

# Sabine's Gull (*Xema sabini*), Ross's Gull (*Rhodostethia rosea*) and Ivory Gull (*Pagophila eburnea*) Gulls in the Arctic: A Review

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**ABSTRACT.** The earliest information on Sabine's gull, Ross's gull and Ivory gull was collected by several heroic arctic explorers during the nineteenth century and the beginning of the twentieth. Ross's gull was discovered in northern Canada in 1823 by James C. Ross and Sabine's gull in northwestern Greenland in 1818 by Edward Sabine. S.A. Buturlin was the first to find the breeding places of Ross's gull in northeastern Siberia. Recently new breeding places have been reported from U.S.S.R. (Taymyr Peninsula, 1973), Canada (near Devon Island, 1976 and 1978; near Churchill, Manitoba, 1980) and Greenland (Peary Land and Disko Bay, 1979). Sabine's gull and Ivory gull have a dispersed and patchy distribution with gaps too wide for them to be regarded as true continuous circumpolar species. The biotope requirements for the three species are compared. All three are food opportunists; recent data on their food choice and foraging behaviour are reviewed and discussed. The breeding ecology of the gulls is updated with special attention to the clutch size, where a climatological trend may be distinguished. In contrast to birds in general, the most southerly breeding species (Ross's gull) has the largest clutch size and the most northerly breeding species (Ivory gull) has the smallest. Details of the large interspecific differences in migratory and wintering habits are presented. The documented northbound autumn migration of Ross's gull observed in Alaska and the southbound migration of Sabine's gull to western South America and southwestern and southern Africa are surveyed. The Ivory gull is regarded as a straggler during the winter, but recent observations on East Greenland of at least 500 migrating birds in September 1975 indicate that specific migratory routes may be used by this species too.

**RÉSUMÉ.** Les toutes premières informations concernant la mouette de Sabine, la mouette rose et le goéland sénateur, furent rassemblées par d'héroïques explorateurs de l'Arctique, au cours du siècle dernier et au début de celui-ci. La mouette rose fut découverte dans le nord du Canada, en 1823, par James C. Ross, et la mouette de Sabine, dans le nord-ouest de Groenland, en 1818 par Edward Sabine. S.A. Buturlin fut le premier à découvrir les lieux de reproduction de la mouette rose dans le nord-est de la Sibirie. De nouveaux lieux de reproduction ont été signalés récemment, en URSS (péninsule de Taymyr en 1973), au Canada (près de l'île de Devon en 1976 et 1978, près de Churchill et Manitoba en 1980) et au Groenland (Peary Land et Disco Bay en 1979). La mouette de Sabine et le goéland sénateur présentent une distribution dispersée et irrégulière avec de trop grands écarts pour être considérés comme de véritables espèces circumpolaires. Les besoins biotopiques de ces trois espèces sont comparés. Toutes les trois ont un comportement opportuniste par rapport à la nourriture. Des données récentes sur leur attitude quant au choix et la recherche de la nourriture sont passées en revue et discutées. L'étude de l'écologie de la reproduction des mouettes est mise à jour. Une attention toute spéciale est portée sur l'importance de la grandeur de la couvée, pour laquelle une influence climatologique peut être discernée. Contrairement aux oiseaux en général, l'espèce qui se reproduit le plus au sud (mouette rose) a la plus grande couvée, tandis que l'espèce qui se reproduit le plus au nord (goéland sénateur) a la plus petite. Des détails sont donnés sur les grandes différences existant entre les espèces, concernant leurs habitudes migratoires et leurs comportements pendant l'hiver. La migration de la mouette rose, en direction du nord, observée en automne en Alaska et celle de la mouette de Sabine en direction du sud, vers l'Amérique du Sud et vers l'Afrique du Sud et du Sud-Ouest, sont examinées. Le goéland sénateur est considéré comme une espèce à part durant l'hiver, mais de récentes observations faites en Septembre 1975 dans l'est du Groenland, sur au moins 500 oiseaux migrants, montrent que ces espèces peuvent également emprunter des itinéraires de migration qui leur sont spécifiques.

Traduit par les auteurs.

**Содержание.** Первые сведения о вилохвостой чайке, розовой чайке и белой чайке были даны в течение девятнадцатого и в начале двадцатого века некоторыми выдающимися исследователями арктики. Розовая чайка была замечена Джетсом С. Россом в Канаде в 1823 году. Вилохвостая чайка была открыта Эдвардом Себайном в северо-восточной Гренландии в 1818 году. С.А. Бутурлин был первым который нашел места гнездения розовой чайки в северовосточной Сибири. В последнее время было сообщено о наидении новых мест гнездения в СССР (Таймырский полуостров, 1973), в Канаде в близости Девон Айленд 1976, 1978; в близости Черчилл-Манитоба 1980 и в Гренландии (Пири Ленд и Диско Бей, 1979). Размещение вилохвостой и белой чайки сравнительно редкое и характерно лишь для отдельных регионов, пробелы между которыми настолько велики что нельзя считать выше упомянутых птиц настоящими вокругполярными видами.

Сравнено биотопические требования всех трех видов. Пересмотрено и продискутировано новые данные о их пище и способах разыскивания продовольствия. Продискутировано экологию высиживания со специальным учтением величины яиц, при чем указано на влияние климата. Обратно чем у большинства птиц, сам южный вид (розовая чайка) высиживает самые большие количество яиц, тотчас как сам северный (белая чайка) вид высиживает самые малые количества. Приведено подробности о особенностях миграции и зимовки отдельных видов. Дан обзор доказанной осенней миграции розовой чайки в северном направлении, наблюдаемой на Аласке, а также миграции вилохвостой чайки на юг в юго-западную часть Южной Америки и на югозапад и юг Африки. Белая чайка считается неперелетной, но последние наблюдения не менее чем 500 птиц в восточной Гренландии в сентябре 1975 указывают, что этот вид тоже может пользоваться специфическими миграционными путями.

