutch size varies according to food abundance, being two in years when lemmings are plentiful, an increasing proportion of the population laying only one egg in years when lemmings become increasingly scarce (Parmelee and MacDonald 1960, Maher 1970, see Andersson 1980). Both sexes incubate, though the female does more brooding and the male more hunting and defence of the territory (Andersson 1971).

Hatching usually occurs during the first three weeks of July (4-20 July in 1966 and other years at Lake Hazen (Maher 1970)). Incubation starts with the first egg, so that the first chick is often rather larger than the second, resulting in only one young usually surviving in years of moderate or poor food abundance (Andersson 1980, see Lack 1954). The young disperse from the

nest area and generally remain separate from one another (Andersson 1971). Fledging takes about three weeks (Pedersen in Parmelee and MacDonald 1960), and occurs from late July to mid August or possibly later, as in Greenland (Salomonsen 1950-51). At Lake Hazen, flying young were first seen on 3 August in 1962 and 1966, with most flying by 11 August 1962 (Savile and Oliver 1964, Nettleship and Maher 1973, Maher 1970). The adults feed the young, occasionally for some time after fledging (Parmelee and MacDonald 1960).

After the breeding attempt, jaegers gather in flocks and depart. Flocks may be fairly large: Parmelee and MacDonald (1960) reported concentrations of 38 on 7 July 1955, 79 on 29 July 1955 and 24 on 16 August 1955. Non-breeding birds gather from late June or early July (Manniche 1910, Parmelee and MacDonald 1960). The species was last observed at Lake Hazen on 23 August 1962 (Savile and Oliver 1964, Maher 1970), at Alert on 5 August 1951 (MacDonald 1953), at Discovery Harbour on 30 August 1882 (Greely 1886), and on the Fosheim Peninsula on 1 September 1955 (Parmelee and MacDonald 1960).

Banding studies have shown that the Long-tailed Jaeger has a high fidelity to its breeding area, often occupying the same territory from year to year throughout its range (Maher 1970, Taylor 1974, de Korte 1977, Andersson 1980).

Although lemmings are the principal food on Ellesmere Island (Maher 1970), the Long-tailed Jaeger is an important predator on birds, especially shorebird chicks and Snow Buntings; insects are an important supplement to the diet and form the main food of chicks for the first ten days of life (Parmelee and MacDonald 1960, Nettleship and Maher 1973, Nettleship 1967, 1973, 1974, Maher 1970, Savile and Oliver 1964).

ICELAND GULL Larus glaucoides
THAYER'S GULL Larus glaucoides thayeri
(formerly L. thayeri)

(also **HERRING GULL** Larus argentatus)

The Thayer's Gull appears to be a regular though rather scarce visitor to northeastern Ellesmere Island, including the EINPR.

The taxonomic status of "Thayer's Gull" has been the subject of much discussion, with some authorities previously considering it the northernmost race of the Herring Gull (L. argentatus) (AOU 1957) and others regarding it as the High Arctic representative of the Iceland Gull (L. glaucoides) (Salomonsen 1950-51), a view

favoured by Parmelee and MacDonald (1960). Godfrey formerly (1966) treated Thayer's Gull as a separate species (L. thayeri), a viewpoint adopted by the American Ornithologists' Union in 1973 (AOU 1973), but has more recently (Godfrey 1986) considered it a form of the Iceland Gull (L. glaucoides thayeri). In terms of distribution, Herring Gulls breed in the Boreal and Low Arctic zones of North America, being replaced by "Kumlien's Gull" (L. glaucoides kumlieni) in southeast Baffin Island, by "Iceland Gulls" (L. glaucoides glaucoides) in Low Arctic west Greenland, and by "Thayer's Gulls" (L. glaucoides thayeri) farther north in the Canadian Arctic (Godfrey 1966, 1986, Salomonsen 1950-51, 1967, 1981, Brown et al. 1975). On the west coast of Greenland the breeding distribution of the nominate form extends north to Melville Bay, beyond which it is only a scarce and occasional visitor to the Thule District north to Ingelfield Bay (Salomonsen 1950-51, 1967, 1981). Its occurrence on Ellesmere Island is thus possible, though unlikely. Manning et al. (1956) and Macpherson (1961) presented evidence indicating that Herring Gulls and Thayer's Gulls bred sympatrically, and Godfrey (1986) stated that thayeri intergrades with kumlieni at Home Bay on east-central Baffin Island. Thayer's Gull was originally separated as a species by Brooks (1915) on the basis of specimens collected at Buchanan Bay on the east coast of Ellesmere Island. In the present work, the name "Thayer's Gull" will be retained to refer to L. glaucoides thayeri as described in Godfrey (1986).

The only previous records of "Iceland Gulls" on Ellesmere Island are those of single birds reported by Greely (1886, 1888) on 19 May 1882 and 5 June 1883 in the Fort Conger; it seems most likely from consideration of breeding distributions of the gulls and from the additional comments in Greely's 1888 paper that the birds were Thayer's Gulls.

Neither Savile and Oliver (1964) or Nettleship and Maher (1973) observed the species at Lake Hazen, but good views of a single bird were obtained by Morrison (unpubl.) on the northeast flank of Mount McGill on 20 June 1975: the bird appeared to be moulting, probably its inner primaries.

Although the species was not reported by Feilden (1877, 1878) or MacDonald (1953) in the Alert area, it has been seen regularly in small numbers in recent years. Morrison (unpubl.) observed one Thayer's Gull at the garbage dump at Alert on 10 June 1974 and on 21 June 1975, and single birds were seen in late May/early June in all years from 1986 to 1990.

The species was not observed in the northwest (Osbourne 1982) or central parts of the north coast (Williams 1972).

Thayer's Gulls breed in the southern half of Ellesmere Island (Godfrey 1986), though wandering birds occur further north. On the west coast, J.D. Heyland and H. Boyd saw a small

colony (20 pairs or less) on top of a cliff on the mid-west side of Hat Island (78°59'N 84°55'W) in Eureka Sound at the base of the Fosheim Peninsula on 23 July 1970 (H. Boyd pers. comm.). Small numbers have been observed on the Fosheim Peninsula (Parmelee and MacDonald 1960, Godfrey 1953, Waterston and Waterston 1972). Arrival occurred on 10 June 1955 and the species was last seen on 25 July 1953, 25 August 1954 and 9 August 1955 (Parmelee and MacDonald 1960). Although not seen at Princess Marie Bay in 1980-83 (Morrison unpubl., Burton in Williams 1982), Thayer's Gulls were oberved at Alexandra Fjord in 1980-81 (Freedman and Svoboda 1982) and one was reported from the Flagler Bay polynya on 10 July 1979 (Ouellet in Schledermann 1980). Finally, the species was collected in 1901 (10 June) from the Buchanan Bay area (see above), where it was found breeding (Brooks 1915, Bent 1921).

SLATY-BACKED GULL Larus schistisagus

The Slaty-backed Gull, which breeds in northeast Asia and winters from the Bering Sea and Kamchatcka south to Japan and China (Godfrey 1986, Campbell et al. 1990), is only of accidental occurrence in Canada: a bird found at Alert in 1991 is the only record from the eastern Canadian Arctic and represents the first specimen record for Canada.

In 1991, Mr. Frank Cosgrove and C.P.O. Bob Pennell drew the attention of R.I.G. Morrison and N.C. Davidson to a dark-backed gull which had been noted shortly before the latters' arrival at Alert on 21 June. During the next two and one half weeks, the bird was seen roosting with Glaucous Gulls and Thayer's Gulls on the sea ice near the garbage dump. Observations indicated that the gull was a Slaty-backed Gull, and this was tentatively confirmed when the bird was found dead at the dump on 7 July 1991: confirmation of the identification was subsequently made by W.E Godfrey of the National Museum of Canada.

Only two other acceptable records currently exist of the species in Canada, both on the west coast. The first is of a bird photographed at Clover Point, British Columbia, in March 1974 (Roberson 1980, Godfrey 1986, Campbell et al. 1990), and the second is of an adult at Beaver Harbour, Vancouver Island, in November 1986 (Campbell 1987, Mattocks and Harrington-Tweit 1987, Campbell et al. 1990). Godfrey (1986) considered the report of a Slaty-backed Gull at Harrowby Bay, Mackenzie District (70°10'N, 128°00'W), in the western Canadian Arctic by Bent (1921) to be unsatisfactory. Kessel and Gibson (1978) reported that the species had become a rare visitor to western and northern Alaska within the last decade. The record at Alert thus appears to be the first confirmed record of the species in the Canadian Arctic,

perhaps reflecting the increasing occurrence in Alaska, and is the first specimen record for Canada.

GLAUCOUS GULL *Larus hyperboreus*

The Glaucous Gull occurs regularly in the EINPR, especially in the coastal areas of the northeast of Ellesmere Island, and breeds in low numbers.

The Glaucous Gull occurs widely on Ellesmere Island, having been encountered on all coasts, but its breeding appears to be mostly in the south, extending northwards to the Fosheim Peninsula on the west coast, to Lake Hazen in the interior, and to Cape Sabine on the east coast (Parmelee and MacDonald 1960, Waterston and Waterston 1972, Godfrey 1986, Nettleship and Maher 1973, Canadian Parks Service unpubl. data); Godfrey (1986) shows its breeding distribution extending to Lady Franklin Bay.

The species has been seen regularly at Lake Hazen, although no breeding records have been obtained in the vicinity of Hazen Camp itself (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988, Morrison unpubl.). Previous reports of a few pairs breeding on the islets at the far west end of the lake (Kevan in Nettleship and Maher 1973) were confirmed in 1988, with observations of up to seven pairs incubating eggs on 16 June 1988; nine birds were observed nesting in the same location on 16 June 1989 (Canadian Parks Service unpubl. data). Further breeding records involved a single bird nesting at the Snow Goose River on 14 June 1990 and the discovery of 10 nesting sites at the Very River, also on 14 June 1990. Towards the east end of Lake Hazen, an unidentified gull was reported nesting at a lake west of Craig Lake, and two unidentified gulls appeared to be nesting at Turnabout Lake (Canadian Parks Service unpubl. data): both reports occurred on 16 June 1989 and probably involved Glaucous Gulls.

Greely (1886, 1888) reported that Glaucous Gulls were common in the vicinity of Fort Conger, but no breeding places were found, despite careful search.

Feilden (1877, 1878) recorded its presence on the north coast as far as 82°32'N, and MacDonald (1953) encountered it regularly at Alert in 1951, though again no evidence for breeding was seen. The species was common around the garbage dump at Alert during 1974-1976 and 1986-1990 in late May and early June: 30-40 birds were seen regularly during this period, the majority of which were in pairs; numbers fell during early June and birds were seen flying inland, though it is not known whether breeding took place (Morrison unpubl.).

On the north coast, the species was not recorded by Williams (1972) in the Yelverton Bay/Milne Bay area. England et al. (1981) reported seeing a few individuals in Clements Markham Inlet in 1979 and 1980. In the northwest, the species was seen occasionally in the area between Emma Fjord and Henson Bay in 1981 (Osbourne 1982), and MacDonald (in CWS 1972) located a colony of 20-30 pairs at the entrance to Emma Fjord on the north side. Occasional birds were seen up to Yelverton Inlet, but there was no evidence of breeding (IAE 1982).

On the south coast, Glaucous Gulls are numerous and many colonies have been found (Bay 1904, Schaaning 1933, Waterston and Waterston 1972, CWS 1972, McLaren and Renaud 1979). On the west coast, the species breeds in small numbers in widely scattered pairs on and around the Fosheim Peninsula (Parmelee and MacDonald 1960, Waterston and Waterston 1972, Macpherson 1963, Davis et al. 1973, CWS 1972). On the east coast, the species has been found breeding in the area of the Flagler Bay polynya south of the Bache Peninsula (Ouellet in Schledermann 1980) and in Makinson Inlet (Waterston and Waterston 1972); the species was present though no nests were found at Princess Marie Bay (Burton in Williams 1982, Morrison unpubl.) and Alexandra Fjord (Freedman and Svoboda 1982).

Glaucous Gulls arrive rather early, generally before the sea ice breaks up, as early as the end of April to mid May in the Thule Distict of northwest Greenland, sometimes not until early June in Washington Land (Salomonsen 1950-51). Arrival in EINPR areas in northeast Ellesmere Island is usually in the latter part of May. In the Alert area, Feilden (1877, 1878) noted arrival in the middle of June 1876, but MacDonald (1953) first saw the species on 23 May 1951, and it had already arrived by 28 May 1975 and 24 May 1976 and was consistently present by late May during the period 1986-1990 (Morrison unpubl.). The earliest arrival date recorded by Greely (1886, 1888) at Fort Conger was 5 June 1883, and the earliest record at Lake Hazen is 3 June 1966 (Nettleship and Maher 1973). On the north coast, the species arrived near Yelverton Inlet on 7 June 1981 (Osbourne 1982).

In northwest Greenland, egg-laying occurs in June, hatching in July and the young leave the nests mid to late August; adults depart from the breeding grounds around early September, whereas the young remain until around freeze-up, until approximately the end of September or October (Salomonsen 1950-51). A similar schedule appears to occur on Ellesmere Island. On the Fosheim Peninsula, Parmelee and MacDonald (1960) indicated egg-laying took place during June, hatching throughout July, with most young fledging in August, though young were seen in the nest as late as 5 September 1953 (Bruggemann in Parmelee and MacDonald 1960). Adults attend the young until fledging, but depart around mid September, occasionally remaining until the end of September: the young depart after the adults. Latest records at Lake Hazen

were around mid to late July (Savile and Oliver 1964, Nettleship and Maher 1973). MacDonald (1953) saw the species up to 17 August 1951 at Alert, and latest dates reported by Feilden (1877, 1878) and Greely (1886) were 1 September 1875 and 6 September 1871(?). On the south coast, the birds remain as long as there is open water, the latest date reported by Bay (1904) being 30 October 1899.

BLACK-LEGGED KITTIWAKE Rissa tridactyla

The Black-legged Kittiwake may occur occasionally in coastal areas of the EINPR in northeast Ellesmere Island as a vagrant.

The only records in the northeast involve a sighting of two birds at Distant Cape near Fort Conger by Greely (1886, 1888) on 23 July 1883. There are no records for the north coast (Williams 1972, MacDonald 1952, Feilden 1877, 1878), and it seems unlikely that MacMillan (1918, 1927) could have been correct in stating that it was common as far north as 82°30'N, even on the Greenland side. The species was not seen on the east-central coast at Princess Marie Bay in 1980-1983 (Burton in Williams 1982, Morrison unpubl.), at Alexandra Fjord in 1980-81 (Freedman and Svoboda 1982) or in the Flagler Bay polynya area in 1979 (Ouellet in Schledermann 1980). Feilden (1877, 1878) reported that the species was not seen after entering the pack ice in Smith Sound north of Port Foulke in 1875 until the North Water was reached during the return south in 1876.

