ARCTIC BIRDS

Bulletin of the International Breeding Conditions Survey

supported by the International Wader Study Group and
Wetlands International's Goose and Swan Specialist Groups

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compiled by Mikhail Soloviev and Pavel Tomkovich

A WORD FROM THE COMPILERS

Pronounced fluctuations of the reproductive output of birds and mammals are characteristic of many Arctic terrestrial ecosystems, but are not restricted to them. However, while habitat degradation and pollution have strongly affected many biomes of the world, patterns of ecosystem dynamics in the tundra are still mostly natural, even at a global, pan-Arctic scale. As it is expected that there will be changes in the environment due to climate amelioration and accelerating industrial activities in the Arctic, the present unique opportunity to investigate the regularities of the dynamics of a natural ecosystem at a wide spatial scale should be fully explored.

The current issue of the bulletin of the Arctic Birds Breeding Conditions Survey (ABBCS) brings together information about the breeding conditions for birds in the Arctic and Subarctic during summer 2006, and includes data on weather, predators and their prey and bird breeding success. The geographic coverage of the survey in 2006 did not change considerably compared with the two previous years, with an exception of the data from the Russian Arctic, which decreased by approximately 20%. While several factors contributed to the decrease, discontinued funding of the project in 2006 and hence the failure to publish the 'Arctic Birds' issue number 8 as a hardcopy was a contributory factor.

The interpretation of global patterns in bird reproductive performance will only be perfected when they are complemented by more detailed studies at a smaller, regional scale. Regional reviews of the dynamics of rodents as alternative prey for Arctic predators appeared in the previous issues of the bulletin (number 4-6). The current issue has made another step forward by presenting the paper by Hans Meltofte *et al*. on breeding performance of tundra birds in Northeast Greenland based on the studies carried out in the area during two decades.

Monitoring of juvenile proportions on the non-breeding grounds still remains the only practical option for the assessment of bird breeding success across wide geographical regions and for flyway populations. The long-term efforts of researchers from the Victorian and Australasian Wader Studies groups to catch waders during the non-breeding season in Australia are exemplary in this context. The high quality and consistency of data are particularly valued in light of their rapid and wide accessibility, also in the form of annual reports in the "Arctic Birds" bulletin (see the paper by Clive Minton *et al*. in this issue).

The start of the International Polar Year (IPY) in 2007 was associated with the intensification of research activities in the Arctic and increasing international cooperation. The communication of the results of these activities will be aided by the launch of the Arctic Portal (http://arcticportal.org) by the Arctic Council as its gateway to Arctic related information. The "IPY – Arctic Predators" (http://www.arctic-predators.uit.no) can be mentioned, among more specific projects, as a network of Norwegian and Russian scientists aiming at a large-scale monitoring of terrestrial Arctic predators with the objective of developing reliable predictors of how the tundra ecosystem will function in the context of climate change. This issue will apparently remain the focus of many studies given the continued overall warming of the Arctic system in 2007 (http://www.arctic.noaa.gov/reportcard).

As the project coordinators we have seen new opportunities for ABBCS arising from the increasing level of research and other activities in the Arctic. However, we also recognize challenges associated with the need to trace, collect and process the larger volume of data. Fortunately, a grant provided in 2007 by the Royal Netherlands Embassy in Moscow, Russia, within the framework of the Small Nature Protection Initiative Project (KNIP), made it possible not only to maintain a level of data processing typical for recent years, but also to propose new activities with the view of raising the profile of ABBCS as an information resource. Namely, new survey forms were developed with the aim of making the submission of data more simple and straightforward for respondents with different background in field data collection. The survey website along with its traditional address at http://www.arcticbirds.ru has also been made available at http://www.arcticbirds.net. This emphasizes the international nature of the project and its reliance on the network of respondents. The site will become bilingual with the principal sections translated into Russian, and we plan to increase the usefulness of the resource by expanding the range of data published on the web. All these efforts, along with the much anticipated support by contributors, should provide for the collection of information on bird breeding conditions and reproductive performance in summer 2007 that will match the expectations for the International Polar Year and provide for a better understanding of ecological processes in a changing environment.

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For the latest information about the survey and data access visit the websites:

http://www.arcticbirds.net, http://www.arcticbirds.ru

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The bulletin is distributed to contributors to the database.
Others may request it, free of charge, from the project coordinators.

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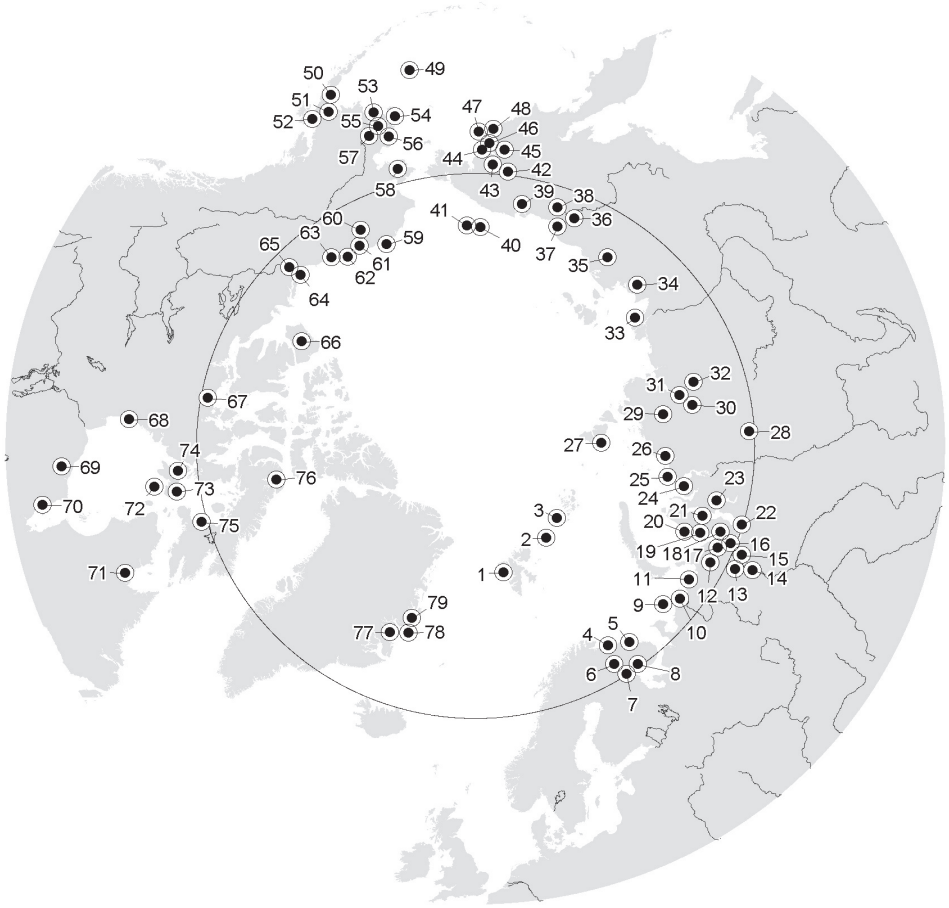

Figure. Arctic localities from which reports about bird breeding conditions were provided

LOCALITY REPORTS

1. Svalbard, Norway (78°55'N, 12°15'E)

Between 25 September 2006 and 8 March 2007, a total of 7,043 Svalbard Barnacle Geese *Branta leucopsis* was aged by a single observer at WWT Caerlaverock, Scotland. The overall proportion of young present in these flocks was 14.6%, ranging from 5.7% to 25.0% within individual flocks. This is the highest percentage of young since 1998, and is well above the current 10-year mean (8.9%±1.78 s.e.), thus representing a good breeding season. Brood size was recorded for a total of 111 families, and the mean brood size per successful pair was 2.2 goslings, with brood sizes ranging from 1-5 goslings. This is slightly lower than in the previous year, but still higher than the mean for the most recent 10-year period (1997-2006; 1.81, ± 0.11 s.e.). Although Svalbard Barnacle Geese had a better than recent average breeding season in 2006, they have shown a steady decrease in breeding success over the past 15-20 years, with particularly low outputs in the past seven years.