**Key words:** Sabine's gull (*Xema sabini*), Ross's gull (*Rhodostethia rosea*), Ivory gull (*Pagophila eburnea*), distribution, feeding habits, breeding biology, migration

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## INTRODUCTION

The three gull species Sabine's gull (*Xema sabini*), Ross's gull (*Rhodostethia rosea*) and Ivory gull (*Pagophila eburnea*) belong to the breeding and/or wintering avifauna of the Arctic. The present knowledge of the biology of these species, although sparse, indicates large differences between their ways of exploiting and surviving the arctic environment. Sabine's gulls only visit the Far North to breed, and spend the winters on oceans in the southern hemisphere. The most important known breeding area of the Ross's gull, in contrast to the Sabine's and Ivory gulls, is not in the Arctic but in subarctic and boreal parts of northeastern Siberia. In the late summer and during the autumn Ross's gull migrates northwards to unknown wintering grounds apparently in the Arctic Ocean. The Ivory gull has, on average, the most northern breeding grounds of all birds. In the non-breeding season the Ivory gulls straggle southwards but are rarely seen far from the pack ice of the North.

The gulls, especially Ross's gull, are regarded as exotic visitors in southern latitudes. The first sighting of Ross's gull in the U.S.A. outside of Alaska, in 1975, inspired a literal pilgrimage to Massachusetts to watch the beautiful bird (Grandjean and Grandjean, 1980). The amount of rose colour in the plumage varies with individuals and is occasionally completely absent. The breast and belly of the Sabine's gull are sometimes slightly tinged with pink (Sutton and Parmelee, 1956; Sutton, 1962).

Taxonomically all three gulls belong to separate genera with each species as the only known member of the respective genus. The species are generally regarded as monotypic, i.e. no obvious geographically-based intra-specific variations have been shown that have led to subspecies differentiation. The exception may be Sabine's gull (Portenko, 1939), but division into subspecies is not widely accepted.

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## HISTORY

During the arctic expeditions and adventures in the nineteenth and early twentieth centuries, sightings of the legendary arctic gulls were extraordinary events. In his narrative of the North-East Passage on the *Vega* in 1878-80, Adolf E. Nordenskiöld says of the almost unknown breeding places of the Ivory gull: "... that its main nesting place might be found further north, along the coasts of a so far undiscovered, perhaps constantly icebound arctic land" (Nordenskiöld, 1881, Vol. 1:114). Sabine's gull was not observed at all during the voyage but a single sighting of Ross's gull gave Nordenskiöld the impetus to publish paintings of the two seldom-seen gull species "as a field-guide to future explorers of the Arctic" (Nordenskiöld, 1881, Vol. 1:113).

Between 1893 and 1896 the Norwegian polar explorer Fridtjof Nansen sailed with his ship *Fram* in the Arctic Ocean north of the present Soviet Union. From a position on the 81st degree of latitude, midway between the mouth of the river Lena and the North Pole, Nansen wrote in his diary on 3 August 1894: "Today my longing has at last been satisfied. I have shot the Ross's gull." To this Nansen added in his book *Farthest North*: "... this rare and mysterious inhabitant of the unknown north, which is only occasionally seen, and of which no one knows whence it cometh or whither it goeth, which belongs exclusively to the world to which the imagination aspires, is what, from the first moments I saw these tracts, I had always hoped to discover, . . ." (Nansen, 1897, Vol. 1:414-415).

During Andrée's unsuccessful and tragic attempt in 1897 to reach the North Pole with the balloon *Örnen* (the Eagle), Ross's and Ivory gulls were seen. On the difficult walk from the wrecked balloon to Kvitøya (White Island) on eastern Svalbard, Ivory gulls, among other things, were shot and eaten. It is apparent from the diaries of the deceased expedition members that "the Ivory gulls were regarded as delicious and in part of September when the meat supply was extremely limited, the gulls constituted a valuable extra contribution to the menu" (Andrée *et al.*, 1930:272).

Ross's gull, known for its beauty, has long been cloaked in mysticism. Other than a single record on West Greenland around 1810 (Winge, 1898), the first description of Ross's gull originates from William E. Parry's second attempt to find the North-West Passage (Parry, 1824). In June 1823, on the east coast of Melville Peninsula in arctic Canada, one member of the expedition succeeded in shooting two gulls. One of these is the holotype for the species Ross's gull. Four years later, in 1827, the same James C. Ross found Ross's gull in the polar pack ice north of Svalbard during a unsuccessful attempt to reach the North Pole (Parry, 1828). The gull is sometimes called "Rosy gull" but more often Ross's gull in honour of its discoverer.