The nearest colony in Canada is on Coburg Island (Godfrey 1986, Brown et al. 1975, McLaren 1982). Salomonsen (1950-51) points out that it breeds only where the coast is free of ice in the summer, and is therefore excluded from many parts of the High Arctic zone. In Greenland, breeding is mostly in the Low Arctic, though wandering birds may be encountered as far north as Hall Land (Bessels 1879) in favourable years (Salomonsen 1950-51, 1967, 1981). The most northerly Canadian colonies are associated with polynyas and areas of recurrent open water during the summer (Brown et al. 1975, Brown and Nettleship 1981), and wandering birds might be anticipated to occur northwards.

ROSS'S GULL Rhodostethia rosea

No sightings exist of the Ross's Gull in the EINPR. The only record for Ellesmere Island is of a single bird seen at Alert on 7 June 1988 by RIGM and N.C. Davidson (Morrison unpubl.).

SABINE'S GULL Xema sabini

The Sabine's Gull may be an accidental visitor to the EINPR in coastal areas in the northeast of Ellesmere Island.

Sabine's Gull has a widespread though patchy distribution in the Canadian arctic, the nearest colonies to Ellesmere Island being on the Grinnell Peninsula on Devon Island and on Bylot Island (Tuck and Lemieux 1959, Godfrey 1986, Brown et al. 1975). In northwest Greenland, scattered colonies have been found in Melville Bay, the Thule District, Inglefield Land and Hall Land, where two apparently breeding birds were collected. The existence of colonies at such high latitudes in northwest Greenland indicates that sightings of the gull might be anticipated on the east coast of Ellesmere Island, and the only records to date have come from this general area. Greely (1886, 1888) reported that the species was "exceedingly uncommon" at Fort Conger, but a specimen was collected on 6 July 1882. MacMillan (1918, 1927) also reported seeing and collecting a Sabine's Gull on the northern shore of Grant Land at 82°30'N on 8 July 1909. These appear to be the only records for Ellesmere Island.

IVORY GULL Pagophila eburnea

The Ivory Gull may be considered to occur regularly in the EINPR in coastal areas in the northeast of Ellesmere Island; it breeding status is unknown.

Greely (1886, 1888) found the species uncommon at Fort Conger, with only three or four sightings during the two years at the site. Feilden (1877, 1878) reported they were common, however, in Discovery Bay on 12 August 1876, and observed individuals as far north as Lincoln Bay (one on 1 September 1875) and Cape Union (one on 2 August 1876).

Although not seen by MacDonald (1953) at Alert in 1951, Morrison (unpubl.) found Ivory Gulls to be rather common around the station garbage dump in late May/early June during 1974-1976 and 1986-1990, when up to approximately 40 birds were present. Copulation was observed on 6 June 1976, though it is not known whether the species nests in the vicinity of Alert. Potential feeding areas include open water/small polynyas at Cape Frederick VII at the south side of Lincoln Bay on the Robeson Channel, as well as further south at Cape Defosse on the Judge Daly

Promontory on the Kennedy Channel, which were open on 31 May 1975. Open water may not occur regularly or extensively enough, however, for the species to breed in the area.

The nearest known breeding colony is near Princess Marie Bay on the east-central coast of Ellesmere Island, where over 200 Ivory Gulls were found breeding on mountainous ledges overlooking an icefield, at an elevation of approximately 2,000 feet and distance of some 12 km from the nearest coastline (Burton in Williams 1982). Other known colonies in southeastern Ellesmere Island and eastern Devon Island are situated on nunataks in icefields (Frisch and Morgan 1979, Frisch 1983) within foraging distance of open water/polynyas.

ARCTIC TERN Sterna paradisaea

The Arctic Tern is a regular breeding bird in most areas of the EINPR where coastal waters, lakes or rivers provide food resources for the birds. The Arctic Tern appears to breed in many parts of Ellesmere Island, in widely scattered small colonies consisting mostly of not more than a few pairs or even scattered individual pairs: it is probably more abundant in the south and perhaps east of the island where open water is present for a greater proportion of the summer season and is considerably less abundant or perhaps even absent from areas such as the central north coast where the ice does not break up in the summer.

A few pairs breed in most years at Hazen Camp on Lake Hazen (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). Williams (1972) reported a bird at Kettle Lake near Tanquary Fjord in 1972.

Feilden (1877, 1878) reported eight or ten pairs breeding on Breakwater Island at Discovery Harbour, and Greely (1886, 1888) found the birds nesting at the same place in 1882-1883.

Recent records (since 1988) include sightings of the species in many parts of the EINPR, including Tanquary Fjord, the west and north sides of Lake Hazen, Murray Lake, Ella Bay and Fort Conger (Canadian Parks Service unpubl. data).

The species breeds in small numbers throughout the northeast, probably becoming less numerous to the north where open water occurs less regularly during the summer. Feilden (1877, 1878) found a nest not far from Alert on 27 June 1876, and MacMillan (1918, 1927) found one west of Alert near Black Cliffs Bay (82°33'N) on 7 July 1909. MacDonald (1953) found one nest near Alert in 1951 and reported the species was common though not

abundant, the maximum number seen being 20 on 4 July 1951 with the species again becoming more common towards the end of August, when 17-18 birds were seen on different days between 18 and 25 August 1951. MacDonald (1953) reported a possible breeding place on a small islet some three-quarters of a mile offshore from Wood Creek Delta in Black Cliffs Bay. This island, also visited by Lt. Egerton of the Nares expedition, contained a number of nest depressions, remains of eggshells and excrement: in 1975, five old nest scrapes were located by Morrison (unpubl.) and much excrement and lichen again noted on the island during a visit on 24 June 1975.

On the east-central coast, the species has been found breeding on Norman Lockyer Island (Feilden 1877, 1878, Burton in Williams 1982), at Princess Marie Bay (Burton in Williams 1982) and at Alexandra Fjord (Freedman and Svoboda 1982). The large concentrations found in the Flagler Bay polynya system by Ouellet (in Schledermann 1980) - 60 on 18 June and 200 on 10 July 1979 - also suggest breeding in the area.

In the south, the species is a common breeding bird (Bay 1904, Schaaning 1933). On the west-central coast, it is conspicuous but not abundant (Parmelee and MacDonald 1960, Godfrey 1953, Macpherson 1963). The species breeds northwards through Greely Fjord and Nansen Sound, and has been found nesting at Borup Fjord (Hankinson 1990) and Emma Fjord (Osbourne 1982). The species was not seen in the Yelverton Bay/Milne Bay area by Williams (1972) in 1972.

The Arctic Tern is one of the latest of the regular breeders to arrive on Ellesmere Island, often not making its appearance until mid to late June. At Lake Hazen, arrivals were recorded on 16 June 1962 (Savile and Oliver 1964) and 16 June 1966 (Nettleship and Maher 1973). In the northeast, arrival dates 18 miles southwest of Fort Conger were given as 21 June 1882 and 18 June 1883 by Greely (1886). Near Alert, Feilden (1877) recorded arrival on 16 June 1876 and MacDonald (1953) on 22 June 1951: one was first seen near Alert on 25 June 1975 (Morrison unpubl.).

The birds generally do not appear to be paired on arrival, but pairs form soon afterwards and egg-laying on Ellesmere Island appears to be mostly in late June or early July. The incubation period for the Arctic Tern appears to be 21 days (Parmelee and MacDonald 1960, Parmelee et al. 1967) or 21-22 days (Hussell and Holroyd 1974)., so that laying dates for two nests at Lake Hazen in 1962 would have been 22-25 June and 26-28 June, some 7-10 days after the birds' arrival. In 1965, clutches were laid on 29 June and 7-8 July (Nettleship and Maher 1973): in 1966, a late clutch which hatched on 10 August would have been laid on 20 July. Hatching occurred after 21 July 1981 and 31 July 1982 (Gould 1988). Nest dates reported by Parmelee and MacDonald (1960) also indicated laying in early July and hatching

in late July and early August. Both sexes incubate the eggs and intruders are generally, though not invariably, viciously attacked (e.g. Salomonsen 1950-51, Greely 1886).

The majority of Arctic Terns apparently return to the same breeding place from year to year. Salomonsen (1967) reported many recoveries of birds up to 19 years old at the places they were banded as nestlings, and Hussell and Holroyd (1974) reported one bird returning from year to year at the Truelove Lowland on Devon Island. Most one-year old birds remain south of the breeding grounds and although an increasing proportion of two year olds come north, it is not until three years of age that maturity occurs (Salomonsen 1967).

Fledging takes 23 days, and within a short time, the young are able to fly strongly: the birds remain in the general vicinity of the breeding area with their parents before migration, which may be within a week of fledging (Salomonsen 1967, Parmelee and MacDonald 1960). Fledging occurs on Ellesmere Island from mid to late August, sometimes from early August. At Lake Hazen, the first flying young were seen on 8 August 1962 (Savile and Oliver 1964), 1 August 1958 (Tener in Savile and Oliver 1964), and 12 August 1966 (Nettlehsip and Maher 1973). On the Fosheim Peninsula, flying young were first seen on 17 August 1955 (Parmelee and MacDonald 1960). Feilden (1877) reported nearly flying young at 81°40'N on the northeast coast on 17 August 1876. The adults undergo some body moult, which is not completed, and departure of parents and young birds occurs rapidly in late August and early September (Parmelee and MacDonald 1960). Latest sightings for the north coast were on 3 September 1951 (MacDonald 1953), in the northeast at Discovery Harbour on 26 August 1875 (Greely 1886), at Lake Hazen on 19 August 1962, and on the Fosheim Peninsula on 28 August 1848 (Duvall and Handley in Parmelee and MacDonald 1960), 29 August 1953 (Brugemann in Parmelee and MacDonald 1960) and 1 September 1955 (Parmelee and MacDonald 1960).

Populations from the eastern Arctic and western Greenland migrate to wintering grounds in antaractic and subantarctic waters. The migration route takes them south through Baffin Bay, then eastwards with prevailing winds across the Atlantic Ocean to the west coast of Africa, which they pass down in October and early November. Off South Africa, they encounter the Roaring Forties, which drifts them eastwards as they head for the Antarctic pack ice, which is reached in the early austral summer. The birds moult their flight feathers on the southern "wintering grounds". During the course of the "winter", many make a complete circumnavigation of the Antarctic continent, and by spring, most of the Canadian arctic breeders are again drifted through the Drake Passage into the South Atlantic Ocean, where they move northwards, feeding in the Benguela Current, the adults moving rapidly up and across the Atlantic again to the breeding

grounds, many juveniles remaining off Africa during the northern summer. The migration is very rapid and the birds build up considerable fat reserves before departure, probably feeding little during the journey. This remarkable route covers some 22,000 miles or 35,600 km. (See Salomonsen 1967, 1967a, Lockley 1974; also Bent 1921, Godfrey 1986, Storr 1958, Hawksley 1949, Johnson and Herter 1989).

DOVEKIE Alle alle

The only reported breeding site of the Dovekie in Canada is in Home Bay, Baffin Island (69°02'N 67°23'W) (Finley and Evans 1984): the species is not currently known to breed in the northeastern Canadian High Arctic (Godfrey 1986, Brown et al. 1975), though its presence has been recorded on a number of occasions on Ellesmere Island and Godfrey (1986) suggested possible breeding on Hans Island. It appears to be a casual or accidental visitor to northeastern coastal parts of the EINPR.

In northwest Greenland, Dovekies breed in enormous numbers, principally in the High Arctic zone of the northwest, where numbers have been estimated as possibly 30 million between about Etah and Melville Bay (Salomonsen 1950-51, 1967, 1974, 1981, Brown et al. 1975, Freuchen and Salomonsen 1958). This may represent some 50% of the species' total numbers (Roby et al. 1981). In view of the myriads of birds breeding on the Greenland side, it might seem surprising that none have been found breeding on the Ellesmere Island side, but as Dunbar (1969) pointed out, one of the constant features of the North Water is the persistent land-fast ice edge running down the Ellesmere coast, and many parts of the coast, including most of Makinson Inlet, remain ice-bound until late in the season. Comparison of the distribution of breeding colonies in northwest Greenland with the occurrence of pack ice or ice-free areas from April onwards (Salomonsen 1967, 1974, Brown et al. 1975, Ito 1982) shows very clearly that the Greenland colonies are all located adjacent to such areas.

On the east coast of Ellesmere Island, neither Feilden (1877, 1878) nor Greely (1886) reported seeing Dovekies further north than Buchanan Strait south of the Bache Peninsula. The most northerly records to date are those of MacDonald (1953), who collected an adult male at Parr Inlet at Alert on 31 August 1951, and Morrison (unpubl.), who found a dead bird being carried by an arctic fox at Alert on 8 June 1988.

There are few records for other parts of the east and southeast coasts of Ellesmere Island. Single birds were seen at Princess Marie Bay on 8 and 31 July 1980 (Burton in Williams

1982). Ouellet (in Schledermann 1980) reported 15 on the Flagler Bay polynya on 15 June 1979 (though none was seen during visits on 18 June and 8 and 10 July 1979). McLaren and Renaud (1979) reported that no Dovekies were observed during aerial surveys along the south east and eastern coast of Ellesmere Island as far north as Pim Island on 31 May-1 June 1978, and the species was again absent from the Ellesmere Island side of Smith Sound and Baffin Bay on 1 July 1978.

THICK-BILLED MURRE Uria lomvia

No records of Thick-billed Murres exist for the EINPR; it is possible though not very likely that the species may occur occasionally as a vagrant along the northeastern coast of Ellesmere Island.

The nearest breeding colonies of Thick-billed Murres are on Coburg Island, off southeast Ellesmere Island, and in the Thule District of northwest Greenland (Brown et al. 1975, Gaston 1980, Gaston and Nettleship 1981, McLaren 1982, Salomonsen 1950-51). Brown and Nettleship (1981) point out that all of these colonies, and others in arctic Canada and west Greenland, are situated on coastlines adjacent either to recurring polynyas or to waters covered with unconsolidated pack-ice during the winter. Sightings of Thick-billed Murres are thus plentiful off the southeast coast of Ellesmere Island, but are elsewhere generally limited by the occurrence of open water.

Feilden (1877, 1878) considered the North Water as the northern limit of the range of the species, with two birds at 79° in Buchanan Strait in August 1875 representing the most northerly records. Greely (1886, 1888) reported a similar situation, with most northerly records at Littleton Island on the Greenland side in 1881 and north of Cape Sabine on the Canadian side in 1884. One bird was observed by Ouellet (in Schledermann 1980) in the Flagler Bay polynya area on 18 June 1979.

Records for the ice-bound western (Parmelee and MacDonald 1960, Waterston and Waterston 1972), northwestern (Osbourne 1982) and northern (MacDonald 1953, Feilden 1877, 1878, MacMillan 1918, 1927) are lacking, although Macpherson (1963) reported a single "murre" at Eureka on 30 August 1960, possibly a late-season vagrant.