L. Griffin (GooseNews. The Newsletter of WWT's Goose & Swan Monitoring Programme. Issue no. 6, Autumn 2007. http://www.wwt.org.uk/research/pdf/GooseNews6.pdf)

2. Victoria Island, the Barents Sea, Russia (80°09'N, 36°43'E)

Air temperatures ranged from +1-6°C on Victoria Island on 14-17 July with dull weather, fogs, drizzle and wet snow. At least 2 strong storms with northely winds occurred on the island in the first half of July, judging by the abundance and distribution of driftwood.

Ivory Gulls *Pagophila eburnea* did not breed in 2006 on Victoria Island, although a big colony existed there from the 1950s to the 1990s. The absence of ice cover around the island and associated poor feeding conditions for Ivory Gulls could be a possible reason for their non-breeding. Almost all nests of other seabirds which attempted to breed on Victoria Island, the Arctic Tern *Sterna paradisaea*, Glaucous Gull *Larus hyperboreus* and Kittiwake *Rissa trydactyla* (the latter on deserted buildings of the closed weather station) were destroyed by an Arctic Fox *Alopex lagopus* staying on the island throughout the summer.

M.V. Gavrilo, A.E. Volkov

3. Frantz Josef Land Archipelago, Russia (80°50'N, 47°30'E)

Mean monthly air temperature was 0.3° above the long-term average (+0.2°C) in July 2006 on the Frantz Josef Land archipelago, based on the data of weather station on Kheys Island; maximum and minimum temperatures were +10.8°C and –2.4°C, respectively. The mean daily air temperature dropped to –1.0°C on the coldest day of the month, 27 July. The weather was dull with drizzle, air temperatures ranging from 0°C to +1.7°C (mean daily temperature +1°C) in the period of our studies on the archipelago on 17-18 July.

Thus, weather conditions were close to the long-term average based on the weather station data. Information of the Arctic and Antarctic Research Institute, St. Petersburg, Russia, indicated considerably reduced ice-cover at the north of the Barents Sea and close to long-term average ice conditions (slightly reduced) in the eastern part of the Kara Sea. We did not observe drifting ice between Victoria Island and Frantz Josef Land Archipelago, but there was drifting and fast ice among the islands of the latter archipelago, primarily in the north-east.

Rodents do not inhabit Victoria Island and Frantz Josef Land Archipelago.

Ivory Gulls bred successfully in the surveyed colonies on Zemlya Alexandry and the Eva-Liv islands of the Frantz Josef Land archipelago, where nesting of the Common Eider *Somateria mollissima* (clutches found) and Arctic Skua *Stercorarius parasiticus* (downy chick found) was also recorded.

M.V. Gavrilo, A.E. Volkov

4. Rybachy Peninsula, Kola Peninsula, Russia (69°36'N, 32°57'E)

Rainy dull weather with almost daily precipitation prevailed in June. Mean daily air temperatures ranged from +7-10°C. Wind speed reached 20-25 m/s during a storm lasting for 3 days in the end of June. The season was probably average in timing.

The abundance of rodents was not studied. However, voles and signs of their activities, were recorded everywhere during observations from 15 June - 5 July, and several dead animals were found in nests of Rough-legged Buzzards *Buteo lagopus*.

Arctic Foxes were not recorded. Wild Reindeers *Rangifer tarandus* were encountered almost daily during the whole period of study in herds of 15-100 animals. Three pairs of Rough-legged Buzzards and a pair of Peregrine Falcons *Falco peregrinus* bred in the study area. One White-tailed Sea Eagle *Haliaeetus albicilla* was regularly seen, and a pair of Gyrfalcons *Falco rusticolus* was recorded once. Six Ravens *Corvus corax* were resident in the area. Owls and grouse were not recorded.

Human impact was considerable in the area, as fishermen's motorboats were moving along the coast on all days and at any time.

The principal research was carried out on a seabird colony where we counted 40,000 nests of Kittiwakes, over 500 nests of Common Murres *Uria aalge* and less than 70 nests of Thick-billed Murres *U. lomvia*. A colony of the Great Cormorant *Phalacrocorax carbo* contained 120 nests, and 141 birds were recorded on nests or nearby. Other breeding birds included the Common Eider (4 nests), Bean Goose *Anser fabalis* (brood), Black Guillemot *Cepphus grylle*, Razorbill *Alca torda* (one bird on nest), Herring Gull *Larus argentatus* (2 nests) and White Wagtail *Motacilla alba* (nest).

A.V. Ezhov

5. Kharlov Island, Sem' Ostrovov Archipelago, the Barents Sea, Russia (68°49'N, 37°20'E)

The snow completely melted before our arrival on 7 June. Extreme weather events and snowfalls were not recorded in the period from 7 June to 13 August, but 2 thunderstorms occurred in June. The season was average in timing and was warm and dry. Weather data was collected by the weather station on Kharlov Island.

Norway Lemmings *Lemmus lemmus* were not recorded in 2006 and voles are absent on Kharlov Island.

Mammalian predators on the island were represented by the American Mink *Mustela vison* (3 juveniles were seen in one of the broods) and Ermine *M. erminea*. A territorial pair of Peregrine Falcons was recorded on one of the islands, as well as non-breeding Northern Goshawk *Accipiter gentilis*, Rough-legged Buzzard, Golden Eagle *Aquila chrysaetos*, White-tailed Sea Eagle, Gyrfalcon and Merlin *Falco columbarius*. A dead Short-eared Owl *Asio flammeus* was found on Kharlov Island. The abundance of Great Skuas *Stercorarius skua* on the archipelago had not changed (14 pairs), while numbers of Arctic Skuas decreased slightly (to 116 pairs). Several vagrant Long-tailed Skuas *Stercorarius longicaudus* were recorded on the island. Mean size of complete clutches of Arctic Skuas was 1.91±0.03 (range 1-2, *n*=78) and hatching success 70.5% .

The abundance of Herring Gulls and Great Black-backed Gulls *Larus marinus* did not change, but increased in Common Gulls *Larus canus* and Kittiwakes. Breeding attempts were not recorded in Arctic Terns. Mean clutch size of Common Gulls was 2.05±0.13 (range 1-3, *n*=41) and hatching success 81.7%. Complete clutches of Kittiwakes contained on average 1.91±0.02 (range 1-3, *n*=344) eggs, brood size was 1.14±0.01 (range 1-2, *n*=977) chicks before fledging, and breeding success was 28.1% (in a sample of 35 nests on survey plots).