More than fifty years after Parry's expeditions, Ross's gull was still only a legend. In the collections of various museums around the world, fewer than a dozen skins were registered. The breeding places were still unknown. It is therefore easy to imagine the excitement caused by the sighting of Ross's gulls from the American expedition ship *Jeanette* in the autumn of 1879. Imprisoned in ice on the East Siberian Sea, slowly drifting between Wrangel Island and New Siberian Islands, the explorers saw flocks of the rare gull in numbers far exceeding those which had ever been seen before. At that time no one was aware that *Jeanette* was being carried by the currents north of and along the central nesting grounds of the Ross's gull. The gulls seen were north-migrating individuals from the Siberian mainland. In June 1881 *Jeanette* foundered close to Henrietta Island. Although the leader George W. De Long

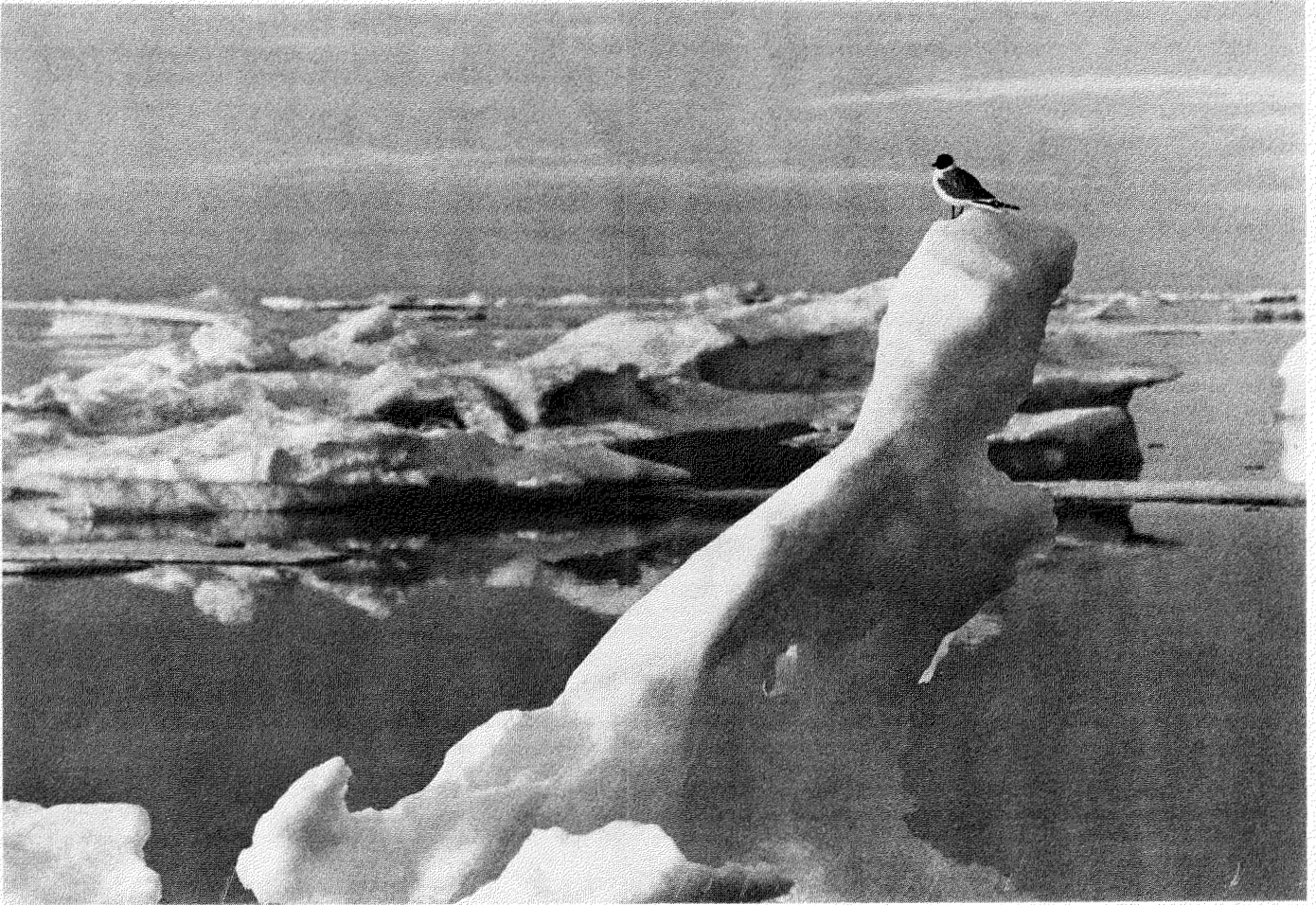


PLATE 1. Sabine's gull in the pack ice close to the breeding area at Young Sund, Northeast Greenland, August 1978. Sabine's gulls only visit the Far North to breed, and spend the winters on oceans in the Southern Hemisphere. (M. Elander)

and many others died, some members of the expedition managed to reach the Siberian mainland in lifeboats via the New Siberian Islands and the Laptev Sea. The biologist R. L. Newcomb survived and saved the skins of three Ross's gulls by carrying them under his shirt during the long, rough journey home (Newcomb, 1888).

The crew on Nansen's ship *Fram*, sailing westward (1895-96) between the New Siberian Islands and towards Franz Josef Land from the north, observed several Ross's gulls, including the northernmost record so far at 84°41'N (Colett and Nansen, 1900). By the end of the nineteenth century it was obvious that an important area for Ross's gulls is the drift ice north and northeast of Svalbard and Franz Josef Land. Further support was obtained from Andrée's expedition in 1897. The diary tells us that 15 or possibly 17 Ross's gulls were counted between 25 July and 30 August (Andrée *et al.*, 1930).

The discovery of Sabine's gull also occurred during a famous arctic enterprise. On John Ross's first expedition along the west coast of Greenland in 1818, Edward Sabine found this gull on some small islands in Melville Bay (Sabine, 1818). The gull and the islands were named in honour of their discoverer.

#### KNOWN BREEDING RANGE

Sabine's gull (Plate 1) is an arctic breeder with scattered distribution and has a larger breeding range than Ross's and Ivory gulls. However, the breeding area is not completely circumpolar: large gaps occur in the breeding range, especially along the Eurasian coast of the Arctic Ocean (Fig. 1). Sabine's gull nests on level terrain in grass-covered moist tundra or on islets.