BLACK GUILLEMOT Cepphus grylle

The Black Guillemot occurs in moderate numbers in coastal areas of the EINPR in the northeast of Ellesmere Island; it likely breeds in the area, though this has not been proven.

On Ellesmere Island, the breeding distribution of the Black Guillemot is strongly influenced by the availability of open water during the summer and possibly spring, being concentrated on the south coast and southern half of the east coast (Godfrey 1986, Brown et al. 1975); these areas are mostly adjacent to the North Water and Hell Gate and Cardigan Strait polynyas and other areas which become open in Jones Sound (Brown and Nettleship 1981, Smith and Rigby 1981).

Greely (1886) reported that the species was a common bird and probably nested around the cliffs of Cape Lieber, and that it was occasionally seen near Distant Cape, both near Discovery Harbour. Further northwards, MacDonald (1953) recorded it twice near Alert in 1951 (4 on 25 July and one on 30 July); Feilden (1877, 1878) found two or three in pools on floes as far north as 82°33'N, but did not think the species bred further north than Cape Union. Morrison (unpubl.) observed 100-150 Black Guillemots on a patch of open water at the base of Cape Defosse (c. 81°13'N) not far south of Cape Lieber, on 31 May 1975, and another eight on a patch of open water at Cape Frederick VII (c. 82°06'N), not far south of Cape Union, on 30 May 1975; four more were seen at the latter locality on 31 May 1975.

Breeding birds apparently can reach similar latitudes in Greenland - the species range extends nearly continuously up to Washington Land (Feilden 1877, 1878 reported it at Bessels Bay) and in good ice years as far as Hall Land (Bessels 1879, Hart 1880, Salomonsen 1950-51, 1967, 1981).

Black Guillemots nest in large numbers along the southern coast of Ellesmere Island (McLaren 1982, Shortt and Peters 1942, Bay 1904, Sverdrup 1904 and in Schaaning 1933, Nettleship 1974b, Brown et al. 1975, Renaud and Bradstreet 1980, Brown and Nettleship 1981). Black Guillemots have not been reported from various fjords on the west coast of the island (e.g. Fosheim Peninsula, Parmelee and MacDonald 1960, Waterston and Waterston 1972), nor from the northwest (Osbourne 1982), nor central parts of the north coast (Williams 1972, Feilden 1877, 1878, MacMillan 1918, 1927, Greely 1886), all of which are well removed from regularly occurring polynyas. Nesting has been recorded on the east-central coast of Ellesmere Island in the Princess Marie Bay area (Feilden 1877, 1878, Burton in Williams 1982), and large numbers were reported on the Flagler Bay polynya by Ouellet (in Schledermann 1980) in 1979: 60 on 15 June, 250 on 18 June, 300 on 8 July and 350-400 on 10 July 1979.

Most adult black Guillemots move south during the winter. In Greenland, the populations from different parts of the coast move southwards in a series of sliding parallel displacements (Salomonsen 1967). Many first-year birds apparently disperse northwards in their first winter, not only through drift with the northward currents off Greenland, but also by active movement (Salomonsen 1967), and it may well be these birds which have been reported in small numbers throughout the winter as far north as open water is found (Brown and Nettleship 1981). Black Guillemots were seen as early as 28 February 1872 at Thank God Harbour (Bessels 1879, Davis 1876), and both Hayes (1867) and MacMillan (1918, 1927) reported Black Guillemots in Smith Sound during February; other records from these northerly regions were provided by Greely (1888) and Nares (1878). Greely (1886) reported arrivals at Fort Conger on 9 June 1882 and 4 June 1883, and at Thank God Harbour on 26 May 1876. A bird in winter plumage was seen at Cape Sabine on 15 March 1884, probably an overwintering individual (Greely 1886).

Salomonsen (1950-51) provides the following schedule for the High Arctic in Greenland: arrival in the last half of April, eggs in the last half of June, young leaving the nest from mid August, when they can fly, and birds dispersing in September/October, with movements southward during October and November. Nests are generally located in steep areas of bouldery scree or in crevices. Clutches are usually two eggs: incubation lasts 28 days and the young fledge 35-40 days after hatching (Divoky et al. 1974). Both adults feed the young, but the parents depart when the young leave the nest (Salomonsen 1950-51). The latest bird to be seen near Floeberg Beach on the northeast coast was 29 August 1875 (Greely 1886).

SNOWY OWL Nyctea scandiaca

The Snowy Owl is a regular, though not especially numerous, breeding bird within the EINPR.

The Snowy Owl has been reported from most areas of Ellesmere Island, and probably breeds throughout the island in years when the lemming populations are high enough to enable it to do so. It is well known that Snowy Owls are highly dependent on population levels of lemmings, breeding prolifically in years when lemmings are abundant and hardly at all in years when they are scarce: years with intermediate levels may result in some attempted breeding (Salomonsen 1950-51, Parmelee et al. 1967, Parmelee 1972). On Ellesmere Island, the Snowy Owl is dependent on cycles of the collared lemming (Dichrostonyx groenlandicus), which reaches a peak about every four years (Salomonsen 1950-51, Godfrey 1986, Banfield 1974), and this may account for the considerable variability in abundance reported from different areas.

At Tanquary Fjord, Williams (1972) reported a juvenile bird seen in Air Force Valley on 5 August 1972. At Lake Hazen, the species is apparently an irregular breeder. It was not seen in 1962 or 1981, was seen occasionally but did not breed in 1958, 1961, 1965, and 1982, and has only been found breeding in 1966, when there was a relatively high lemming population (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). One nest was reported near Divide Glacier northeast of Lake Hazen on 13 July 1989 (Canadian Parks Service unpubl. data).

In the northeast, both Feilden (1877, 1878) and Greely (1886, 1888) described the species as breeding abundantly near Fort Conger/Discovery Bay, Greely mentioning that up to 15-20 young birds were kept at Fort Conger in 1882, which was thought to be a peak lemming year (Salomonsen 1950-51). Nettleship and Maher (1973) reported a male and four chicks barely able to fly at Fort Conger on 29 July 1966, another good year for lemmings.

Feilden (1877, 1878) described finding several nests in the Alert area in 1876, thought to be a high lemming year (Salomonsen 1950-51), and breeding in this area was also reported by MacMillan (1918, 1927) in 1909. MacDonald (1953), on the other hand, although observing the species frequently throughout the season at Alert between 24 April and 11 August 1951, did not find any evidence of breeding in a year when lemmings were thought to be scarce and in which Long-tailed Jaegers also did not breed. Morrison (unpubl.) observed the species near Black Cliffs Bay on 23 June 1975.

Recent records (since 1988) have included sightings of Snowy Owls at Hazen Camp, northeast of Lake Hazen in the Boulder

Hills/Divide Glacier area, and around Fort Conger/Discovery Harbour (Canadian Parks Service unpubl. data).

In other parts of Ellesmere Island, reports indicate a variable population which is dependent on the presence of lemmings, including the south coast (Bay 1904), the west coast (Bruggemann 1953, 1954, Godfrey 1953, Parmelee and MacDonald 1960, Waterston and Waterston 1972), the northwest (Osbourne 1982), and the east coast (Burton in Williams 1982, Freedman and Svoboda 1982). Greely (1886, 1888) reported a bird flying northwards at Cape Sabine on 20 May 1884.

Although thought to be resident in parts of its range, most Snowy Owls on Ellesmere Island and the High Arctic parts of Greenland probably move south some distance during the winter (Salomonsen 1950-51). Some birds apparently winter within the breeding range, however: they are known to winter as far north as Etah in northwest Greenland (MacMillan 1918, 1927, Salomonsen 1950-51), on Jenny Lind Island in the central Canadian Arctic (at least in years of lemming abundance, Parmelee et al. 1967), and many winter within their breeding range in the Beaufort Sea area (Johnson and Herter 1989) and in Alaska (Pitelka et al. 1955a,b).

Early sightings include 29 March 1876 at Floeberg Beach (near Alert) (Feilden 1877, 1878) and 24 April 1951 at Alert (MacDonald 1953), and the species has been seen as late as 17 October 1882 at Fort Conger (Greely 1886, 1888).

Egg-laying appears to take place from around mid May to early June. Clutch size varies from about 3-11, often being largest (9-11) in years of lemming abundance: the eggs are laid at intervals of 40-48 hours and incubation starts with the first egg. Incubation takes 32-33 days and the eggs hatch at similar intervals to those at which they were laid. The female alone incubates, while the male brings food to the nest. Early hatching young have the highest chance of success. Chicks leave the nest well before fledging and scatter nearby on the tundra, where the male continues to feed them, the female remaining at the nest while there are eggs or young. After the last young leave the nest, the family regroups and is attended by both adults until the last young have fledged. Fledging takes some 45-50 days. Most young fledge in August. Owing to the asynchronous start of incubation and large clutch size, the breeding season is considerably elongated, and many cover as much as 104 days - or 3-3 1/2 months. Banding returns show young may disperse to widely different areas for the winter, though some have returned quite close to their natal area as three-year-old birds (from Salomonsen 1950-51, Parmelee et al. 1967, Parmelee 1972, Taylor 1974, Johnson and Herter 1989, Sutton and Parmelee 1956, Pitelka et al. 1955a,b, Watson 1957).

HORNED LARK Eremophila alpestris

The Horned Lark has not been reported from within the EINPR. There appears to be only one record of the species on Ellesmere Island. Freedman and Svoboda (1982) report that it was observed at Alexandra Fjord on the east-central coast in 1980-81. Godfrey (1986) marks the distribution of the Horned Lark in Canada as extending throughout the Arctic islands up to about 76-77°N, in the east to and including Devon Island.

COMMON RAVEN Corvus corax

The Common Raven has been observed infrequently within the EINPR, principally in areas near the northeast coast of Ellesmere Island.

The species was not recorded near Tanquary Fjord (Williams 1972). It has only been seen once at Lake Hazen (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). At Fort Conger, ravens were seen occasionally in 1881-1884 (Greely 1886, 1888). There have been no reports of the species from the north coast of Ellesmere Island, (Feilden 1877, 1878, 1878a, Williams 1972), or from the Alert area in 1951 (MacDonald 1953) or in late May/early June 1974-1976 and 1986-1990 (Morrison unpubl.).

The Common Raven has been reported fairly regularly, though sparsely, on the south (Bay 1904, Schaaning 1933, Shortt and Peters 1942) and on the east (Feilden 1877, 1878, 1878a, Morrison unpubl., Greely 1886, 1888, Freedman and Svoboda 1982, Schledermann 1980) coasts of Ellesmere Island, although no definite proof of its breeding has so far been obtained .

Records from the west coast are infrequent (Tener 1963, Waterston and Waterston 1972, Bruggemann 1953, 1954, Parmelee and MacDonald 1960, Duvall and Handley 1948, Parmelee and MacDonald 1960, Troelsen 1952), and the species has not been seen in the northwest (Osbourne 1982).

In northwest Greenland, the Raven breeds up to the Thule District, as far north as Etah (Salomonsen 1950-51, 1967, 1974, 1981). A few birds may remain to winter in the Thule District as far north as Etah (MacMillan 1918, 1927, Salomonsen 1950-51). The species returns northwards in the spring very early with the light, eggs normally being laid in the first half of April. Clutches are 4-5, occasionally 3 or 6. Nestlings are seen until mid June, with fledging from early June: family parties are seen from mid June to mid July, when the adults are undergoing their

wing moult. The young gather in flocks in August and gradually move south until October (Salomonsen 1950-51). A similar situation probably occurs in Ellesmere Island. On the south coast, the species has been oberved as early as 13-24 March 1900 and up to 26 September 1901 (Sverdrup in Schaaning 1933), while on the east coast, Greely reported it at Cape Sabine until November 1883 and reappearing on 20 February 1884). A single bird was said to have remained at Grise Fjord throughout the winter of 1977-1978 (L. Andlalik in Renaud and Bradstreet 1980).

Salomonsen (1950-51) noted that the most northerly records in Greenland probably involve wandering, non-breeding birds, and that in the northern part of its breeding range, nesting was apparently dependent on the presence of seabird colonies, usually involving only the very large colonies, or human habitation. Large seabird colonies of the type found in northwest Greenland are not present on the Ellesmere mainland. Human habitation is also very sparse, with one small settlement at Grise Fjord and weather stations at Eureka and Alert, and ravens do not appear to have been attracted to either of the weather stations (Parmelee and MacDonald 1960, MacDonald 1953, Morrison unpubl.).

In summary, Common Ravens may breed sparsely, if at all, along the southern coast and up to the central east coast, most likely along coastlines which become ice-free during the summer and which are influenced by polynyas. Records on the west-central coast and up to Fort Conger on the east coast probably involve wandering birds. Records for the north coast are lacking.

NORTHERN WHEATEAR Oenanthe oenanthe

There are currently no records of the Northern Wheatear from within the EINPR, although its presence might be anticipated on an occasional basis.

The Northern Wheatear appears to be a very uncommon bird on Ellsmere Island. Proof that breeding occurs on the island was obtained by Parmelee and MacDonald (1960), who found a single pair with a nest on the Fosheim Peninsula in 1955, and by Boothroyd (1984), who found a nest at Hare Fjord. Few other records exist. Parmelee and MacDonald (1960) saw one other individual, a male near Slidre Fjord on 22 June 1955, and the species was also noted at Bay Fjord on the west coast south of the Fosheim Peninsula in June 1899 by Sverdrup (1904 and in Schaaning 1933). Parmelee and MacDonald (1960) speculated that it might have been more abundant in 1955 than their records indicated, because they did not often visit the rocky interior, a preferred habitat (Salomonsen 1950-51), and this consideration

would apply to most other investigations. Two other sightings exist, of a female seen from 29 May to 5 June 1987, and of a dead male found on 25 May 1989, both at Alert (Morrison unpubl.).

In Greenland, the Wheatear is a common breeder in the Thule district up to Etah: in the present century, it has expanded considerably in number and range in the northwest, probably as a result of climatic amelioration (Salomonsen 1950-51). It is not clear that this expansion has reached Ellesmere Island. With the reservation that the species may have gone undetected in interior areas, its occurrence and breeding on the island appear to be only occasional, though Godfrey (1986) marks its range as including the southern half of Ellesmere Island.

Wheatears from the west coast of Greenland migrate to the Old World (Salomonsen 1950-51, 1966, 1967); those from the eastern Canadian Arctic are also thought to winter in the Old World (Godfrey 1986).

LAPLAND LONGSPUR Calcarius lapponicus

The Lapland Longspur appears to be a scarce and irregular breeding bird in the EINPR. It has been reported as nesting from only a few localities on Ellesmere Island, where it reaches the northern limit of its breeding range, probably around Lake Hazen; it is generally more common in the Low Arctic (Salomonsen 1950-51, Parmelee and MacDonald 1960).