Two pairs of Red-throated Divers *Gavia stellata* nested on Kharlov Island. The abundance of Gannets *Sula bassana* increased from 145 nesting pairs in 2005 to 161 pairs in 2006. Numbers of Great Cormorant decreased to 46 pairs on Veshnyak Island, but did not change on Maly Litsky Island (29 pairs). Mean clutch size was 2.70±0.17 (range 1-4, *n*=23) before hatching, and mean brood size 2.50±0.12 (range 1-4, *n*=46). The abundance of Shags *Phalacrocorax aristotelis* increased to 150 pairs on Veshnyak Island, with mean clutch size 2.09±0.28 (range 1-4, *n*=11) and mean brood size 2.30±0.10 (range 1-3, *n*=43).

Breeding of Barnacle Geese was recorded on Maly Zelenets Island once again. Approximately 50 pairs of Bean Geese were observed on the islands, 2 Pintail *Anas acuta* nests were found and 1 Long-tailed Duck *Clangula hyemalis* nest. Non-breeding waterfowl were represented by Whooper Swans *Cygnus cygnus*, Red-breasted Mergansers *Mergus serrator* and Common Mergansers *M. merganser*. No data are available on population dynamics of the Common Eider; the mean clutch size was 3.84±0.13 (range 1-6, *n*=95).

We recorded 7 pairs of Rock Ptarmigans *Lagopus mutus* on the archipelago, of which 4 were with broods. Numbers of Thick-

billed and Common murres decreased slightly on Kharlov Island, while reliable counts of other auks were not conducted.

Breeding waders included the Turnstone *Arenaria interpres*, Oystercatcher *Haematopus ostralegus* and Red-necked Phalarope *Phalaropus lobatus*. Display of the Temminck's Stint *Calidris temminckii* was recorded on Bolshoi Litsky Island. The Eurasian Golden Plover *Pluvialis apricaria*, Ringed Plover *Charadrius hiaticula*, Spotted Redshank *Tringa erythropus*, Ruff *Philomachus pugnax*, Little Stint *Calidris minuta*, Dunlin *C. alpina*, Purple Sandpiper *C. maritima*, Common Snipe *Gallinago gallinago*, Whimbrel *Numenius phaeopus* and Bar-tailed Godwit *Limosa lapponica* were observed on migration.

Breeding passerines of the archipelago included the Meadow *Anthus pratensis*, Red-throated *A. cervinus*, and Rock *A. petrosus* pipits, White Wagtail, Hooded Crow *Corvus cornix*, Raven, Willow Warbler *Phylloscopus trochilus*, Wheatear *Oenanthe oenanthe*, Bluethroat *Luscinia svecica*, Redwing *Turdus iliacus* and Snow Bunting *Plectrophenax nivalis*. We also recorded the House Martin *Delicon urbica*, Magpie *Pica pica*, Waxwing *Bombycilla garrulus*, Sedge Warbler *Acrocephalus schoenobanus*, House Sparrow *Passer domesticus*, Redpoll and Lapland Bunting *Calcarius lapponicus*.

M.V. Melnikov, A.V. Osadchiy

6. Laplandsky State Nature Reserve, Kola Peninsula, Russia (67°57'N, 31°46'E)

The season was generally early, warm and wet. Phenological spring started on 2 April when maximum air temperatures consistently rose above freezing, compared to 22 April in 2005 and the long term average of 12 April. The last air frost occurred on 26 May and last frost measured at ground level on 2 June. Snow disappeared from 50% of the flat open surface on 17 May and in the forests and in mountains on 20 May. Ice passed along larger rivers on 18 May, and snow completely melted on 29 May. Ice broke up 5 days earlier than average on large lakes. Thus, the spring was ca.10 days earlier than average, and birds also arrived earlier.

Summer started on 12 June when daily mean air temperatures consistently exceeded +10°C compared to 9 June in 2005 and the long-term average of 12 June. Autumn started on 5 September when daily mean air temperatures consistently dropped below +10°C, compared with 6 September 2005 and the long-term average of 30 August. The first air frost occurred on 1 October and ground frost on 21 September. As in 2005 winter started on 19 October when daily mean air temperatures consistently dropped below freezing, compared with the long-term average of 24 October. Snow had blanketed the ground on 25 October in the forest. The winter was warm.

Mean monthly air temperatures were 2.9°C above the long-term average in April, 2.2°C in May, 2.7°C in June, 1.1°C in August, 0.4°C in September and 5.3°C in December, but were 1.7°C below average in July, 0.5°C in October and 0.2°C in November. Mean annual air temperature was 1.4°C above the long-term average, and only July was relatively cold in the summer months. Snowfalls and other extreme events were not recorded from mid May to the end of summer. Precipitation was 129% of the monthly average in April, 117% in May, 124% in June, 146% in July, 26% in August, 158% in September, 116% in October, 111% in November and 194% December, while mean annual precipitation was 116% above average. Thus, precipitation was above average in all months with the exception of February, March and August. The water table was high in rivers and lakes in June and July. Rainy weather in September also resulted in increasing water levels.

Weather conditions were generally favourable for reproduction of birds. Weather data were obtained from http://rp5.ru, while long-term averages were available from the weather station in Monchegorsk.

As expected, the abundance of *Clethrionomys* species of voles started to increase in 2006, although only from the second half of summer. The population of Bank Voles *Cl. glareolus* reached its maximum by autumn in the area of the long-term field station "Elnyun". Abundance of *Microtus* species of voles, particularly the Tundra Vole *M. oeconomus*, was high based on observations and catches at the Chunozero field station. Numbers of shrews (*Sorex* spp.) increased as well. Assuming favourable winter the population of the Grey-sided Vole *Clethrionomys rufocannus* should reach its peak in 2007, while Bank Voles should start decreasing. In autumn most of *Clethrionomys* voles were mature animals of this year. Reproduction continued until October in Grey-sided and Bank voles due to satisfactory weather and good resources of food. *Clethrionomys* voles can be expected to remain abundant in 2007, while populations of most *Microtus* voles and shrews will probably decrease.

The yield of Bilberry *Vaccinum myrtillus* ranked 5 on a scale of 5; Clusterberry *V. vitis-idaea*, Bog bilberry *V. uliginosum*, Alpine bearberry *Arctous alpina*, pine, Grey Alder *Alnus incana* ranked 4; Crowberry *Empetrum nigrum*, Cloudberry *Rubus chamaemorus*, Bearberry *Arctostaphylos uva-ursi* ranked 3; Cranberry *Oxycoccus sp*., spruce, European Rowan *Sorbus aucuparia* ranked 2; birch ranked 1.

The European Mink *Mustela lutreola*, Otter *Lutra lutra*, Wolverine *Gulo gulo*, Wolf *Canis lupus* and Brown Bear *Ursus arctos* were common, while numbers of the Red Fox *Vulpes vulpes*, Ermine and Least Weasel *M. nivalis* were relatively low. Abundance of Marten *Martes martes* has remained high during the last three years.

Among birds of prey nests or indications of breeding were found in the Osprey *Pandion haliaeetus*, Golden Eagle, Eurasian Kestrel *Falco tinnunculus*, Gyrfalcon and Merlin. Rough-legged Buzzards and owls were rare without any sign of breeding.