The nesting biotope, breeding places and nesting biology of Ross's gull were completely unknown until 1905. That summer an expedition under the leadership of S. A. Buturlin found the gull breeding in northeastern Siberia. The range discovered extended along the north-flowing Kolyma, Alazeya and Indigirka rivers, between the Cherskogo Mountains in the west and the Kolymskiy Mountains in the east (Buturlin, 1906, 1912). Another area with breeding Ross's gulls has recently been discovered in the U.S.S.R.: in 1973 a colony of unknown size was found on southern Taymyr Peninsula (Zhirnov *et al.*, 1978:258-260).

Somewhat unexpectedly, the most common breeding biotope of Ross's gull is neither the tundra nor rocky

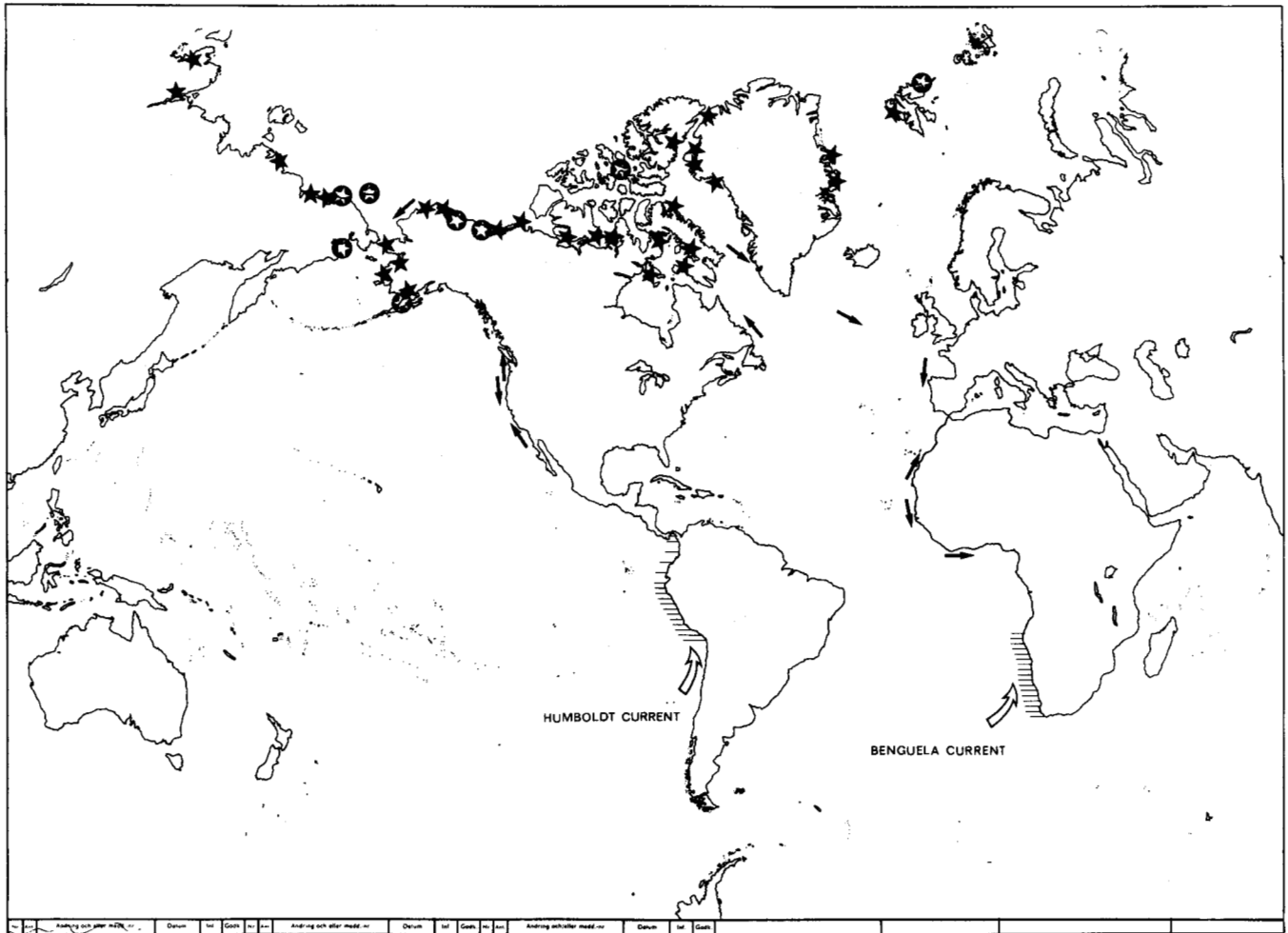


FIG. 1. Sabine's gull. Known breeding places (★), probable breeding places (●★), winter quarters (hatched) and observed main migration routes (arrows) are shown. The map is based on the following references: Bailey, 1948; Bannerman, 1962; Bierman, 1966; Brown *et al.*, 1975; Chapman, 1969; Dementiev and Gladkov, 1969; Fisher and Lockley, 1954; Gabrielson and Lincoln, 1959; Lambert, 1967, 1969, 1973; Løvenskiold, 1964; Mayaud, 1965; Meeth, 1969; Meltofte, 1975; Nettleship, 1974; Post, 1971; Roux, 1961; Salomonsen, 1950, 1967; Savile, 1972; Schaanning, 1928; Snyder, 1957; Watson and Divoky, 1972; Zoutendyk, 1965, 1968.

terrain in the Arctic, but marshy wetlands in subalpine and boreal tracts. Vegetation includes bushes and hardwood trees (e.g. willows [*Salix* spp.] and alder trees [*Alnus incana*], and here and there even coniferous trees (*taiga* in Russian). The finding of a nest on Spitsbergen in 1955 (Løvenskiold, 1964), one on northern Greenland in 1979 (Hjort, 1980), and three pairs in 1976 and six pairs in 1978 near Devon Island in northern Canada (MacDonald, 1978; Fig. 2) show that breeding on high arctic tundra may occur.