At Lake Hazen, the species breeds irregularly and rarely: it was not seen in 1965 (Nettleship and Maher 1973) or 1975 (Morrison unpubl.), seen but did not breed in 1961, 1962 and 1966 (Savile and Oliver 1964, Nettleship and Maher 1973), and one pair bred in the area in 1958, when Tener (1961) found a female feeding a flightless young, with the other adult nearby, on 24 July 1958.

There are no records from the northwest (Osbourne 1982) and north (Williams 1972, Feilden 1877, 1878, 1878a) coasts, including Alert (MacDonald 1953), nor from the northeast (Greely 1886, 1888). On the east-central coast, the species has been seen with greater regularity, and breeding has been recorded at Princess Marie Bay (Morrison unpubl., Burton in Williams 1982) and at Alexandra Fjord in 1980-81 (Freedman and Svoboda 1982).

In southern Ellesmere Island, the only record is of an adult male at Craig Harbour on the late date of 26 August 1938 (Shortt and Peters 1942). On the Fosheim Peninsula, it appears to be rather uncommon, and most records come from the area of Eastwind Lake, where there was a small colony estimated to contain about

20 pairs in 1955 (Parmelee and MacDonald 1960). Records elsewhere on the Fosheim Peninsula are few, and include a single bird east of Slidre Fjord on 12 July 1955 (Sim and Marsden in Parmelee and MacDonald 1960) and a male at Irene Bay on 19 July 1972 (Waterston and Waterston 1972).

In Greenland, the Lapland Longspur is principally a bird of the Low Arctic region, but has extended its range, perhaps in the present century, to the southern parts of the High Arctic region, apparently as a result of climatic amelioration (Salomonsen 1950-51). In northwest Greenland, it breeds in the Thule District and has been found breeding up to Inglefield Bay and possibly Inglefield Land (Salomonsen 1950-51, 1967, 1979, 1981). The west, and possibly east, Greenland population winters in North America.

SNOW BUNTING Plectrophenax nivalis

The Snow Bunting is a common breeding bird in the EINPR; it is certainly one of the commonest and perhaps the most abundant bird on Ellesmere Island, breeding in all parts of the island.

The Snow Bunting was probably the most abundant passerine at Lake Hazen, where the preferred breeding habitat was talus slopes, shortage of suitable nesting crevices limiting its numbers on foothills and lowland habitats (Savile and Oliver 1964, Nettleship and Maher 1973, Gould 1988). The species has been observed regularly at Tanquary Fjord and almost certainly nests in the area (Morrison unpubl., Williams 1972).

Greely (1986, 1888) considered it the most common land bird in Grinnell Land, and eggs, nests and young were obtained during the work at Fort Conger. It is a regular breeder in the Alert area (MacDonald 1953, Morrison unpubl.), and was observed and found breeding to the north and west of Alert up to 82°35'N by Feilden (1876, 1878). It likely breeds throughout the northern parts of the EINPR; Williams (1972) found it to be abundant in the Milne Fjord/Yelverton Inlet area.

On the east-central coast, it was a common breeder at Princess Marie Bay (Morrison unpubl., Knights in Williams 1982), and by far the most abundant breeding bird at Alexandra Fjord (Freedman and Svoboda 1982). Ouellet also reported the species from the Flagler Bay area (in Schledermann 1980).

Elsewhere on Ellesmere Island, it has been consistently reported as a regular breeding bird, including on the south (Bay 1904, Schaaning 1933), west-central (Parmelee and MacDonald

1960, Waterston and Waterston 1972) and northwest coasts (Parmelee and MacDonald 1960, Osbourne 1982). Population levels and distribution may be considerably affected by weather between years, as noted by Hussell and Holroyd (1974) on the Truelove Lowland on Devon Island (and see Meltofte 1976).

The Snow Bunting is one of the earliest migrants to arrive on Ellesmere Island; variation in arrival dates from year to year are thought to occur owing to climatic variation on the breeding grounds themselves (Pleske 1928) as well as on migration areas and on the wintering grounds (Tinbergen 1939). The arrival period may be considerably protracted with major influxes and/or movements occurring well after the first migrants. At Fort Conger on the northeast coast, arrivals occurred on 14 April 1882 and 24 April 1883, and further south at Cape Sabine on 13 April 1884 (Greely 1886, 1888). Feilden (1876, 1878) recorded the arrival on 13 May 1876 at Depot Point (82°35'N), and at Alert, MacDonald (1953) first recorded the species on 27 April 1951, though it was not seen again until 21 May, after which it was observed regularly. The schedule may be delayed by up to a month in years with poor weather (Salomonsen 1950-51).

Arrivals in the northern parts of Ellesmere Island may be somewhat later than in the south: Bay (1904) stated arrivals occurred on the south coast in either late March or early April, while arrivals on the Fosheim Peninsula have been recorded from mid April to early May (Parmelee and MacDonald 1960), and northwest and north from early to late May (Osbourne 1982).

The arrival and pre-nesting period is consderably protracted, and may last some 6-8 weeks (Salomonsen 1950-51, Parmelee and MacDonald 1960, Meltofte 1983). On Ellesmere Island, males, which arrive first, start moving inland in early to mid May and start to establish territories (Parmelee and MacDonald 1960). Females arrive some 2-4 weeks after the males, though arrivals of both sexes continue into late May. Migration continues throughout May, with maximum numbers recorded in late May (Parmelee and MacDonald 1960, Meltofte 1983). There is some suggestion of flocks at Lake Hazen in early June (Nettleship and Maher 1973), with arrivals around the end of the first week of June at Alert, where (MacDonald 1953) recorded maximum numbers during the period 7-12 June 1951 (peak of 50 on 9 June), suggesting the arrival schedule may be somewhat later on the north coast.

Pairs may be seen from the latter part of May, sometimes early June. Nest construction is by the female and starts from late May, usually in crevices in rock fields, or cavities in other habitats, though sometimes unusually on open ground, and old nests may be relined and reused from year to year (Watson 1957a, Parmelee and MacDonald 1960, Freedman and Svoboda 1980).

Egg-laying may occur from early June, though probably most clutches are completed in the latter half of June. One egg is laid per day (Tinbergen 1939), incubation takes 12 or 13 days (Parmelee and MacDonald 1960) and fledging 10-12 days (Manniche 1910). Clutch size at Princess Marie Bay was generally 4-5 (occassionally 3 or 6) (Knights in Williams 1982, Morrison unpubl.), on the Fosheim Peninsula 6-8 (Parmelee and MacDonald 1960) and in Greenland 4-7 (usually 6, sometimes 3, maximum recorded 9; Salomonsen 1950-51). Incubation starts with the laying of the third or fourth egg (Parmelee and MacDonald 1960). After hatching, the young scatter in the area of the nest, and are fed by both parents for up to 8-10 days (Salomonsen 1950-51) or perhaps 10-12 days (Asbirk et al. in Meltofte 1983).

By mid July, newly fledged young become apparent everywhere, often with dramatic suddenness. Song and territorial activity generally cease around this period. Males start a complete post-nuptial moult around mid July: the moult proceeds with such rapidity and with so many feathers in growth at once, that birds may become practically flightless during the latter part of July and early August (Salomonsen 1950-51, Parmelee and MacDonald 1960, Hussell and Holroyd 1974, Green and Summers 1975). Females start moult somewhat after males. Adults become rather inconspicuous during their moult, many retiring to secluded places away from the coast, and skulking or hiding to avoid detection. Juveniles leave the adults and form large flocks from late July or early August, and undergo a post-juvenilt moult which is completed in early September. Young and adults in winter plumage gather along the coast from late August: in 1955, Parmelee and MacDonald (1960) reported flocks of at least 1000 birds on 24 and 27 August at Eureka, and another of about 800 near Eureka on 10 September. Migration probably begins in late August or early September, and numbers on the Fosheim Peninsula decreased rapidly after mid September, most birds having left by the end of the month. Bay (1904) stated the species departed in October in southern Ellesmere Island. Last recorded dates include 16 October 1955 on the Fosheim Peninsula (Parmelee and MacDonald 1960), 1 September 1951 at Alert (MacDonald 1953) and 24 September 1875 near Alert (Feilden 1877, 1878). The vast majority apparently leave for the winter, although a few may remain around weather stations or settlements. Parmelee and MacDonald (1960) describe reports of two birds at Alert on 29 November 1952 and a few days later, during the dark period. Salomonsen (1950-51) was skeptical of MacMillan's (1918, 1927) report that the Eskimos said some remained all winter at Etah, though Bird (Bird and Bird 1941) was said to have observed a few at Mackenzie Bay as late as 10 December 1937 on the northeast coast, and some birds winter in the southern parts of the country (Salomonsen 1950-51, Meltofte 1983).

Banding has shown that some adults return to the same breeding areas from year to year (Salomonsen 1967, Hussell and Holroyd 1974). In the autumn, southward movements are indicated by declining jumbers at Alert from mid August in 1951 (MacDonald 1953), observations of migrating flocks at Lake Hazen during the period 15-20 August 1958 (Tener in Savile and Oliver 1964) and large numbers gathering and observations of many flocks on the Fosheim Peninsula from late August (Parmelee and MacDonald 1960).

Breeding schedules from other parts of Ellesmere Island appear similar to those on the Fosheim Peninsula. At Lake Hazen, Savile and Oliver (1964) and Nettleship and Maher (1973) found dispersal of flocks in early June, with egg-laying apparently occurring during June and most nests hatching in the first half of July. The first flying young were observed on 16 July 1961, 13 July 1962, 8 July 1965 and 14 July 1966 (one fledging period of 11 days was recorded in 1962) and flocks of juveniles formed from late July in 1962 and 1966. A similar schedule occurred in 1981-1982 (Gould 1988).

Snow Buntings breeding on Ellesmere Island have been referred to the race P. n. nivalis (Salomonsen 1950-51, Godfrey 1953, 1986, Parmelee and MacDonald 1960). For a discussion of the taxonomy of the Snow Bunting see Salomonsen (1931, 1947, 1950-51).

HOARY REDPOLL Carduelis flammea hornemanni

The Hoary Redpoll is a regular though not very numerous breeding bird in the EINPR.

At Lake Hazen, Hoary Redpolls have nested regularly: they were relatively common on talus slopes, but scarce on the lowlands and foothills in 1961-1966 (Savile and Oliver 1964, Nettleship and Maher 1973), but were not observed, however, at Hazen Camp in 1981-1982 (Gould 1988).

The species was not observed on the north or northeast coasts by Williams (1972), Feilden (1877, 1878, 1878a) or Greely (1886, 1888). MacDonald (1953), however, observed the species occasionally from April to August in the Alert area, and suppoed that it bred: most observations were in steep rocky ravines.

On the east coast, the species was only seen at Princess Marie Bay in 1983 (Morrison unpubl.), but it was recorded regularly in 1980 and 1981 at Alexandra Fjord, where it apparently nested on or near talus slopes (Freedman and Svoboda 1982).

Although widely distributed on Ellesmere Island, the Hoary Redpoll has not been encountered by all authors, and its breeding distribution is probably patchy. In the south, it was not mentioned by Bay (1904) or Sverdrup (in Schaaning 1933) and no specimens obtained. On the Fosheim Peninsula, flocks have been recorded along fjord slopes in early spring and in late summer and autumn, but nesting appears to be confined to barren inland rocky areas (Parmelee and MacDonald 1960). The species was not observed in the northwest of Ellesmere Island in 1981 (Osbourne 1982).

In Greenland, breeding occurs on high interior hill slopes and mountainsides, mostly with willow or other well-developed shrubs, which Salomonsen (1950-51) describes as indispensable to it: this contrasts with the situation on Ellesmere Island, where the species appears confined to barren rocky areas or talus slopes.

On Ellesmere Island, flocks appeared as early as 22 April 1955 on the Fosheim Peninsula and were found along coasts (as well as in the interior) during spring and autumn, being confined to inland areas while nesting (Parmelee and MacDonald 1960). MacDonald (1953) saw the species on 29 April 1951 at Alert. At Lake Hazen, arrival dates were uncertain, but thought to be early in the season (Savile and Oliver 1964), though it was not recorded until 6 June in 1966 (Nettleship and Maher 1973). Nesting appears to occur in June, with first flying young being seen on 27 June 1962 and family parties being seen from early to mid July at Lake Hazen (Savile and Oliver 1964, Nettleship and Maher 1973), and from early August on the Fosheim Peninsula (Parmelee and MacDonald 1960). During this period both adults and young are in moult and winter plumage is acquired in early September (Parmelee and MacDonald 1960, Savile and Oliver 1964). Incubation takes 11 days and fledging 11-12 days (Salomonsen 1950-51). At Lake Hazen, most Hoary Redpolls depart by the end of July, the latest date being 4 August 1961 (Savile and Oliver 1964), though the species was seen up to 13 August 1951 at Alert, when a maximum of 6 was observed (MacDonald 1953). Migration on the Fosheim Peninsula occurs from early-mid September, the latest date for the species being 17 September 1955 (Parmelee and MacDonald 1960).

Redpolls breeding on Ellesmere Island have been referred to the race Acanthis flammea hornemanni on the basis of their large size (Godfrey 1953, Parmelee and MacDonald 1960).

THE AVIFAUNAL RESOURCES OF THE ELLESMERE ISLAND NATIONAL PARK RESERVE

Significance of the Avifauna

The avifauna of the Ellesmere Island National Park Reserve is of special significance not merely as an example of a high arctic bird community, but as an avian community whose members are able to survive and reproduce at the most northerly limits of land in the world. Although the number of species and individuals inhabiting the region is low compared with areas further south, each is a highly specialised and adapted species that is not only able to live under the extremely harsh environment found at such high latitudes, but is able to undertake the long migrations required to reach the area from distant winter quarters. It is not yet known to what extent most of the populations breeding on northern Ellesmere Island differ genetically from populations of the same or different subspecies breeding elsewhere, but the genetic resources contained in the avifauna (and other animals) of the EINPR must be regarded as being of outstanding significance. Baker (1991) recently showed that Red Knots of the subspecies Calidris canutus islandica from northern Ellesmere Island differed genetically from populations of C. c. rufa breeding in the central Canadian arctic, but it is not known how much genetic variation may exist within the subspecies themselves.

The avifauna of the EINPR must be regarded as one of the most interesting examples of an internationally shared wildlife resource. The long migrations undertaken by many of the birds breeding on northern Ellesmere Island take different species to many different parts of the globe, including Antarctica (Arctic Terns), most of the countries bordering the European seaboard (shorebirds and Brant), Africa (jaegers, terns), and North and South America (shorebirds). Few avifaunas include members dispersing to such a wide range of countries, continents and oceans.

Given the relatively low numbers of birds on northern Ellesmere Island, it is not likely that the populations of many species breeding there represent a highly significant proportion of the entire species population. For instance, the numbers of Greater Snow Geese breeding within the EINPR (see species accounts) form only a small proportion of the eastern arctic population of the species (250,000-400,000, H. Boyd pers. comm.), but its genetic significance as the most northerly element of the population breeding at the edge of the range is important.