Densities of Tetraonid birds determined in the course of counts in August was 60 birds/10 km^2, which is the record low value found during 1998-2006. Abundance of waterfowl (divers and ducks) per unit length of lake and river shoreline increased 40% compared with the 2005 value. Waders bred in usual numbers in forested areas. Crossbills were rare. Juvenile Redpolls, European Siskins *Spinus spinus*, Willow Warblers, Siberian Tits *Parus cinctus* became numerous from July, while the

abundance of other small birds was close to normal. Passerines and waders departed earlier than usual.

Human impact is minimal in the area.

A.S. Gilyazov, G.D. Kataev

7. Karelsky coast, Kandalaksha Bay, the White Sea, Russia (67°00'N, 32°25'E)

The abundance of insectivores (Soricidae) declined dramatically during the period under the snow in winter 2005/2006, and they were not captured in snap-traps (300 trap-days in early June and late August). Their relative density in captures by cylinders was 0 animals/10 days in June, 13.8 animals/10 days in July and 42.0 animals/10 days in August, with the Common Shrew *Sorex araneus* always being the dominant species.

Abundance of voles was low in spring, when they were absent in snap-trap catches, but increased in July and reached 0.7 animals/100 trap-days in late August. Considerably more voles, predominantly Short-tailed Voles *Microtus agrestis* (46.2%), were captured in cylinders with a relative density of 10 animals/10 days in June, 0 animals/10 days in July and 16.0 animals/10 days in August. Wood Lemmings *Myopus schisticolor* were not captured in 2006.

Similarly to the previous year, rains and the high level of ground water adversely affected rodent trapping efficiency. Precipitation occurred on 50% of days in June, 68% in July, 32% in August and 53% in September.

High abundance of voles, primarily of *Microtus* genus, was recorded in September and October 2006 in Kandalaksha, Luvenga and Kolvitsa. Animals running on the snow surface were seen in the vicinity and within these settlements until December. We captured 23 Common Voles *Microtus arvalis* in Nizhnyaya Kandalaksha area.

Rodent specialist predators of the area were represented by the Eurasian Kestrel, whose behaviour indicated breeding.

N.S. Boyko

8. Northern Archipelago, Kandalaksha Bay, the White Sea, Russia (67°00'N, 32°34'E)

The head of the Kandalaksha Bay did not freeze until 27 December 2005 due to a prolonged warm period in the middle of the month. Ice was still loose in mid February and only 15-20 cm thick according to a report by V.B. Voschikov. The reduction of ice cover started very early: leads appeared between islands by 20 March 2006, a major part of the bay near Kandalaksha was ice-free in mid April and ice disappeared in early May even from localities where it normally remains until 20 May. Ice was also almost completely melted by mid May on the shores of the islands.

Early May was unusually warm and air temperatures during 9 days reached +10-17°C during the day, but temperatures did not exceed +5-7°C on most days in the second half of the month. Temperatures and precipitation were close to average in June and July, but the weather turned cold in late July and early August with air temperatures of +7-12°C. The first night frost was recorded on 27 September in the Kandalaksha area, and permanent snow cover was established on 2 December. The whole of December was very warm with temperatures often around freezing. Ice formed near the shoreline of the bay and between the islands in late October and half the area of the strait between Kandalaksha and the islands was ice-covered by mid November. However, strong wind broke up the ice and moved it away in late November. The bay did not freeze until the end of December.

The crop of berries was not heavy on the islands and ranked as 1 in Cloudberry, 1-2 in Crowberry *Empetrum hermaphroditum*, 2 in Bog bilberry, and 3 in Clusterberry and Bilberry.

Insectivores (Soricidae) overwintered successfully, and their relative density on Ryashkov Island was 1.7 animals/10 days in May, 4.5 animals/10 days in July and 15.7 animals/10 days in August based on captures using cylinders. Common Shrew was the dominant species.

The abundance of voles was low in spring and they were not caught in snap-traps or cylinders. Their numbers increased in July, and density reached 1.8 animals/100 trap-nights on Ryashkov Island in September. The relative density based on captures using cylinders was considerably higher: 7 animals/10 days in July, 20 animals/10 days in August and 10.0 animals/10 days in September. The Short-tailed Vole was the most common species (90.4%). The abundance of voles was low on other islands compared with in 2005, and similar to the abundance in 2000. Running voles, always belonging to *Microtus* genus, were seen on 26% of forested islands and 3% of ludas (small tree-less islands), while in 2005 the respective figures were 53% and 31%. Voles were absent in pellets of Herring Gulls (n=25), Great Black-backed Gulls (n=6) and Hooded Crows (n=31) collected in June on the islands of Luvengsky and Northern archipelagos, but turned up in pellets of Herring Gulls in August. The remains of 14 mammals were found in 284 pellets of Herring Gulls and 14 pellets of Common Gulls collected in August and September on islands of the Luvengsky archipelago, including 64.3% belonging to Bank Voles, 28.6% to Common Shrews and 7.1% to Short-tailed Voles. Voles comprised 60% of the diet of an adult American Mink on Ryashov Island, based on examination of an animal latrine; of these 54.5% were Short-tailed Voles and 45.5% Bank Voles.

Counts carried out on 23 treeless islands of the archipelago, ranging in area from 0.1-0.3 ha (15 ha in total), recorded 5 nests of Greater Scaups *Aythya marila*, 1009 nests of Common Eiders, 6 nests of Red-breasted Mergansers, 12 pairs of Turnstones, 74 pairs of Oystercatchers, 140 pairs of Herring Gulls, 16 pairs of Great Black-backed Gulls, 164 pairs of Common Gulls, 29 pairs of Arctic Terns, 22 pairs of Black Guillemots, 15 pairs of White Wagtails and 1 pair of Wheatears. Numbers of breeding birds had changed little compared with the previous years.

In contrast to 2005, when 3 pairs of White-tailed Sea Eagles bred on the islands, these birds did not nest in 2006, although adult and immature eagles were recorded during the whole summer. As in the previous years sea eagles successfully hunted Common Eiders, including incubating females, and killed

125 eider females by the time of the counts of most abundant seabirds nesting on the islands in late June and early July.

The forested islands of the archipelago (19 in total) were inhabited by 6 nesting pairs of Ravens. European Kestrels were seen on 2 islands in the breeding period, and their behaviour indicated possible breeding. We observed 2 Short-eared Owls almost daily in June on Ryashkov Island, and in August a Hawk Owl *Surnia ulula* was seen there frequently. A Lapland Owl *Strix nebulosa* was recorded on Anisimov Island by V.B. Voschikov in September and October.

Two forested islands were inhabited by one Red Fox each and one island by two foxes. Red Foxes also visited adjacent islands where they destroyed clutches of land-nesting birds. An Ermine was recorded on Ryashov Island. American Minks inhabited four islands.

E.V. Shutova, N.S. Boyko

9. Peschanka River lower reaches, Kolguev Island, the Barents Sea (69°07'N, 49°58'E)

Observations were carried out from 29 May to 12 August. In all upland habitats snow was present only in deep ravines by the end of May, but coastal marshes were still approximately 50% snow-covered. Mean daily air temperatures were above freezing point, and only on 5-7 June were temperatures below 0°C at night. Maximum daily temperatures exceeded +16°C only on 4 June, 20-26 June, 9-14 July and 18-19 July. The majority of days were cloudy, precipitation occurred regularly, and wind speed exceeded 6-8 m/s on most days.

Rodents were absent on the island.

The first Barnacle and White-fronted geese *Anser albifrons* arrived on 17-18 May, according to reports of people from Bugrino village. Their main arrival occurred after 27 May, and the number of White-fronted Geese continued to increase until 6 June.