The Ivory gull (Plate 2) has an extremely northern distribution and breeds, according to present knowledge, almost exclusively north of 70°N; the main nesting areas lie between 75° and 83°N. It is perhaps surprising that the Ivory gull is not a circumpolar species. There are dispersed breeding records in northern Canada (MacDonald and Macpherson, 1962; MacDonald, 1976; Frisch and Morgan, 1979; Witts and Morrison, 1980) and in northern as well as southeastern Greenland (Salomonsen, 1961, 1967; Wright and Matthews, 1980), but the largest occur-

rences are found on Svalbard (Løvenskiold, 1964), Franz Josef Land and North Island (Severnaya Zemlya), and apparently the north island of Novaya Zemlya (Dementiev and Gladkov, 1969) (Fig. 3). The continental north coasts of Eurasia and North America are apparently not suitable breeding grounds for Ivory gulls.

Recently three more southerly records (66-68°N) of nesting Ivory gulls were made NNW of Angmagssalik on the southern part of East Greenland (Wright and Matthews, 1980). All three colonies were found on nunataks, i.e., rocks or mountains cropping out of the Inland Ice. The most remote colony was situated 1850-1900 m above sea level and a good 60 km inland from the coast. Nesting on nunataks, sometimes far from the sea, is previously known both from Svalbard (Birkenmajer and Skreslet, 1963; Løvenskiold, 1964) and from Canada (Frisch and Morgan, 1979). Breeding Ivory gulls on a drifting moraine-covered ice floe have also been reported (MacDonald and Macpherson, 1962). The adaptive value of such remote and barely accessible nest sites might be related to preda-