Similar considerations apply to species such as the Baird's Sandpiper, which reaches the edge of its range on Ellesmere Island; individuals breeding within the EINPR are likely to undertake some of the longest migrations within the species, whose wintering grounds extend to southern South America. Again, species such as the Arctic Tern, Long-tailed Jaeger, Gyr Falcon and Snowy Owl, which have extensive breeding ranges across the arctic, are at the northern limit of their distributions.

On the other hand, Ellesmere Island supports internationally significant numbers of some shorebirds. For instance, the breeding range of the Red Knot C. c islandica extends through the high arctic zone of Greenland west as far as Prince Patrick and Melville islands in the Canadian Arctic, with Ellesmere Island possibly supporting the core of the breeding population. Meltofte (1985) attempted to estimate numbers of breeding shorebirds in Greenland and the eastern high arctic of Canada (Ellesmere Island and eastern Axel Heiberg Island), and found that Ellesmere Island supported up to 50% of the estimated population. Despite the facts that estimates of habitat area and breeding densities were necessarily crude, and that the more westerly arctic islands were not included, the work does indicate that Ellesmere Island is likely to contain a significant proportion of the breeding population of islandica. Given the suitable habitat and prominence of the species in areas around Lake Hazen, the EINPR seems likely to hold internationally significant numbers of Red Knot. A better understanding of the distribution, habitat availability and breeding density of knots within the EINPR is needed to assess this more authoritatively. The same applies to populations of the Ruddy Turnstone Arenaria interpres, which also migrates to European wintering areas, and for which Meltofte (1985) estimated that over half of the Greenland/arctic Canadian population resided on Ellesmere Island.

Ecological and other factors affecting bird distribution

Availability of habitat and food may be considered the most important factors affecting the distribution of bird populations in the EINPR. Most of northeastern Ellesmere Island may be classified as polar desert, and areas of habitat suitable for breeding birds are rather restricted. Within the EINPR, areas such as the north shore of Lake Hazen, the wetlands between the Turnabout River and Piper Pass, and the lakes and valleys to the southeast of Lake Hazen are known to be important breeding areas for birds, but little published information is available regarding habitat distribution or terrain characteristics elsewhere within the Reserve.

Cycles in lemming numbers affect breeding populations of

Snowy Owls and Long-tailed Jaegers, both of which are unlikely to breed in years of low lemming abundance. Jaegers, in particular, turn to shorebird populations as alternative prey when lemmings are scarce, so that predation pressure may vary considerably between years.

Some concerns affecting visitors to the EINPR

Visitors to the EINPR have a superb opportunity to view high arctic species of birds in a magnificent setting. The restricted diversity of species inhabiting the reserve will mean that relatively few species are likely to be seen during a visit and that the attraction will be in observing highly specialised and adapted birds in their natural environment.

Since breeding densities are low, it will usually be necessary to cover a large amount of terrain to encounter a variety of birds. Since this will involve a considerable amount of walking or hiking, it does mean that large areas are potentially liable to disturbance. The sensitivity of the terrain, even to walking, will make repeated visits to the same area undesirable. Visitors should take care to observe Reserve guidelines regarding disturbance of both the birds and the terrain.

Visitors should take great care not to cause excessive disturbance of birds and other wildlife during the breeding season. While detecting the presence of most species is relatively straightforward, finding nests can often be difficult. Considerable disturbance can result if observers spend undue amounts of time searching for nests that are difficult to find. While single brief visits to a nest site do not necessarily result in abandonment of nests by many species, repeated visits are likely to have much more detrimental effects. Even single visits to a nest causing a bird to flush can alert a predator to the location of the nest. Extended visits to nests can result in enough alteration of the terrain, either through disturbance or scent, that the nest is more likely to be discovered later by predators such as arctic foxes, ermine, jaegers or gulls. Disturbance during inclement weather when adults are accompanying recently hatched young that need regular brooding may result in mortality of young through exposure. Disturbance later in the season may affect energy reserves required for subsequent migration.

On the other hand, observations from interested birdwatchers can be valuable in documenting the avifaunal resources of the EINPR and in establishing the presence and numbers of birds in different parts of the reserve.

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Appendix I. Summary of field studies on birds in, and adjacent to, the Ellesmere Island National Park Reserve.

Date	Study Type	Area of coverage	Reference
1875-76	General avifauna	Floeberg Beach, north coast	Feilden 1877, 1878, 1878a; Nares 1878; Moss 1878
1882-84	General avifauna	Fort Conger	Greely 1886, 1888
1898-1902	General avifauna	Cape Sabine; south coast	Bay 1904; Sverdrup 1904; Schaaning 1933
1913-1917	General avifauna	north coast	MacMillan 1918, 1927
Aug. 1938, Aug. 1939	Bird records made during resupply voyages	Craig Harbour	Shortt and Peters 1942
August 1947, August 1948	General avifauna	Slidre Fjord	Duvall and Handley 1948
April-Aug. 1951	Muskox and other wildlife observations	Queen Elizabeth Islands	Tener 1961, 1963; see Godfrey 1953
April-Sept. 1951	General avifauna	Alert	MacDonald 1953; see Godfrey 1953
1952	Birds observed during geological investigations	Canyon Fjord	Troelsen 1952
1953, 1954	General avifauna	Fosheim Peninsula	Bruggemann 1953, 1954

Appendix I. Summary of field studies on birds in, and adjacent to, the Ellesmere Island National Park Reserve (contd.).

Date	Study Type	Area of coverage	Reference
April-Sept. 1955	General avifauna	Eureka, Fosheim Peninsula	Parmelee and MacDonald 1960
1956	Observations made during geological investigations	Eureka	Thorsteinsson and Tozer 1957
1958-1964	General avifauna, studies on jaegers, shorebirds	Lake Hazen	Savile and Oliver 1964; Maher and Nettleship 1968; Nettleship 1967, 1968, 1973, 1974; Maher 1970; Nettleship and Maher 1973
1960-61	Observations made during expedition activities	West-central Ellesmere Island	Macpherson 1963
1968	Snow Goose survey	Southern and western Ellesmere Island, including Fosheim Peninsula	Heyland 1968
1968	Studies of Red Knot	Eureka	Hobson 1972
1969	Snow Goose Survey	Ellesmere Island	Heyland and Boyd 1970

Appendix I. Summary of field studies on birds in, and adjacent to, the Ellesmere Island National Park Reserve (contd.).

Date	Study Type	Area of coverage	Reference
1969-1973	Seabird surveys	Eastern arctic including southern Ellesmere Island	Brown et al. 1975
1970	Gyr Falcon study	West-central Ellesmere Island	D. Muir unpubl.
1971-73	Banding studies of Brant	Okse Bay	Maltby-Prevett et al. 1975
1972	General avifauna	Tanquary Fjord, Milne Bay	Williams 1972
June-Aug. 1972	Wildlife and avifaunal survey	Ellesmere Island	Waterston and Waterston 1972
May-June 1974-76	Shorebirds and general avifauna	Alert	Morrison 1975, 1976, 1977, 1984
May-June 1975	Shorebirds and general avifauna	Tanquary Fjord, Lake Hazen	Morrison unpubl.
late 1970s - early 1980s	Seabird surveys	Southeast Ellesmere Island	various, see introduction
1977	Observations of Ivory Gull colonies during geological investigations	Southeast Ellesmere Island	Frisch and Morgan 1979
1978	Faunal notes collected during geological expedition	Oobloyah Bay	Barsch and Kingt 1981

Appendix I. Summary of field studies on birds in, and adjacent to, the Ellesmere Island National Park Reserve (contd.).

Date	Study Type	Area of coverage	Reference
1979	General avifauna	Flagler Bay, east-central Ellesmere Island	Ouellet, in Schledermann 1980
1980	Observations during geological surveys	Lake Hazen area	England et al. 1981
May-Aug. 1980, 1981,1983	Shorebirds, Snow Buntings, general avifauna	Princess Marie Bay	Williams 1982, Morrison unpubl., Witts unpubl.
1980-1982	General avifauna	Alexandra Fjord	Freedman and Svoboda 1982
1981	General avifauna, Brant	Northwest Ellesmere Island	Osbourne 1982
1981-82	General avifauna	Lake Hazen	Gould 1990
May-Aug. 1988	General avifauna, shorebirds, Snow Buntings	Borup Fjord	Hankinson 1990
May-June 1986-90	Shorebirds and general avifauna	Alert	Davidson and Morrison 1989; Morrison and Davidson 1990

Appendix I. Summary of field studies on birds in, and adjacent to, the Ellesmere Island National Park Reserve (contd.).

Date	Study Type	Area of coverage	Reference
late 1980s	Ivory Gull surveys	Ellesmere Island	V. Thomas and S. MacDonald unpubl.
1988 - ongoing	General avifaunal observations during other research programs	Hotweather Creek, west-central Ellesmere Island	S. Edlund and others unpubl.
1988-90	General bird sightings	EINPR area	Parks Canada unpubl.
1989?	Discovery of 6500 BP Oldsquaw during geological investigations	North coast (Clements Markham Inlet)	Stewart and Hourston-Wright 1990

Appendix II. Species recorded on Ellesmere Island.

No.	Name	Abbreviation	Scientific name
1.	Red-throated Loon	RTLO	Gavia stellata
2.	Northern Fulmar	NOFU	Fulmarus glacialis
3.	Snow Goose	SNGO	Anser caerulescens
4.	Brant	BRAN	Branta bernicla
5.	Northern Pintail	NOPI	Anas acuta
6.	Common Eider	COEI	Somateria mollissima
7.	King Eider	KIEI	Somateria spectabilis
8.	Oldsquaw	OLDS	Clangula hyemalis
9.	White-tailed Eagle	WTEA	Haliaeetus albicilla
10.	Peregrine Falcon	PEFA	Falco peregrinus
11.	Gyr Falcon	GYFA	Falco rusticolus
12.	Rock Ptarmigan	ROPT	Lagopus mutus
13.	Sandhill Crane	SACR	Grus canadensis
14.	Black-bellied Plover	BBPL	Pluvialis squatarola
15.	Lesser Golden Plover	LGPL	Pluvialis dominica
16.	Common Ringed Plover	RIPL	Charadrius hiaticula
17.	Ruddy Turnstone	RUTU	Arenaria interpres
18.	Knot	KNOT	Calidris canutus
19.	Sanderling	SAND	Calidris alba
20.	Baird's Sandpiper	BASA	Calidris bairdii
21.	Pectoral Sandpiper	PESA	Calidris melanotos
22.	Purple Sandpiper	PUSA	Calidris maritima
23.	Dunlin	DUNL	Caldiris alpina
24.	Common Snipe	COSN	Gallinago gallinago
25.	Red Phalarope	REPH	Phalaropus fulicaria
26.	Pomarine Jaeger	POJA	Stercorarius pomarinus
27.	Parasitic Jaeger	PAJA	Stercorarius parasiticus
28.	Long-tailed Jaeger	LTJA	Stercorarius longicaudus
29.	Iceland Gull	ICGU	Larus glaucoides
30.	Thayer's Gull	THGU	Larus thayeri
31.	Slaty-backed Gull	SBGU	Larus schistisagus
32.	Glaucous Gull	GLGU	Larus hyperboreus
33.	Black-legged Kittiwake	BLKI	Rissa tridactyla
34.	Ross's Gull	ROGU	Rhodostethia rosea
35.	Sabine's Gull	SAGU	Xema sabini
36.	Ivory Gull	IVGU	Pagophila eburnea
37.	Arctic Tern	ARTE	Sterna paradisea
38.	Dovekie	DOVE	Alle alle
39.	Thick-billed Murre	TBMU	Uria lomvia
40.	Black Guillemot	BLGU	Cepphus grylle
41.	Snowy Owl	SNOW	Nyctea scandiaca
42.	Horned Lark	HOLA	Eremophila alpestris
43.	Common Raven	CORA	Corvus corax
44.	Northern Wheatear	NOWH	Oenanthe oenanthe
45.	Lapland Longspur	LALO	Calcarius lapponicus
46.	Snow Bunting	SNBU	Plectrophenax nivalis
47.	Hoary Redpoll	HORE	Carduelis hornemanni

Appendix III. Avifauna of Ellesmere Island/Ellesmere Island National Park Reserve

No.*	Species*	Ellesmere Island			Ellesmere Island National Park Reserve							
		Occ. (1)	Breeding status (2)	(3)	Occ. (1)	Breeding status (2)	(3)	Tanq. (4)	Lake Hazen (4)	Fort Conger (4)	Alert (4)	North coast (4)
1	RTLO	U	B	Unc	U	B	Unc	(-)	B	B	B	-
2	NOFU	Acc	-	-	-(?)	-	-	-	-	-	Acc	-
3	SNGO	C/Rg	B	C	C	B	C	(B)	B	B	B	-
4	BRAN	C/Rg	B	C/U	U	B	U	-	-	B	B	?
5	PINT	Acc	(B)	Acc	Acc	B	Acc	-	(B)	-	-	-
6	COEI	C	B	C/Rg	U	B	U	-	-	B	-	-
7	KIEI	C/Rg	B	C/Rg	C/U	B	U	?	B	(B?)	B	?
8	OLDS	C	B	C	C	B	C	?	B	(B?)	B	?
9	WTEA	Hyp	-	-	Hyp	-	-	-	-	Hyp	-	-
10	PEFA	Acc	-	-	-	-	-	-	-	-	-	-
11	GYFA	U	B	U	U	B	U	?	(B?)	(B?)	(B?)	?
12	ROPT	Rg/C	B	C	C	B	C	B	B	(B?)	(B?)	B
13	SACR	Acc	-	-	Acc	-	-	-	-	-	-	-
14	BBPL	Acc	-	-	?	-	-	-	-	-	(+)	-
15	LGPL	Acc	-	-	Acc?	-	-	-	-	(+)	-	-

Appendix III. Avifauna of Ellesmere Island/Ellesmere Island National Park Reserve (cont.)

No.	Species	Ellesmere Island			Ellesmere Island National Park Reserve							
		Occ. (1)	Breeding status (2)	(3)	Occ. (1)	Breeding status (2)	(3)	Tanq. (4)	Lake Hazen (4)	Fort Conger (4)	Alert (4)	North coast (4)
16	CRPL	U/Ra	B	U	U	B	U	?(+)	(B?)	?(+)	B(?)	-
17	RUTU	C	B	C	C	B	C	B	B	B	B	B
18	REKN	C	B	C	C	B	C	B	B	B	B	B
19	SAND	U	B	U	U/Ra	B	U/Ra	(B?)	B	(B?)	B?	B(?)
20	BASA	C	B	C	U	B	U/Ra	B?	B	-	-	-
21	PESA	Acc	-	-	-	-	-	-	-	-	Acc	-
22	PUSA	U/Ra	B	Ra	Ra	-	-	-	-	(+)	-	-
23	DUNL	Acc	-	-	-	-	-	-	-	-	-	-
24	COSN	Acc	-	-	Acc	-	-	-	(+)	-	-	-
25	REPH	U	B?	Ra	U/Ra	B?	Ra	-	-	-(+)	?(+)	-
26	POJA	Acc	-	-	-	-	-	-	-	-	Acc	-
27	PAJA	U	B	U	Ra	B?	Ra	-	-	B?	-	-
28	LTJA	C	B	C	C	B	C	(B)	B	B	B	B
29 30	ICGU THGU	U	B	U	Ra	-	-	-	-(+)	-(+)	-(+)	-
31	SBGU	Acc	-	-	-	-	-	-	-	-	Acc	-

Appendix III. Avifauna of Ellesmere Island/Ellesmere Island National Park Reserve (cont.)