The first nests of Bean Geese were found on 29 May, of Barnacle Geese on 2 June in the main colony at lower Peschanka River and of White-fronted Geese on 3 June.

Arctic Foxes were common and bred successfully; 5 inhabited dens were found within 5 km from the camp, with up to 7-9 pups. All food remains near dens were of geese (mostly Barnacle Geese). Red Foxes were seen several times on the banks of the Peschanka River, mostly on the northern bank, but inhabited dens of Red Foxes were not found.

Arctic Skuas were common and bred successfully. Breeding of the Great Skua was recorded. Glaucous and Herring Gulls were rather abundant (over 250 pairs bred both spread and in colonies in the Peschanka River, valley including its delta). Glaucous Gulls and Arctic Skuas predated clutches, and especially chicks, of all geese species.

Peregrine Falcons bred successfully. 4 nests contained 4 chicks, and one nest contained 3 chicks, due to the death of one chick soon after hatching. Remains of Ruffs predominated near falcon nests during incubation while chick diet included Dunlins, Grey Plovers *Pluvialis squatarola*, Eurasian Golden Plovers and Turnstones. Hatching occurred between 1 and 12 July. Dense goose colonies were found within 150 m of nests of Peregrine Falcons, one of which consisted of more than 40 nests of 3 species.

Three nests of Rough-legged Buzzards with 2, 2 and 4 eggs were found at the lower Peschanka area at an average distance of 2 km from each other. Adult birds were predating Willow Grouse *Lagopus lagopus* during incubation and fed chicks with goslings and ducklings of various species. Hatching occurred on 30 June in buzzards.

Short-eared Owl was seen only once during spring migration, and one male Snowy Owl *Nyctea scandiaca* stayed in the Peschanka River delta during summer, feeding on geese.

The size of the Barnacle Goose colony at the lower Peschanka River, including the Paarkov River delta, was estimated ca. 47,000 breeding pairs.

The nest success of Barnacle Geese was high and reached 95% on the main part of their colony. White-fronted geese bred at a density of 51-59 nests/km^2, and nest success was 90%. Bean Geese bred at a density of 1-2 pairs/km^2 in coastal areas and there were ca. 30 nests/km^2 in central parts of the island, 10 km inland from the coastline. Their nest success was 77%.

Mean clutch size was 3.5, 3.7 and 3.6 and mean brood size at hatching was 3.2, 2.7 and 3.2 in White-fronted, Bean and Barnacle geese, respectively. Brood size at fledgling was 2.2 young in Barnacle Geese and 1.8 young in White-fronted Geese.

Bewick's Swans *Cygnus bewickii* nested successfully in the Peschanka River valley (20 broods in total), with an average clutch size of 4.5 eggs (n=8). King Eiders *Somateria spectabilis* bred at high density in the area of the Peschanka lagoon. Greater Scaups were common in the Peschanka River valley, with a density of over 10 nests/km^2. Long-Tailed Ducks were common on inland lakes. Pintails and Teals *Anas crecca* were recorded breeding in the river valley, and Velvet Scoters *Melanitta fusca* and Common Scoters *M. nigra* on upland and valley lakes.

The first flightless moulting non-breeding Barnacle and Bean geese were recorded on 4 July. The first flying adults were seen on 6 August, and first broods of flying young were observed after 10 August.

Among waders, Dunlin, Ringed Plover, and Temmink's Stint were abundant and widespread breeders. Leks of Ruffs were common on the bluffs of the Peschanka River valley. Reeves and juvenile Ruffs were common in August in the bogs of the river floodplain. Breeding of the Little Stint and Red-necked Phalarope was recorded at several sites. Grey and Golden plovers were common in the coastal area and inland, respectively. Breeding Turnstones were found at only 2 localities.

Common Snipes were occasionally heard and seen in the Peschanka River valley. Displaying Jack Snipes *Lymnocryptes minimus* were heard and seen at many places of the same area. Wood Sandpipers were recorded displaying in shrubs of the Peschanka River. Oystercatchers were breeding at the eastern and southern sandy spits of the island. Nesting densities

of Dunlin and Turnstone decreased considerably in the area compared with 1995.

Large post-breeding aggregations of waders were found on mudflats of the Peschanka Lagoon and on eastern spits from late June till late July. The biggest concentration consisted of ca.10,000 waders, and others consisted of 2000, 800 and 400 waders. Dunlins formed a majority of these flocks, but Purple Sandpipers and Sanderlings *Calidris alba* were also recorded.

Generally, breeding success of waders was high, as few records of nest failure were documented and numerous broods were observed. Broods of the Dunlin, Temmink's Stint and Ringed Plover were particularly common, but broods of the Little Stint, Red-necked Phalarope, Grey and Golden plovers and Ruff were also recorded.

A.V. Kondratyev, E.M. Zainagutdinova, Yu.A. Anisimov, P.M. Glazov, V.A. Buzun, H. Kruckenberg, J. Mooij, Ch. Zockler

10. Kolokolkova Guba coast, Tobseda settlement, Russia (68°35'N, 52°20'E)

By 27 May snow disappeared in the Naryan-Mar town area, the flood period was already over and ice remained only on large lakes, which all indicated an early spring. Snow was also absent on 31 May in the study area in the northeastern part of the Kolokolkova Bay. Major snowfalls did not occur in June, and the mean monthly air temperature (+7.8°C) was the highest for the last 4 years. There was cold weather from 27 June, and this generally lasted until the end of observations on 13 August, although there were short-term periods of warmer weather (a maximum of +35.2°C was reached on 11 July). Summer was rainy (it rained on 21 days out of 73), windy, with thunderstorms and frequent fogs.

According to the reports of local people the first Barnacle Geese appeared on 14 May and Brent Geese *Branta bernicla* on 26 May, while mass migration of geese occurred on 29 May. One more wave of the Brent Goose migration we recorded on 9 June after the start of observations on 1 June. Goose migration ended on 10 June. The first nests of Barnacle Geese were seen on 29 May in a colony on dunes overgrown with vegetation.

Strong winds from the sea caused flooding of a part of the Barnacle Geese colony on coastal lowland marshes, but contrary to similar flooding in 2005, the consequences were not catastrophic in 2006.

The numbers of rodents were low, and voles were relatively abundant only in Tobseda settlement, as in the previous years.

Arctic Foxes and avian rodent-specialists (owls and Pomarine Skuas *Stercorarius pomarinus*) were not seen, even in the tundra areas adjacent to dunes.

Five pairs of Arctic Skuas bred, and predation pressure by this species, gulls and White-tailed Sea Eagles on breeding Barnacle Geese can be evaluated as low to average. Nest success (proportion of nests with at least one chick hatched) was 86%. The mean (±SE) clutch size was 4.19±0.04 (*n*=1094) eggs, and the mean brood size just after hatching was 2.7±0.04 (*n*=1002) goslings. The total number of nests of Barnacle Geese was about 1490 on the mainland of the study area and 1095 on the islands in the northern part of the Kolokolkova Bay. Favourable conditions prevailed during the brood-rearing period. Non-breeders and failed-breeders could fly after moult in early August, and broods fledged from mid August.