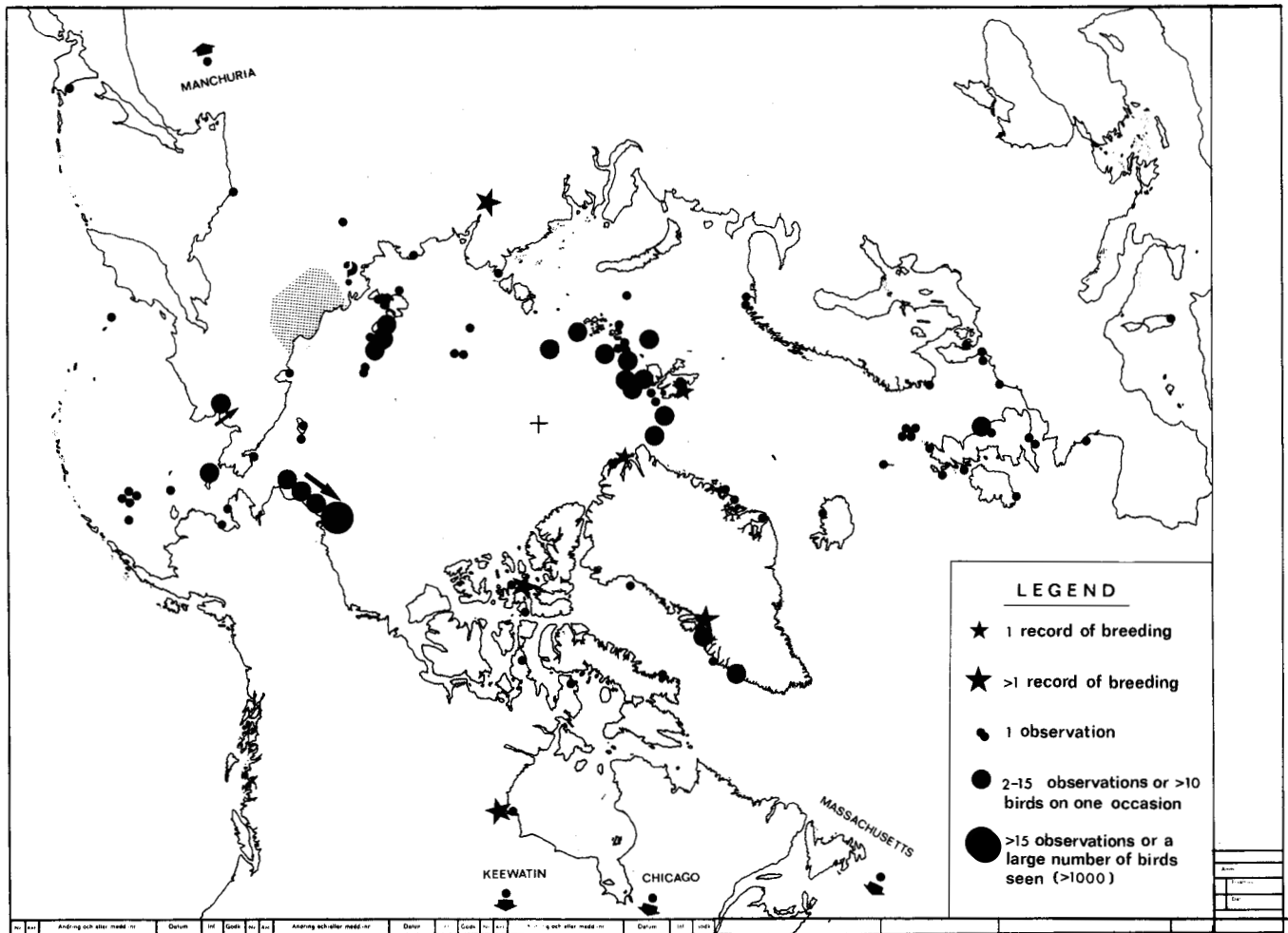


FIG. 2. Ross's gull. Breeding areas (dotted shading), separate breeding records (\*, ★) and places of sightings and specimen records (\*, ●) of different numbers are shown. Observed migration movements are marked with arrows. The map is based on the following references: Aldcroft *et al.*, 1969; Bailey, 1948; Blomqvist and Elander (observation); Brun, 1968; Buturlin, 1906, 1912; Dalglish, 1886; de Korte, 1974; Dementiev and Gladkov, 1969; Densley, 1977a, 1977b, 1979; Dybbro, 1978; Godfrey, 1966; Grandjean and Grandjean, 1980; Hjort, 1980; Kamp and Møbjerg Kristensen, 1980; Kessel and Gibson, 1978; Løvenskiöld, 1964; MacDonald, 1976; Meltofte *et al.*, 1981; Møhl-Hansen, 1949; Nordenskiöld, 1881; Pleske, 1928; Mori, 1976; Schaanning, 1928; Schmidt and König, 1954; Spaans, 1959; Watson and Divoky, 1972; Whelan, 1980; Zhirnov *et al.*, 1978.

tion pressure (Frisch and Morgan, 1979), mainly from the arctic fox (*Alopex lagopus*) (Dalgety, 1932; Bateson and Plowright, 1959a). Breeding on level ground also occurs regularly (Salomonsen, 1961; Bannerman, 1962; Løvenskiöld, 1964).

#### FOOD

Like most other gulls, Sabine's, Ross's and Ivory gulls are opportunists with broad food spectra. All three eat small fish and various small invertebrates, mainly crustaceans and insects. Faeces and carcasses are also included in their menu (Salomonsen, 1950; Bannerman, 1962; Løvenskiöld, 1964; Watson and Divoky, 1972; Divoky, 1976). In summer insects contribute a larger proportion of the diet, and are sometimes the primary food source (Bannerman, 1962; Dementiev and Gladkov, 1969; Vinicombe, 1971; Densley, 1979).

Both Ross's and Ivory gulls, but particularly the latter, have been said to avoid resting on sea water (Bannerman, 1962:365; Dementiev and Gladkov, 1969:487; Salomonsen, 1972:55). The combination of arctic water near its freezing point and extremely low air temperatures was assumed to be dangerous (cf. note by N. Tinbergen in Bateson and Plowright, 1959b:172; Bannerman, 1962:356; Løvenskiöld, 1964:271; Salomonsen, 1972:55). Several recent observations of bathing and swimming birds (Watson and Divoky, 1972; Brown *et al.*, 1974; Bayldon, 1976; Divoky, 1976; Densley, 1977b, 1979; Laybourne, 1978; Meltofte *et al.*, 1981) have cast doubt on the impression that Ross's and Ivory gulls avoid sea water. The revised conception of the behaviour of the birds, combined with further gizzard analysis, have led to the conclusion (Watson and Divoky, 1972; Divoky, 1976) that the importance of seal and walrus droppings, carcasses left by polar bears (*Ursus maritimus*), whale carrion and similar items as a food



PLATE 2. Ivory gull off Liverpool Land in Northeast Greenland, June 1975. The Ivory gull has an extremely northern distribution, and according to present knowledge, breeds almost exclusively north of 70°N; the main nesting areas lie between 75° and 83°N. (M. Elander)

resource has been overemphasized (e.g. Dalgety, 1932:2; Johansen, 1958:41; Løvenskiold, 1964:271; MacDonald, 1976:6). The main food of both the Ivory and the Ross's gull is now considered to consist of small fish and lesser invertebrates. It is more difficult to observe the birds foraging from the sea than to watch them foraging on carrion and faeces on ice-floes or on the shore.

#### BREEDING BIOLOGY

All three species nest in single pairs or small colonies, usually comprising one or two dozen pairs. Colonies are larger in the case of the Ivory gull. Sabine's and Ross's gulls often nest among Arctic tern (*Sterna paradisaea*) colonies (Buturlin, 1906, 1912; Fisher and Lockley, 1954; Snyder, 1957; Sutton, 1962) and in Greenland Sabine's gulls do so exclusively (Salomonsen, 1950, 1967). In Spitsbergen it was found that Ivory gulls may breed in association with Kittiwakes (*Rissa tridactyla*) (Bateson and Plowright, 1959a, 1959b).

Sabine's gulls arrive at their breeding grounds at the end of May or the beginning of June (Sutton, 1962; Salomonsen, 1950, 1967). Where breeding is early, e.g. in parts of

Alaska, egg-laying may start at the end of May (Sutton, 1962), but in Greenland laying may not commence until the second half of June (Salomonsen, 1950, 1967).

Documentation of the breeding biology of Ross's gull (Plate 3) is extremely sparse. Buturlin's publications from his work in northeast Siberia in 1905 are still the most comprehensive and detailed descriptions available. The birds apparently arrive around the end of May or early June and egg-laying starts a week to ten days later. Breeding has been established twice in Disko Bay in West Greenland (eggs in June) (Dalgleish, 1886; Seebohm, 1886; Kampp and Møbjerg Kristensen, 1980), once in Peary Land in North Greenland (newly hatched young on 15 July) (Hjort, 1980), and once at Isfjorden (Ice Fiord) on Spitsbergen (eggs in June) (Løvenskiold, 1964). From Canada breeding is reported at Penny Strait near Devon Island — three pairs in 1976 (eggs in June) and six pairs in 1978 (MacDonald, 1978) — and near Churchill, Manitoba (three pairs in 1980, hatching 11-20 July) (Whelan, 1980).