No.	Species	Ellesmere Island			Ellesmere Island National Park Reserve							
		Occ. (1)	Breeding status (2)	(3)	Occ. (1)	Breeding status (2)	(3)	Tanq. (4)	Lake Hazen (4)	Fort Conger (4)	Alert (4)	North coast (4)
32	GLGU	C	B	C	C	B?	U	-	B	?	?	(+?)
33	BLKI	U	-	-	Acc	-	-	-	-	-	(?)	-
34	ROGU	Acc	-	-	+(?)	-	-	-	-	-	Acc	-
35	SAGU	Acc	-	-	Acc	-	-	-	-	Acc?	Acc?	-
36	IVGU	C	B	U	U	-	-	-	-	-	-(?)	-
37	ARTE	C	B	U	U	B	U	(B?)	B	B	B	?
38	DOVE	Acc	-	-	Acc	-	-	-	-	-	(+)	-
39	TBMU	C	B	C	-	-	-	-	-	-	-	-
40	BLGU	C	B	C	U	(B?)	U	-	-	(B?)	?	-
41	SNOW	U	B	U	U	B	U	B	B	B	B	?
42	HOLA	Acc	-	-	-	-	-	-	-	-	-	-
43	CORA	U	?	-	Ra	-	-	-	-	-	-	-
44	NOWH	Ra	B	Ra	?	-	-	-	-	-	(+)	-
45	LALO	Ra/U	B	Ra	Ra	B	Ra	-	B	-	-	-
46	SNBU	C	B	C	C	B	C	(B?)	B	B	B	B
47	HORE	U	B	U	U	B	U	-	B	-	(B?)	-

Appendix III. Avifauna of Ellesmere Island/Ellesmere Island National Park Reserve (cont.)

Key to symbols:

Abundance	
C = common	B = breeder
Rg = regular	B? = possible breeder
U = uncommon	? = status uncertain
Ra = rare	+ = presence recorded
Acc = accidental	- = no information available

( ) brackets indicate likely status, though direct evidence lacking

* No. and abbreviations for species: see Appendix II.
(1) Occ.: general occurrence/abundance in area
(2) Status as breeder: B = breeding recorded, - = breeding not recorded
(3) Abundance as breeding bird
(4) Status as breeder in area shown; Tanq. = Tanquary Fjord

Table 1. Status of birds occurring on Ellesmere Island and in the Ellesmere Island National Park Reserve.

	Occurrence	
	Ellesmere Island	Ellesmere Island National Park Reserve
Common	15	9
Regular	2	-
Uncommon	11	13
Rare	2	5
Accidental	15	6(1)*
Hypothetical	1	1
?	-	[2(2)]
Total	46	34(5)

* Totals for species whose status is uncertain are included in brackets

Table 2. Status of species of birds breeding on Ellesmere Island and in the Ellesmere Island National Park Reserve.

	Breeding status					
	Ellesmere Island	Ellesmere Island National Park Reserve				
		EINPR	Lake Hazen	Fort Conger	Alert	North Coast
Common	14	7	8	4	3(1)	3(1)
Regular	1	1	4	1(2)	2	-(2)
Uncommon	9	11(1)	3(1)	5(3)	5(3)	2(3)
Rare	3(1)*	1(2)	2	-(4)	1(5)	-(2)
Accidental	1	1	1	-	-	-
Hypothetical	-	-	-	-	-	-
?	-(1)	-	-	-	-	-
Total species	28(2)	21(3)	18(1)	10(9)	11(9)	5(8)
Breeding status						
B	28	21	18	10	11	5
B?	1	3	1	6	4	2
(B?)	-	-	-	1	2	-
?	1	-	-	2	3	6
Overall total species	30	24	19	19	20	13

EINPR = all areas of Ellesmere Island National Park Reserve
* species totals for which status is uncertain are shown in brackets
Breeding status: B = confirmed breeder, B? = likely breeder, presence recorded in or near EINPR, (B?) possible breeder, ? breeding status uncertain.

Table 3. Composition of avifauna breeding on Ellesmere Island.

Group	Ellesmere Island			Ellesmere Island National Park Reserve						
	Occ. (1)	Breed. (2)	Reg. Breed. (3)	Occ. (1)	Breed. (2)	Reg. Breed. (3)	Lake Hazen (4)	Fort Conger (4)	Alert (4)	North coast (4)
Loons	1	1	1	1	1	1	1	1	1	-
Fulmars	1	-	-	-(1)*	-	-	-	-	-	-
Geese	2	2	2	2	2	2	1	2	2	-(1)
Ducks	4	4	3	4	4	3	3	1(2)	2	-(2)
Eagles	1	-	-	1	-	-	-	-	-	-
Falcons	2	1	1	1	1	1	1	-(1)	-(1)	-(1)
Ptarmigan	1	1	1	1	1	1	1	-(1)	-(1)	1
Cranes	1	-	-	1	-	-	-	-	-	-
Shorebirds	12	6(1)*	5	8(2)	5(1)	5	5	2(2)	2(3)	2(1)
Jaegers	3	2	2	2	1(1)	1	1	1(1)	1	1
Gulls	7	3	3	5(1)	1	1	1	-(1)	-(2)	-(1)
Terns	1	1	1	1	1	1	1	1	1	-(1)
Auks	3	2	2	2	-(1)	-(1)	-	-(1)	-(1)	-
Owls	1	1	1	1	1	1	1	1	1	-(1)
Passerines	6	4(1)	2	4(1)	3	2	3	1	1(1)	1
Total	46	28(2)	24	34(5)	21(3)	19(1)	18(1)	10(9)	11(9)	5(8)
Breeding status category(5)										
B		28			21		18	10	11	5
B?		1			3		1	6	2	-
(B?)		-			-		-	1	4	2
?		1			-		-	2	2(1)	6

(1) Occ. = no. of species recorded in area - *confirmed(unconfirmed); (2) Breed. = no. of breeding species recorded in area - *confirmed(unconfirmed); (3) Reg. Breed. = no. of species breeding regularly (status Common, Regular or Uncommon) in area; (4) No. of species breeding in area indicated - confirmed breeders(possible breeders) - see (5) for details; (5) B = confirmed breeder, B? = likely breeder, occurrence recorded, (B?) possible breeder, ? breeding status uncertain.

Table 4. Habitat location, breeding and feeding habitats, and food resources of birds breeding on northern Ellesmere Island.

		Habitat location		Breeding/feeding habitat						Food preferences				
		Coast.	Inland	Marine	Freshw.	Tundra	Marsh	Barren	Cl./Scr.	Fish	Plant	Invert.	Mar.Inv.	Pred.
Red-throated Loon	RTLO	X	X	X	X	-	x	-	-	X	-	-	-	-
Snow Goose	SNGO	X	X	X	X	X	X	X	-	-	X	-	-	-
Brant	BRAN	X	-	X	X	x	x	-	-	-	X	-	-	-
Northern Pintail	NOPI	X	X	-	X	X	X	-	-	-	X	X	-	-
Common Eider	COEI	X	-	X	X	-	-	X	-	-	-	-	X	-
King Eider	KIEI	X	X	X	X	X	-	-	-	-	-	-	X	-
Oldsquaw	OLDS	X	X	X	X	X	X	-	-	-	-	X	X	-
Gyr Falcon	GYFA	X	X	-	-	-	-	-	X	-	-	-	-	X
Rock Ptarmigan	ROPT	X	X	-	-	X	-	X	-	-	X	X	-	-
Common Ringed Plover	CRPL	X	X	X	X	-	-	X	-	-	-	X	-	-
Ruddy Turnstone	RUTU	X	X	x	x	X	X	X	-	-	X	X	x	-
Knot	KNOT	X	X	x	x	X	X	X	-	-	X	X	X	-
Sanderling	SAND	X	X	-	x	X	X	x	-	-	x	X	x	-
Baird's Sandpiper	BASA	X	X	-	-	X	x	X	-	-	x	X	x	-
Red Phalarope	REPH	X	X	X	X	-	X	-	-	-	-	X	X	-
Parasitic Jaeger	PAJA	X	X	X	X	X	X	-	-	-	-	X	-	X
Long-tailed Jaeger	LTJA	X	X	X	X	X	X	X	-	-	-	X	X	X
Glaucous Gull	GLGU	X	X	X	X	-	X	-	X	X	-	x	X	X
Arctic Tern	ARTE	X	X	X	X	-	-	X	-	X	-	X	X	-
Black Guillemot	BLGU	X	-	X	-	-	-	-	X	X	-	-	X	-
Snowy Owl	SNOW	X	X	-	-	X	-	X	-	-	-	-	-	X
Lapland Longspur	LALO	X	X	-	-	X	X	-	-	-	X	X	-	-
Snow Bunting	SNBU	X	X	-	-	-	-	-	X	-	X	X	-	-
Hoary Redpoll	HORE	X	X	-	-	-	-	-	X	-	x	X	-	-
Total principal use (X)		24	21	13	13	13	10	10	5	4	8	14	6	5
Total secondary use (x)				2	3	1	3	1			3	2	6	

Principal association or use shown by X, secondary association or use by x.

Freshw.=Freshwater, Coast.=Coastal, Cl./Scr.=Cliff/Scree, Invert.=Invertebrate, Mar.Inv.=Marine Invertebrate, Pred.=Predator

Figure 1. Breeding schedules of birds on Ellesmere Island.