As in other years, the nesting density of White-fronted Geese was very high and reached 25 nests/km^2 locally. The mean clutch size was 4.25±0.175 (*n*=46) eggs, and 80% (*n*=50) of nests were successful. Three nesting birds were killed by a White-tailed Sea Eagle in a small area. Willow Grouse were common and bred successfully.

Although there was no targeted search for nests of waders and ducks, breeding success was considered relatively high in these birds judging by the records of nests and broods. This could be due to favourable weather conditions and relatively weak predation pressure. We recorded 8 broods of Red-throated Divers, 6 broods of Long-tailed Ducks and 3 broods of Teal. Generally breeding conditions in 2006 were favourable for birds.

K.E. Litvin, E.N. Gurtovaya, F.V. Kazansky, N.B. Konyukhov, O.B. Pokrovskaya

11. Chornaya River and Urer-yakha River basin, Bolshezemelskaya Tundra, Russia (68°47'N, 57°13'E)

According to observations from 9 June – 22 July the season was average in timing, cold and rainy. Snow, probably, melted to 50% on flat surfaces in late May, and ice-break on rivers took place at the same time. Thunderstorms were frequent from 18-22 July, after which the weather turned abruptly cold and the weather was stormy.

Numbers of Siberian Lemmings *Lemmus sibiricus* and Tundra Voles were low.

Arctic Foxes were common and bred. Rough-legged Buzzards, Peregrine Falcons and Merlins bred in usual numbers, and hatching of chicks was recorded in the two former species. White-tailed Sea Eagles were present in small numbers, and one observation of a Short-eared Owl was made. Arctic Skuas were common breeders, but nesting of Long-tailed Skuas, Common and Herring gulls was not confirmed. Willow Grouse were common breeders. None of waterfowl species was numerous.

Trampling by reindeers could adversely affect the breeding success of birds.

Y.N. Mineev, O.Y. Mineev

12. East of Bolshezemelskaya tundra, Russia (67°15'N, 64°35'E)

At arrival on 27 May winter conditions prevailed in the tundra with few snow-free patches on the tops of hills and hillocks. Air temperature dropped to –7°C at night. However, the advance of spring was rapid and daytime air temperatures were above freezing in the following days. Pouring rain continued for the whole day on 3 June resulting in the complete disappearance of snow. Ice broke on rivers 29 May – 3 June. The water table was high, particularly in forest tundra where the

upper parts of floodplain were flooded as well as the lower floodplain.

June was warm in general with the exception of a sudden drop of temperatures on 12-13 June, when a strong northwestern wind and a snowstorm resulted in a layer of snow several cm thick, which did not melt even in the day-time. However, the weather soon improved and the second half of June was warm and the weather stable. Phenological events, including nesting of birds, occurred earlier than usual due to the rapid advance of spring, and were not affected by the cold weather in mid June.

Summer was cool and very rainy. In the period from 1 July to mid August, a single week in mid July was dry; rain showers occurred on all other days. Pouring rain was frequent in late July and early August. This caused a high summer flood with water levels 1.5 m over normal for the middle of July.

Numbers of voles were very low or locally low. Neither lemmings nor signs of their activities were recorded.

All mammalian predators were rare, and we did not observe Arctic Foxes, Red Foxes or Ermines.

Snowy Owls were not recorded, while solitary Short-eared Owls were observed on spring migration. Rough-legged Buzzards nested at a low density in spread localities, and many pairs did not attempt to breed. Mean clutch size did not exceed 3 eggs, and many pairs failed, although several successful pairs raised 1-2 chicks to fledging. Northern Harrier *Circus cyaneus* nested at a low density in patches where there were at least some rodents. Long-tailed Skuas nested in small numbers in the southern tundra, and many pairs failed.

The rapid spring development and early snowmelt allowed the early start of breeding in many species of waders. Apparently their breeding was not adversely affected by the cold weather on 12-13 June and the rains in late July. Predation pressure of both mammals and avian predators on clutches and broods of waders was, probably, not high, and reproductive success of waders can be evaluated as above average or even high.

V.V. Morozov

13. Voikar River middle reaches, Lower Ob' River area, Russia (65°48'N, 63°57'E)

Spring warming started on 6 May, since when snow-free patches appeared on the tundra. By mid May snow remained only in ravines, lakes were filled with meltwater over the ice and leads along the shores started to appear at some of them. However, cold weather with snowfalls returned after 20 May, and snowmelt was delayed. Snow cover was reduced to 50% on 24 May and completely disappeared very quickly by 3 June, helped by rains in early June. Ice broke relatively late on the Voikar River, on 29 May. Greening of birch leaves was completed on average dates, by 10 June.

Rodent numbers were at a low.

Short-eared Owls and Northern Harriers were represented by solitary wandering birds. Numbers of the Willow Grouse were considerably lower compared with 2005, and they occurred at a density slightly below average. Numbers of Pintails and European Wigeons *Anas penelope* were also lower, while abundance of another dominant duck species, the Teal, increased and reached the highest level for 17 years of observations. Numbers of Common Scoters and Long-tailed Ducks were above average. Overall the total numbers of ducks remained unchanged.

Numbers increased in almost all wader species, with the exception of Wood Sandpipers *Tringa glareola*, whose numbers were still, however, above the long-term average. The abundance of Greenshanks *Tringa nebularia* and Black-tailed Godwits *Limosa limosa* has shown a clear increasing trend during the last 10-12 years, and reached the record high numbers, as did also the Common Sandpiper *Actitis hypoleucos* in 2006. Non-breeding Black-tailed Godwits were quite common, in flocks of up to 16 birds.

Among passerines, numbers of Bramblings *Fringilla montifringilla* increased sharply, and to a lesser extent also of Little Buntings *Emberiza pusilla*, Willow Warblers and Yellow Wagtails *Motacilla flava*. Redwing numbers declined. Meadow Pipit and White Wagtail numbers were stable.

M.G. Golovatin

14. Ob' River lower reaches, Russia (65°26'N, 64°56'E)

Ice was fractured and melted near the shores on the Ob' River by mid May. However, the ice-break was delayed until 25 May due to low water levels. Subsequently the river quickly cleared of ice. The water level was not high during the spring flood and meadow ridges were covered by water only for a short time. Spring was average in timing and the summer was warm and rainy.

Voles occurred in average numbers. Short-eared Owls were common breeders.

An unusually high number of White-fronted Geese staged in the Ob' River floodplain in spring, and observations of flocks of up to 700-1000 birds were not rare. The total numbers of waterfowl decreased considerably compared with 2005 in the dominant species, Pintails, European Wigeons and Tufted Ducks *Aythya fuligula*. However numbers of Mallards *Anas platyrhynchos* and, particularly, Garganeys *A. querquedula* increased. Numbers of Black-headed Gulls *Larus ridibundus* decreased by a factor of almost 5 in 2006. Approximately 75% of birds bred, all in small colonies of 3-10 nests. Some gulls, probably, moved downstream along the Ob' River, as the sizes of colonies in the vicinity of the Labytnangi settlement increased considerably. Abundance of Little Gulls *Larus minutus* did not change notably, although the proportion of birds breeding in the inner parts of the floodplain dropped to about 9%. Little Gulls moved to the vicinity of channels, where the proportion of breeding birds was 36%, and they established colonies of medium to large size (25-90 nests) on the flooded shores of the channels.