The time of arrival of the Ivory gull at the breeding grounds varies greatly. Birds have been seen on Svalbard as early as February and March. The majority of birds, however, do not arrive until April or May (Løvenskiold,

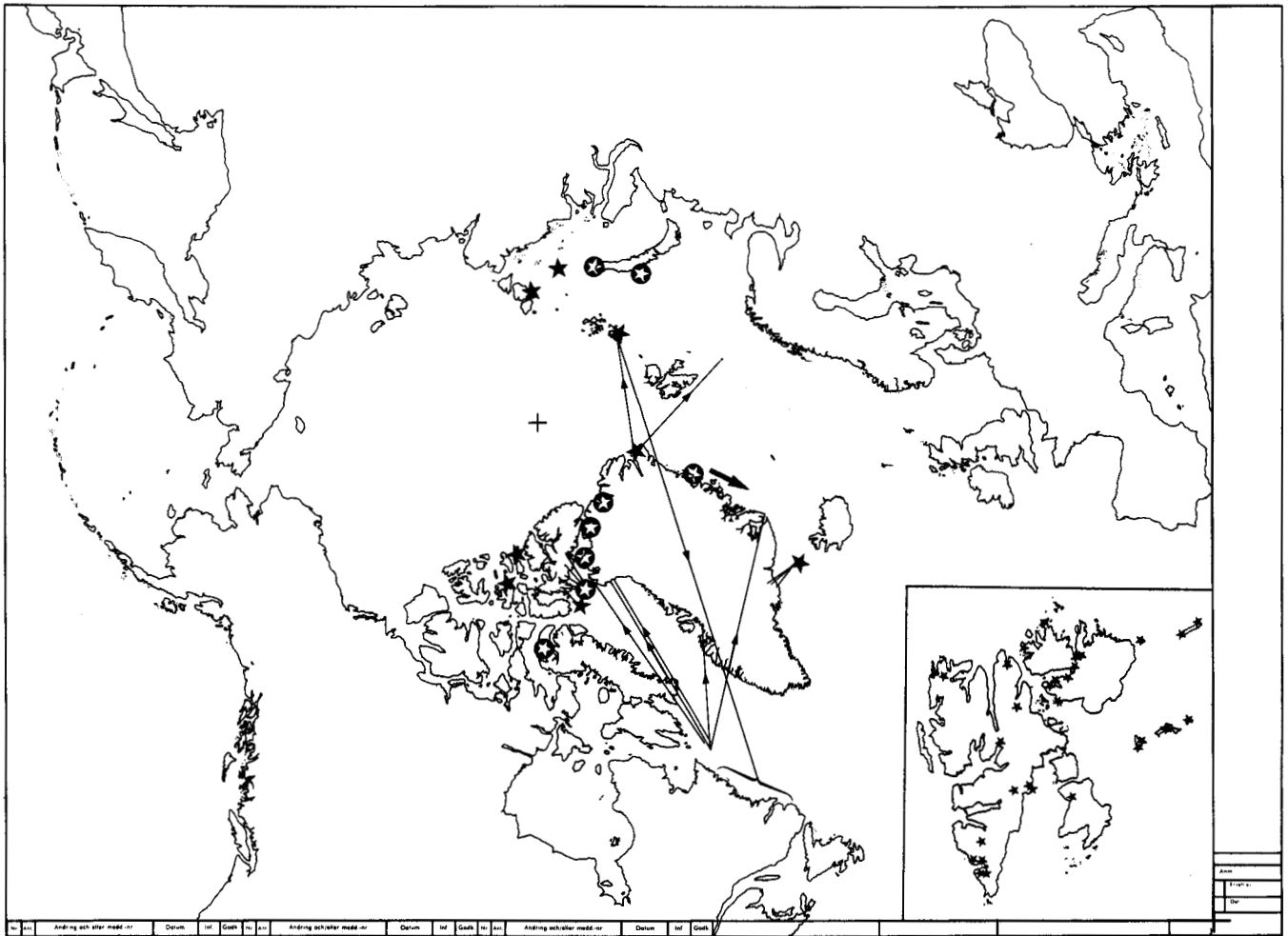


FIG. 3. Ivory gull. Known breeding places (★), probable breeding places (●) and one observed concentrated migration movement (thick arrow) (Hjort, 1976) are shown. Ringing places and recovery places (from Dementiev and Gladkov, 1969:465; Salomonsen, 1971:36, 51; 1979:196, 202) are connected by thin arrows. The map is based on data from the following sources: Birkenmajer and Skreslet, 1963; Clarke and Bruce, 1899; Dementiev and Gladkov, 1969; Flipse and de Roever, 1964; Frisch and Morgan, 1979; Hakala, 1975; Løvenskiold, 1964; MacDonald, 1976; MacDonald and Macpherson, 1962; Manniche, 1910; Meltofte, 1975, 1977; Renaud *et al.*, 1979; Salomonsen, 1950, 1961, 1967, 1971, 1979; Witts and Morrison, 1980; Wright and Matthews, 1980. N.B. Occurrence on Svalbard shown in inset.

1964). The Canadian Ivory gulls arrive at their breeding grounds at the end of May (MacDonald, 1976) while the birds in North Greenland normally arrive at the beginning of June (Salomonsen, 1967). Egg-laying generally commences late in the season. On Spitsbergen, where hatching has been studied in one colony, laying was estimated to be the end of June or the beginning of July (Bateson and Plowright, 1959a), approximately two weeks later than in a nearby colony of Kittiwakes. There have been observations of egg-laying in Canada from the end of June, and in an early year from mid-June (MacDonald, 1976).

The reproductive behaviour of Sabine's and Ivory gulls (see Brown *et al.*, 1967; Bateson and Plowright, 1959b) shows great similarities with other Larids (*cf.* Tinbergen, 1959). It is not known whether this is true also for Ross's gull.