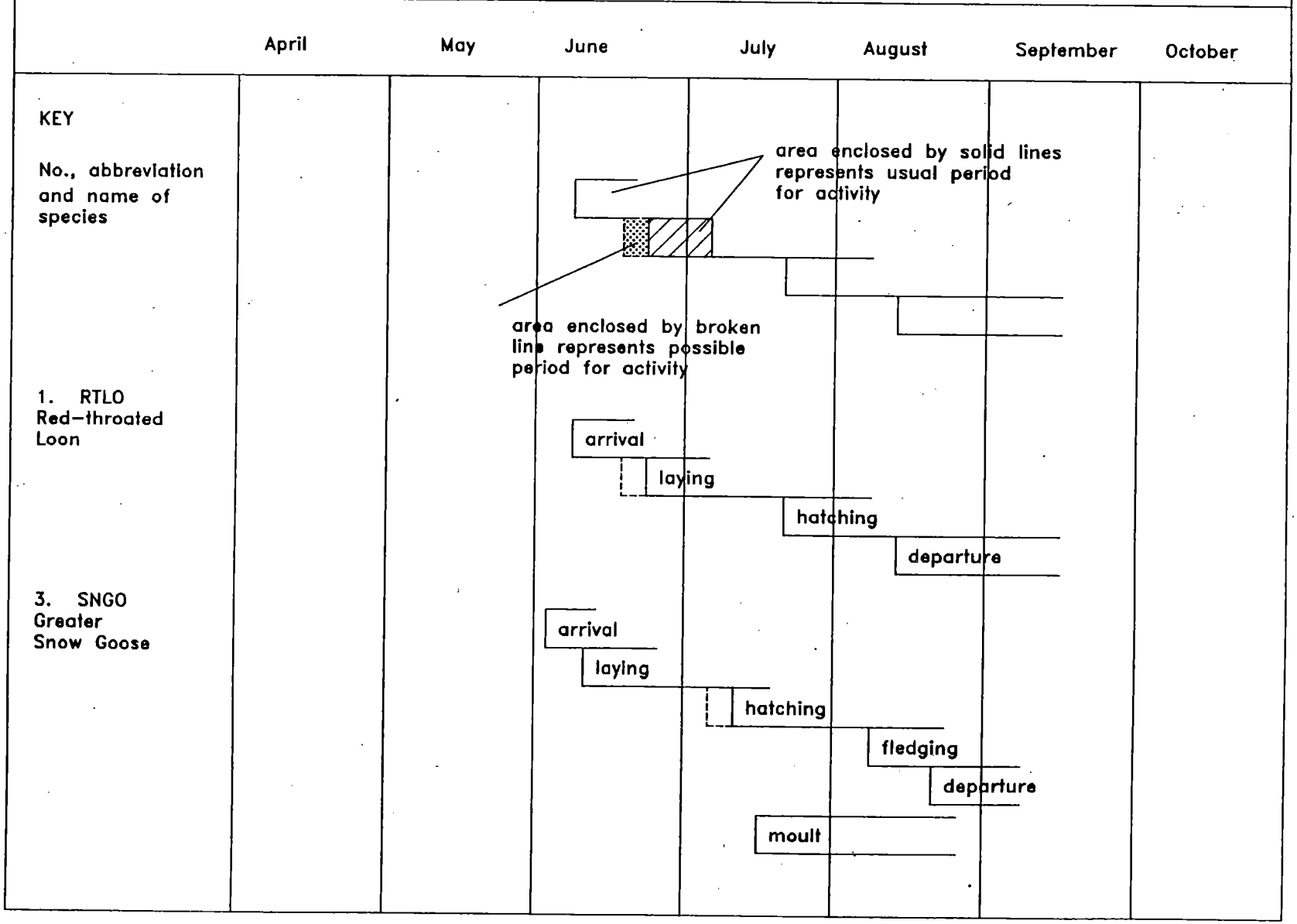

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

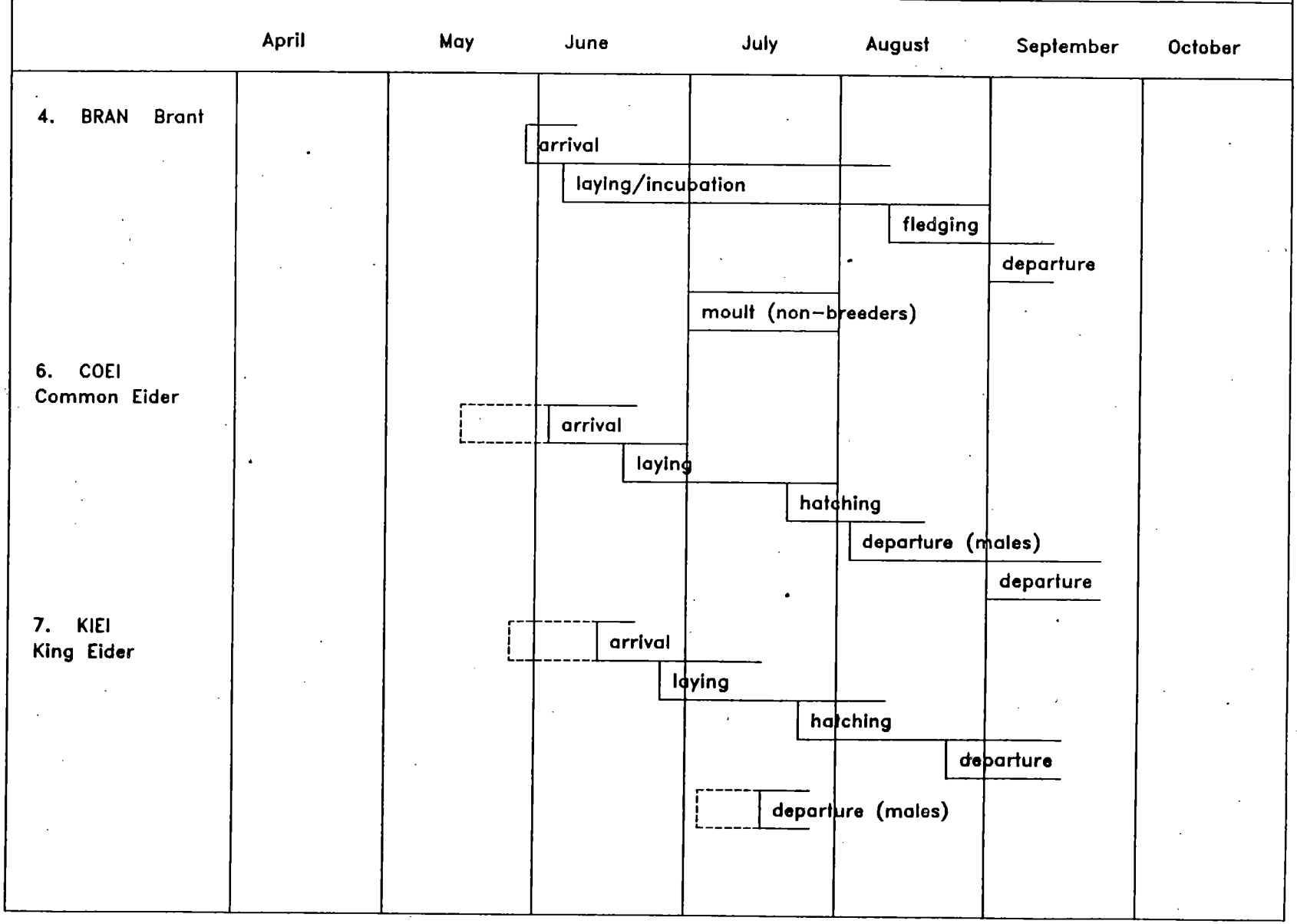

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

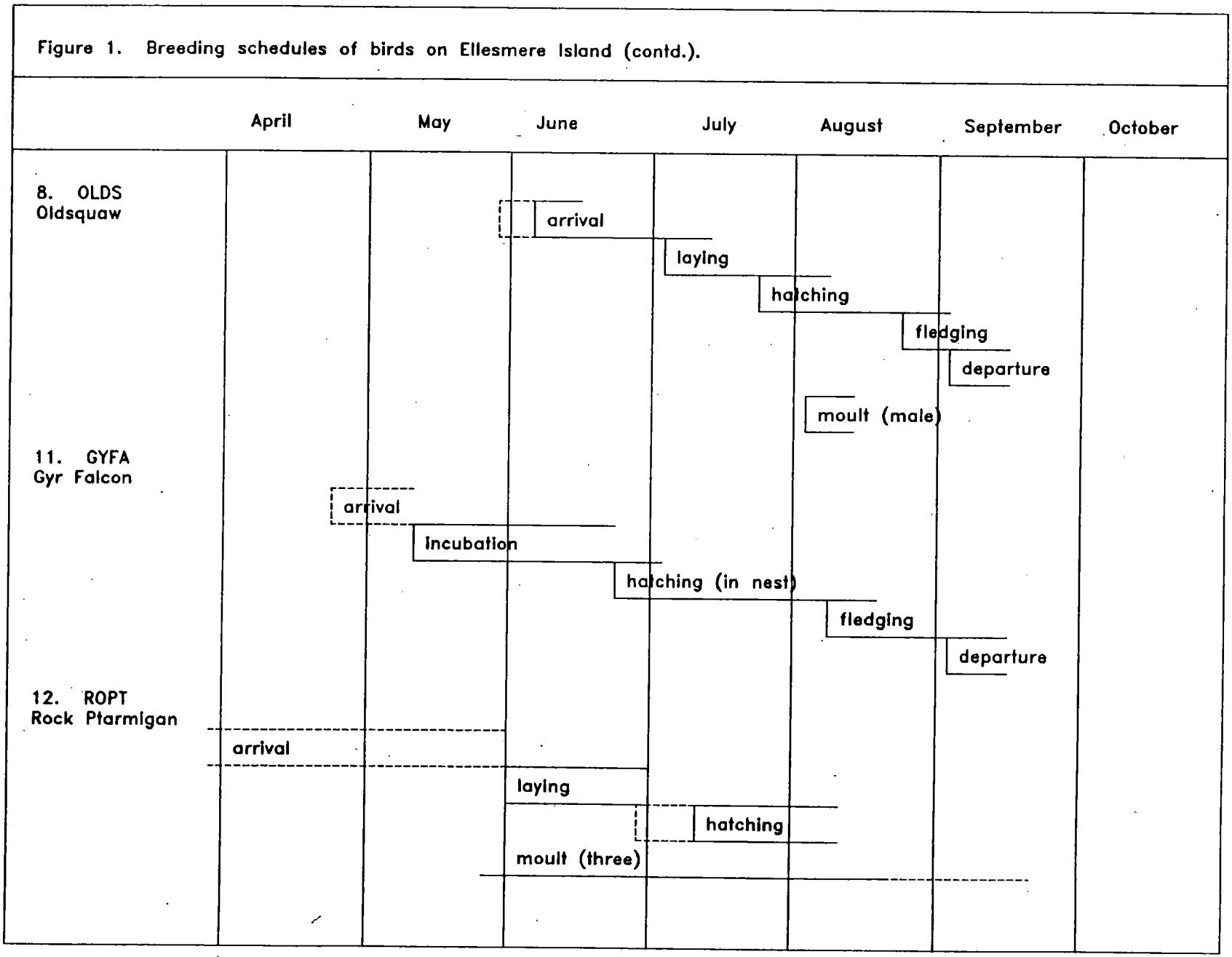

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

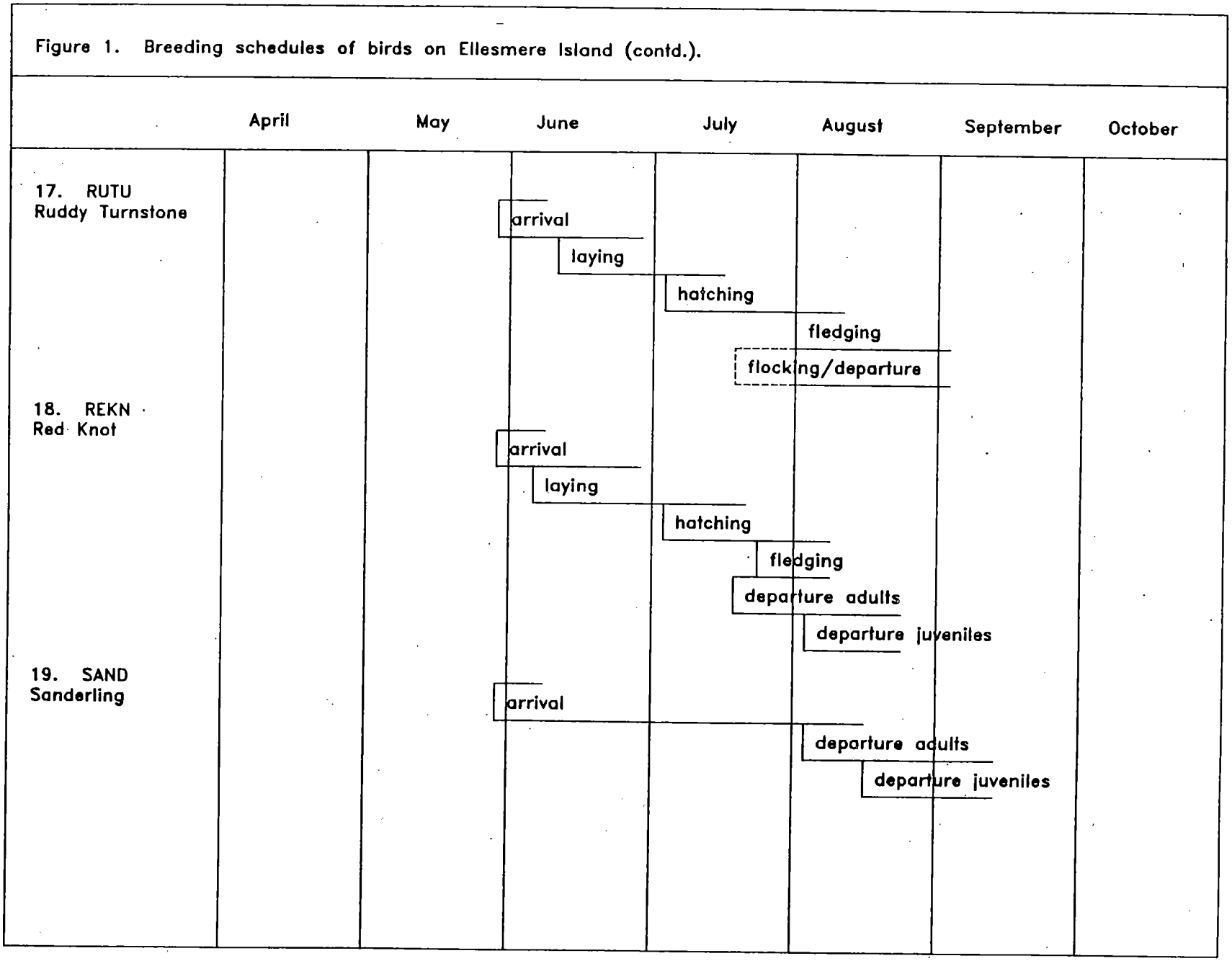

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

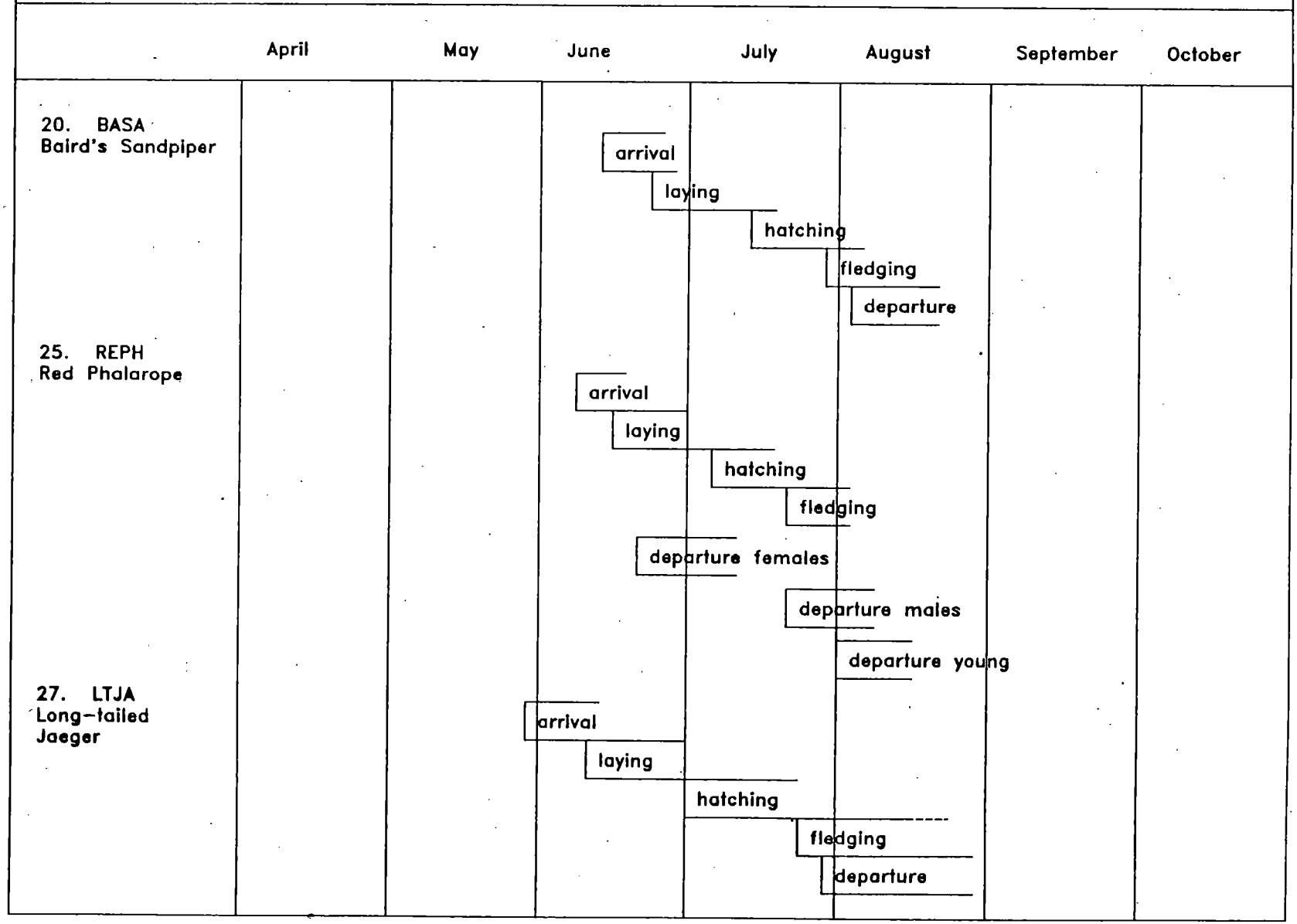

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