Among waders, numbers of Wood Sandpipers and Common Snipes decreased, while Terek Sandpipers *Xenus cinereus* occurred in higher numbers. The Sedge Warbler was the only passerine species whose numbers continued to decrease. Numbers of Willow Warbler, Arctic Warbler *Phylloscopus borealis*,

Chiffchaffs *Ph. collybitus*, and Bramblings increased, while numbers of other species did not change notably.

M.G. Golovatin, S.P. Paskhalny

15. Lower Ob' River, West Siberia, Russia (65°47'N, 67°12'E)

According to observations from 21 June – 2 August air temperatures ranged from 0° to +30°C (during a day in early July), and rainy weather prevailed from the second half of July. The wet weather resulted in increased abundance of mosquitoes and other biting insects, but the water table was low. In spite of the cold and rainy weather in summer, extreme weather events, with possible negative impact on breeding of birds, did not occur.

Both Ruddy *Clethrionomys rutilus* and Tundra voles were common, while lemmings were not recorded.

A variety of mammalian and avian predators was recorded in the study area: Arctic Fox, White-tailed Sea Eagle, Northern Harrier, Northern Goshawk, Rough-legged Buzzard, Merlin and Short-eared Owl. White-tailed Sea Eagle and Merlin were common breeders. All species of skuas were rare, and the Common Gull was the only common breeder among gulls. Willow Grouse bred in average numbers.

Presence of broods of Whooper Swans, Red-throated and Black-throated *Gavia arctica* divers, various species of ducks, waders and passerines indicated fairly successful reproduction by birds.

E.Y. Loktionov

16. Schuchya River middle reaches, Yamal Peninsula, Russia (67°16'N, 68°42'E)

Spring was reported late and prolonged by local residents. According to observations made from 17 June – 7 August vegetation of most plants was delayed by approximately one week compared with average dates and two weeks compared with the early season in 2005. Snow and rain was reported until mid June, but the second half of the month was warm and dry. The first half of July was cold with day-time air temperatures between +10-12°C, while the second half of the month was warm and temperatures reached +27°C. Rains occurred almost daily in July and early August. The water table decreased slowly after the spring flood and increased again in early August. Extreme weather events were not recorded. The late spring resulted in delayed reproduction by some pairs of Rough-legged Buzzards and Merlins, but not by passerines, geese, ducks and waders.

Rodents were generally rare and they were less abundant than in 2005, but were locally more common in forested floodplains and forest-tundra (Ruddy, Tundra and Narrow-skulled *Microtus gregalis* voles). This situation was different from 2005, when rodents (primarily Narrow-skulled and Middendorff's *M. middendorffi* voles) were more common in northerly open tundra areas, where they locally reached moderate numbers. Rodent abundance did not decrease during summer 2006. Arctic Hares and Muskrats *Ondatra zibethicus* were numerous as usual. Solitary lemmings were seen.

Arctic Foxes were not recorded, while Red Foxes were rare, and unlike in 2005 inhabited dens were rare. Tracks of Brown Bears and Wolves were relatively common, similarly to 2005.

Numbers of Rough-legged Buzzards were about average, but lower than in 2005, particularly in the tundra part of the area where rodents were rare. Nesting density in the forested river valleys was 0.1-0.3 pairs per 10 km. Buzzard nests contained 2-3 eggs or 1-3 chicks. Non-breeding territorial pairs, solitary territorial birds and wandering birds were often seen during summer, particularly in the forest tundra. A single nest with 4 chicks of Northern Harrier was found. A vagrant Pallid Harrier *Circus macrourus* was recorded. As in 2005, White-tailed Sea Eagles were very numerous (13 nests) and bred successfully. Only one nest of Golden Eagles out of 4 nests which were active in 2005, was re-occupied and contained two chicks, but breeding pairs in 2 new sites were discovered. Only four of the 9 pairs of Peregrine Falcons recorded breeding in 2005 produced eggs or chicks in 2006, although the breeding was not delayed compared to other years. Gyrfalcons bred at a low density: two broods (away from the nest) and 3 nests were found, with a single chick in each of the latter. The latter apparently represented replacement clutches as they were approximately 3 weeks later than usual. Merlins were numerous as usual, but chick development was 7-9 days delayed. Breeding was less synchronous than usual in Merlins and Rough-legged Buzzards. Owls were not recorded.

Long-tailed Skuas occurred in moderate numbers, but mostly as non-breeders. Common and Herring gulls were common, but there were no breeding recorded. Among passerines, the Lapland Bunting was more numerous than in 2005, while Shorelark *Eremophila alpestris* became very rare. Nesting density of Carrion Crows and Ravens continued to increase, and 5 broods of Magpies were recorded. This is an unusually high number compared with solitary breeding events in previous years.

Willow Grouse were slightly more abundant compared with 2005, and several broods were recorded. Wigeon, Pintail, Teal and Long-tailed Duck were the most numerous ducks, but the latter species bred in only small numbers and a single brood was recorded. Whooper Swans were considerably less abundant than in 2005, and Bewick's Swan was recorded once. Neither species bred. Lesser White-fronted *Anser erythropus* and Bean geese occurred in slightly higher numbers than in 2005 and bred successfully at the usual dates.

Wood and Terek sandpipers were, as usual, the abundant waders; broods and fledged juveniles were recorded in both species. Common Sandpiper, Ringed Plover, Temminck's Stint, Common and Pintail *Gallinago stenura* snipes and Red-necked Phalarope were common, as previously. Numbers of Eurasian Golden Plover, Whimbrel and Bar-tailed Godwit increased compared with 2005, particularly in the two latter species which were rare in 2005, but were as common as in the 1990s. Numbers of Lesser White-fronted Goose also increased. Breeding of most species of birds occurred at the average time. Numerous observations of broods of geese, wad-

ers and passerines indicated successful reproduction by most birds, in spite of the cool summer and low rodent abundance. This was, probably, due to the low numbers of most predators and absence of extreme weather events. The main predator on clutches of land-nesting birds was Carrion Crows.

S.A. Mechnikova, N.V. Kudryavtsev

17. Coasts of the Baidaratskaya Gulf, the Kara Sea (68°30'N, 67°30'E)

The weather was rainy, windy and colder than usual on both the western (Yugorsky peninsula) and eastern (Yamal peninsula) coasts of the Baidaratskaya Gulf in August 2006, with air temperatures ranging from 0°C to +9°C and frequent precipitation.

Two lemmings, numerous Arctic Hares *Lepus timidus*, two Arctic Foxes and one Reindeer were seen during one month. A single Snowy Owl was observed on the Yamal coast, while 2-3 pairs of Rough-legged Buzzards were recorded along the bluffy coast of the Yugorsky. Some buzzard nests that were checked were not inhabited in 2006.

F.A. Romanenko

18. Erkatayakha and Payutayakha rivers, Yamal, Russia (68°13'N, 69°09'E)

Spring was the latest on record for the last 7 years, and it was still possible to cross the Erkatayakha River on snowmobiles in late May. Ice broke on 5-7 June. Snow cover reduced from 80% at our arrival on 2 June to 50% on 3-5 June and snow completely melted on 8-10 June. All the breeding species of birds of the area were recorded in early June. Large flocks of geese of up to 300 birds were regularly observed on 1-10 June.