An interesting difference between Sabine's, Ross's and Ivory gulls is their comparative clutch sizes. In contrast to

most Larids (Lack, 1968), fixed three-egg clutches among these three species are not the general rule. A climatological trend may be discerned. Ross's gull, the most southerly breeding of the three, has a clutch size of three or, less often, two eggs (Buturlin, 1906). The predominant clutch size among Sabine's gulls (Plate 4) is two eggs but clutches of three eggs or one egg do sometimes occur (Bent, 1947; Snyder, 1957; Sutton, 1962). In Greenland a clutch invariably numbers two eggs (Salomonsen, 1950). The Ivory gull, the most northerly breeding species of the three, normally has a clutch of two, or less commonly, one egg. Three-egg clutches in this species are rare (Dalgety, 1932; Bateson and Plowright, 1959a). Thus there is a trend toward smaller clutch size in more northerly breeding habitats, which is also observed among Arctic terns (Salomonsen, 1972). The opposite tendency is usually more common among birds in general (Lack, 1947, 1948, 1968; Cody, 1966). The trend might be explained by a decreasing



PLATE 3. Ross's gull at Myggbukta on Hold With Hope, Northeast Greenland, July 1979. The most common breeding biotope of Ross's gull is neither the tundra nor rocky terrain in the Arctic, but marshy wetlands in subalpine and boreal tracts. (S. Blomqvist)

abundance of available food during the gulls' breeding time, from subarctic continental areas in the south, across tundra land towards the Arctic Ocean in the north (cf. Lack, 1968).

#### MIGRATION AND WINTERING

The migration and wintering of Sabine's, Ross's and Ivory gulls show fundamental differences. The Sabine's gull migrates to oceanic waters in the southern hemisphere. Ivory gulls straggle south but remain in the arctic waters close to the pack ice. Ross's gulls are, by contrast, regularly seen in the autumn heading northwards towards the polar ice.

A substantially increased number of sightings at sea of Sabine's gulls during the last two decades has considerably increased our knowledge of the migration routes and wintering grounds used by this species. However, no ringed birds have been recovered or controlled so far. The Sabine's gulls from eastern Siberia, Alaska and western Canada are thought to move through Bering Strait to the Pacific Ocean. South-migrating birds are seen along the North American Pacific coast (Gabrielson and Jewett, 1940; Godfrey, 1966; Campbell, 1970) and they winter in the Humboldt Current, a very productive upwelling off the

west coast of South America (Chapman, 1969; Post, 1971). The Atlantic part of the Sabine's gull population is thought to breed in eastern Canada and Greenland. The eastern Canadian birds migrate southeast by sea through Baffin Bay and Davis Strait. Only a minority cross the mainland. The Canadian gulls and the small Greenlandic population are encountered in the Atlantic (Lambert, 1973; Brown *et al.*, 1975). Subsequently the Sabine's gulls cross the Atlantic heading east or southeast and appear in the autumn along the west coast of Europe (see e.g. Mayaud, 1961; Bierman, 1966; Ricard, 1966; Sharrock, 1971; Dybbro, 1978; SOF, 1978). The Bay of Biscay was formerly thought to be an important wintering area for Sabine's gull (Fisher and Lockley, 1954) but recent observations at sea give another picture. The Atlantic population moves further south, along the northwest African coast and across the Gulf of Guinea to the productive and food-abundant waters in the Benguela Current upwelling off South West Africa and South Africa (Mayaud, 1965; Zoutendyk, 1965, 1968; Lambert, 1967, 1969, 1973). The Atlantic and the Pacific populations of Sabine's gull thus winter in the Old and New Worlds' hydrographic counterparts respectively. The gulls are extremely pelagic during the non-breeding season and are usually found far from the coasts.





PLATE 4. A pair of Sabine's gulls at Sandøen in Young Sund, Northeast Greenland, August 1978. Sabine's gull nests on level terrain in grass-covered moist tundra or on islets. (M. Elander)

The autumn migration of Ross's gull is observed regularly at Point Barrow, the northern cape of Alaska, during northwesterly gales. In a single season several thousand birds may be seen (Murdoch, 1885; Bailey, 1948; Densley, 1977a, 1979; Kessel and Gibson, 1978). For autumn migration, given Point Barrow's geographical position, the Ross's gulls show an unexpected direction: the birds are mainly heading northeast, towards the polar pack ice! No return migration of the same magnitude in the opposite direction has ever been recorded. It has not been fully established, however, that Ross's gulls winter at and around the polar ice; sightings during the non-breeding season, especially in winter, are still too few. Observations from other parts of the world are also surprisingly few (Fig. 2) for an easily-identified bird.

The Ivory gulls winter in northerly waters and roam in the vicinity of the pack ice in the Arctic Ocean. Ivory gulls have been seen on Svalbard during parts of the polar night, when the sun never rises (Løvenskiold, 1964). Straggling birds are regularly seen off southern Greenland and off Newfoundland (Salomonsen, 1967), in the Bering Sea area (Kessel and Gibson, 1978), in northern Norway (Haftorn, 1971) and further east along the Eurasian coast of the Arctic Ocean (Bannerman, 1962). Southbound September migrations of Ivory gulls, involving more than 500 birds, have been observed off East Greenland (Hjort, 1976). Eight long-distance recoveries of ringed birds (Fig. 3) support the possibility that longer movements may occur. Ivory gulls have occasionally been recorded from Iceland, the Faroe Islands, the British Isles and along the coast of

continental Europe (Bannerman, 1962; Sharrock and Sharrock, 1976; SOF, 1978).

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