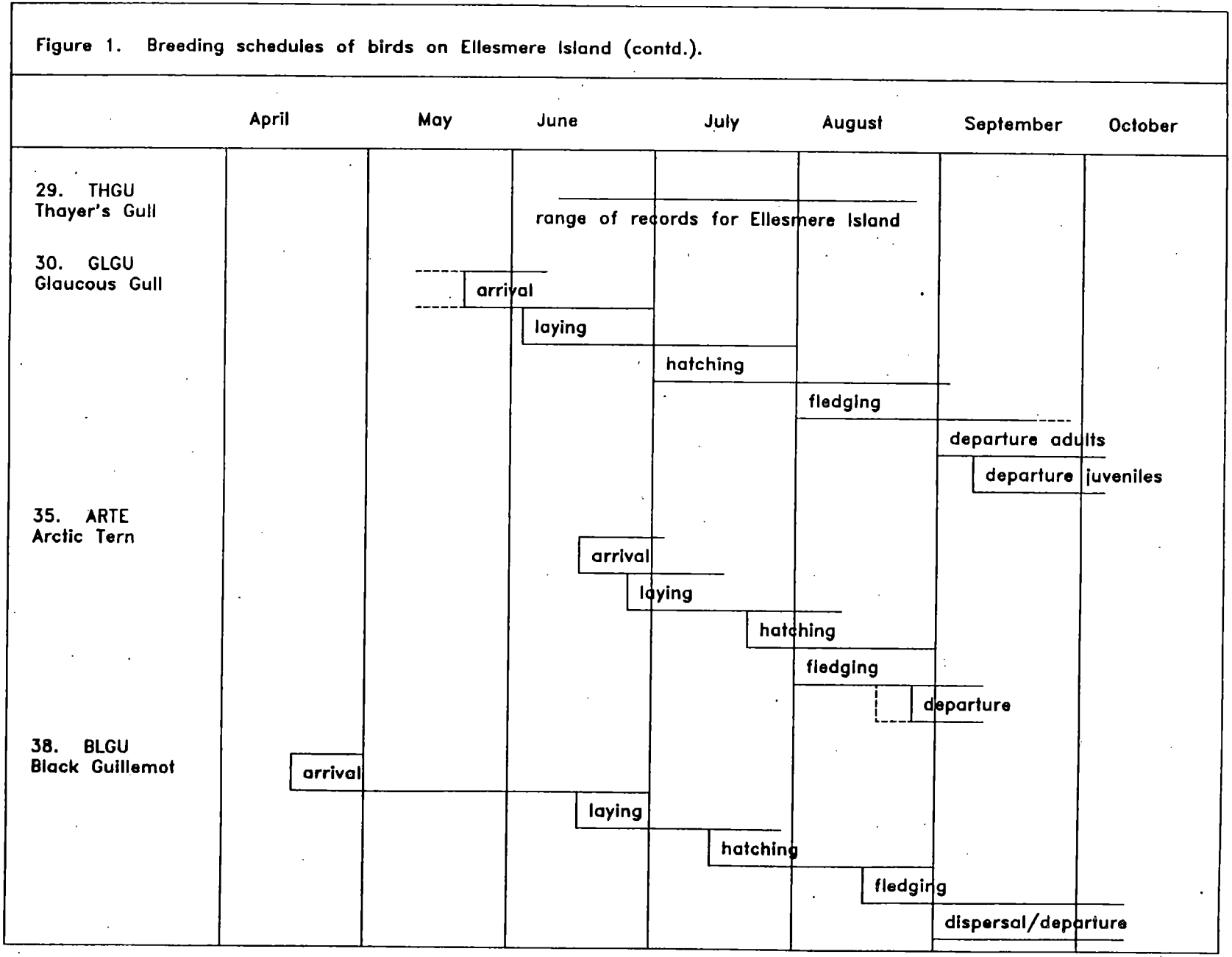

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

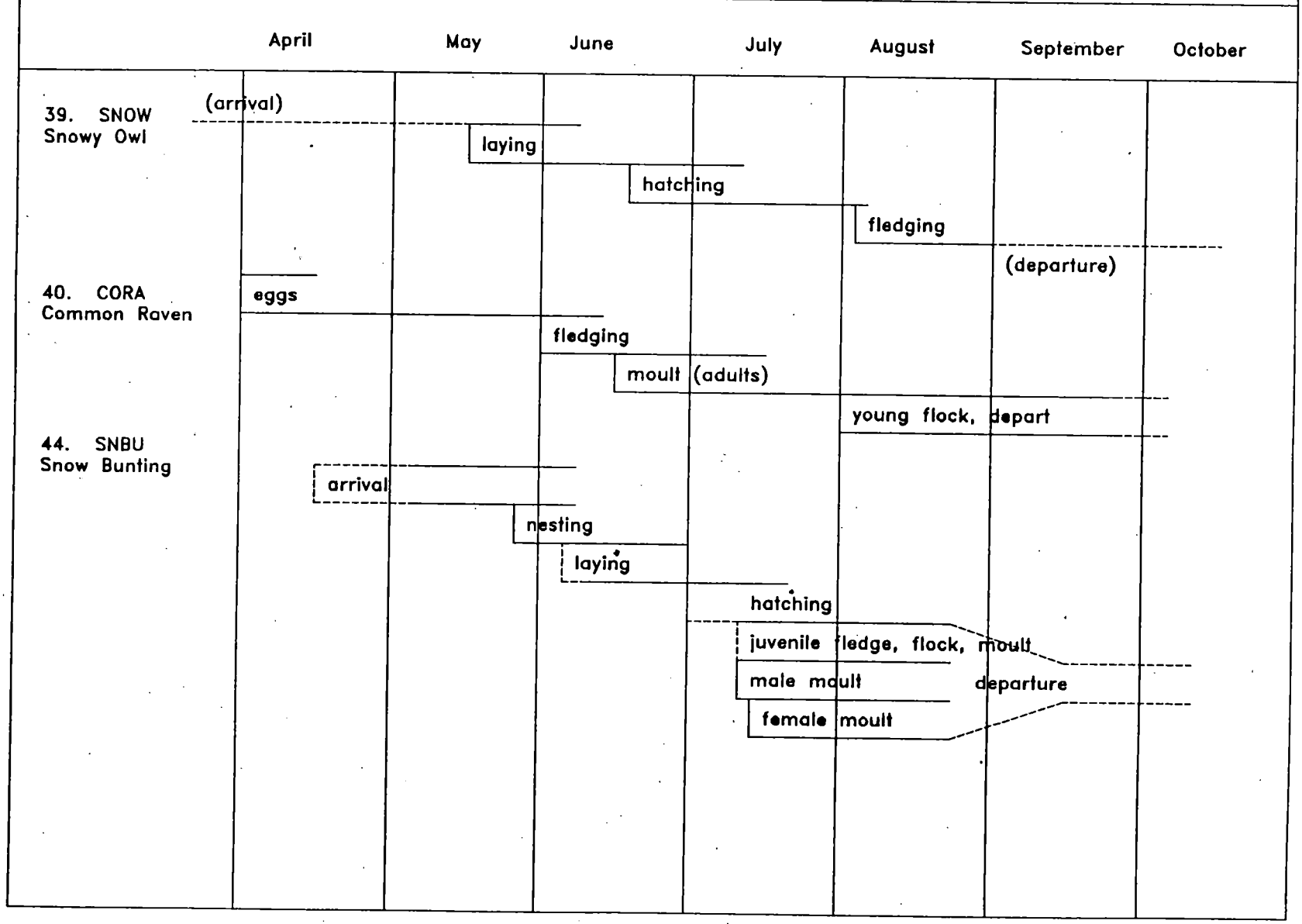

Figure 1. Breeding schedules of birds on Ellesmere Island (contd.).

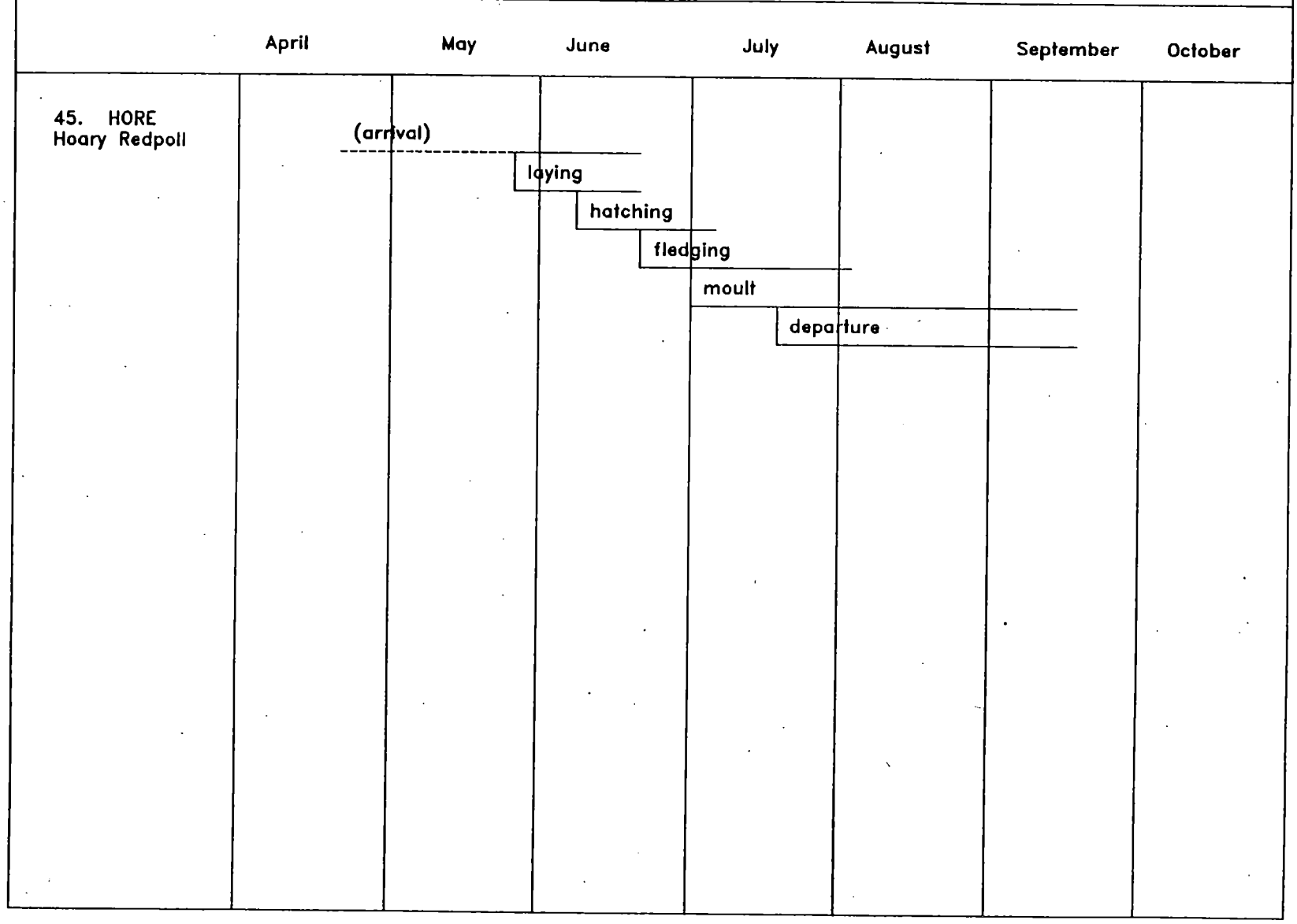

Figure 2.

HABITATS AND HABITAT USE BY SELECTED SPECIES OF BIRDS BREEDING ON NORTHERN ELLESMERE ISLAND

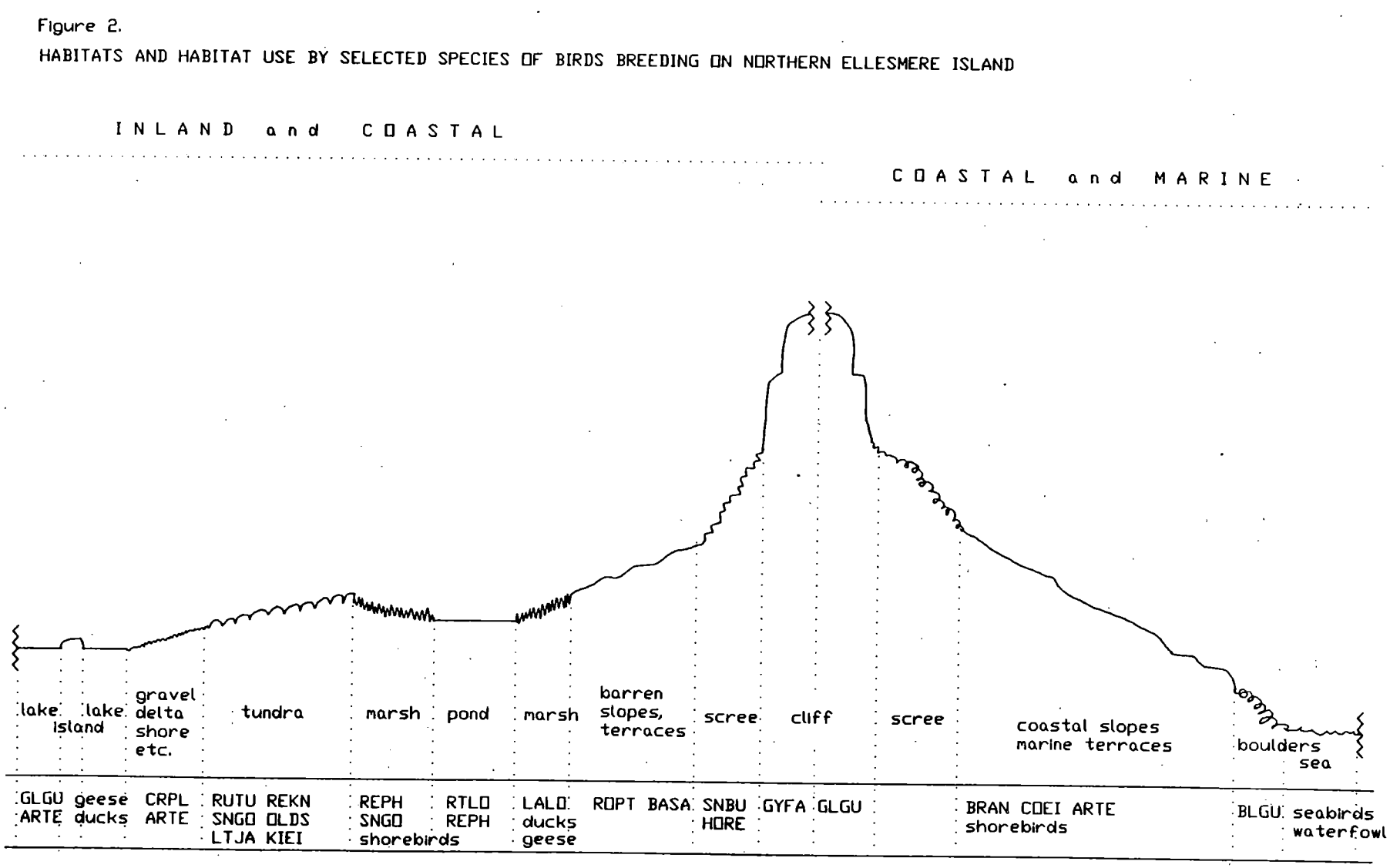

Figure 3.

Simplified food web involving major avifaunal groups breeding on northern Ellesmere Island