It was relatively warm in early June, with moderate winds and air temperatures reaching +5-7°C in the day-time. Drizzle occurred often and lasted for up to 24 hours a day. Such relatively warm rainy weather in early June resulted in intensive snowmelt which, combined with much ice in the Baidaratskaya Bay, caused an unusually high and torrential flood. The highest water level was reached on 8 June when almost the entire area was flooded. The riverbed was only marked by a few bluffy banks. A weakened Barn Swallow *Hirundo rustica* was found by local people on the roof of their house in late May. A Brown Bear was shot by locals 30 km to the south of the study area near the railway bridge on 25 May. The first mosquitoes appeared on 10 June. In spite of the late snowmelt and ice-break, two southern species, the Terek Sandpiper and Brambling, were recorded in the area several times. Northwestern and western winds prevailed on 10-20 June, and rain was common. Extreme weather events were not recorded in the study period from 1 to 21 June.

Lemming numbers were not high. However, a Siberian Lemming was captured for the first time in the last 5 years. Middendorff's and Narrow-skulled voles were common.

Arctic Foxes were relatively common in the first half of June. Snowy and Short-eared owls were rare and did not breed. Migration of Pomarine Skuas was notable on 3-4 June, when several flocks of up to 15 birds were recorded flying eastward. Arctic Skuas were common and regularly recorded in flocks of 4-5 birds in the study area and bred. The breeding status of the rare Long-tailed Skuas was not confirmed.

White-fronted Geese were relatively abundant in the area in early June. We discovered signs of intensive spring hunting on waterfowl in the river area, like wings of geese and the skin of a Bewick's Swan. The river floodplain remained under water until the second half of June due to a high flood. This probably resulted in the more prolonged breeding of several species, as their nests were found both in the uplands and in the floodplain after the retreat of water. A nest of the Lesser White-fronted Goose with a clutch of 4 eggs was found on a bluff, while previously the breeding status of this species was indicated only by records of broods. The earliest records of breeding included a nest of the Wood Sandpiper with a complete clutch on 12 June, a nest of the Red-throated Pipit with a clutch of 5 eggs on 16 June and a nest of the Pintail with a clutch of 6 eggs on 10 June (destroyed by Arctic Fox on 18 June).

Considering the relatively late spring, high flood levels, low lemming abundance and frequent observations of Arctic Foxes, the reproductive success of birds was probably low in the area.

V.A. Sokolov

19. Central Yamal Peninsula, western part, Russia (69°47'N, 68°17'E)

The weather was fairly warm and dry in the period of observations on 22-31 July.

Lemmings were not recorded while voles occurred in low numbers.

Arctic Foxes were rare, and a single brood was found in 12 surveyed dens. Few pairs of Rough-legged Buzzards bred, and those nests which were found contained no more than one chick. Chicks were fed with birds, as we found feathers of the Willow Grouse and Black-throated Diver in their nests. Alarming pairs of Arctic and Long-tailed skuas were rarely seen; while Pomarine Skuas were not recorded. Snowy Owls were rare and did not breed.

Ducks were not numerous, and occurred mostly in small flocks of 3-10 birds, but larger flocks of up to 30 Greater Scaups were recorded in the vicinity of the Mordyyakha River, and flocks of King Eiders of similar size were observed near the sea coast.

Black-throated Divers were unusually abundant, while numbers of Willow Grouse were moderate. Large unfledged chicks were recorded in the Eurasian Golden Plover, Ringed Plover and Ruff. Well flying juveniles of the Dunlin, Temminck's Stint, Little Stint and Red-necked Phalarope (the latter in small numbers) were observed at the end of July.

M.G. Golovatin, V.A. Sokolov

20. Bovanenkovo settlement, Yamal Peninsula, Russia (70°26'N, 68°09'E)

The weather was cold until 10 July, but then turned warm with little rain.

Lemmings were not recorded while voles occurred in low numbers.

According to the surveys carried out on 13-22 July, Arctic Foxes were very rare and did not breed. Snowy Owls, Long-tailed and Arctic skuas were present as solitary wandering birds. Rough-legged Buzzards were rare breeders, and had only 1-2 chicks in their nests.

White-fronted Geese were abundant compared with previous years, and their broods were recorded everywhere including in anthropogenic environments. Abundant moulting Pintails were observed in small flocks of 10-15 birds, not only in shallow waters with stands of Pendant Grass *Arctophila fulva* but also on small tundra creeks and rivers. The Greater Scaup and Long-tailed Duck were rare. Willow Grouse occurred in moderate numbers. Abundance of the Red-necked Phalarope and Little Stint was considerably lower and above average, respectively; other wader species occurred in usual numbers. A clutch of eggs at a stage close to hatching was found in Ruff on 16 July, but at this time we also recorded large chicks of this species (of similar size to Common Sandpipers).

M.G. Golovatin, V.A. Sokolov

21. Seyakha River lower reaches, Yamal Peninsula, Russia (70°07'N, 72°20'E)

A late spring was followed by a cold rainy summer. Snowfalls did not occur in the study period from 21 June to 12 July. Rainy weather caused an increase of water levels in the floodplain, lakes and marshes in the period of mass hatching in waders and grouse and when passerines were feeding their chicks. This apparently resulted in the loss of many clutches and chicks.

Numbers of voles were low and lemmings were not recorded.

The Arctic Fox was seen only once, but their barking was heard several times in June. A single wandering Snowy Owl was recorded. Among skuas, the Arctic Skua was the only species observed and bred. Among birds of prey only Rough-legged Buzzards bred, but they deserted most of their clutches, and it is not likely that chicks survived to fledging, except perhaps for one nest closest to human settlement. Thus, predation pressure on birds and their clutches did not appear significant. However, cold rains in the middle of the reproduction period apparently had strong adverse effect on survival of clutches and chicks (several nests from the few under study were flooded). In spite of the early termination of surveys, based on long-term experience we conclude that reproductive success should have been average or slightly lower in most species of birds.

Several new southerly species were recorded in the area compared with the 1970s (Ryabitsev & Primak 2006), although the late spring in 2006 did not favour spread of southern species to the north. Willow Grouses were common breeders.

V.K. Ryabitsev, I.V. Primak

22. Nyda settlement, Tazovsky Peninsula, Western Siberia, Russia (66°40'N, 73°00'E)

The first snowfall occurred on 23 September, but the snow melted again quickly.

Rodents, Arctic Foxes, Ermines and Snowy Owls were not recorded. The following numbers of raptors were observed in the study period from 20-27 September: 17 Peregrine Falcons, 23 Merlins, 7 Rough-legged Buzzards, 5 White-tailed Sea Eagles, 2 Gyrfalcons and 2 Northern Harriers.

I.R. Enaleev

23. Totayakha River, Gydan Peninsula, Russia (69°17'N, 76°47'E)

According to observations on 8-22 August temperatures were regularly below freezing at night in the second half of August, and reached –12°C on 18 August.

Rodents were not recorded. Both avian and mammalian predators were numerous. Arctic Foxes were common and bred. Successful breeding was observed in numerous Rough-legged Buzzards, common Peregrine Falcons, Merlins and White-tailed Sea Eagles but Northern Harriers were rare. Recorded nests of Peregrine Falcons contained 3 chicks. Snowy Owls and Arctic and Long-tailed skuas occurred in average numbers, also with broods. Pomarine Skuas were not recorded. Willow Grouse were numerous and Rock Ptarmigans were common breeders. Waterfowl broods contained on average 5-7 (maximum 10) chicks. In spite of the high abundance of predators successful reproduction of waders, geese, ducks and passerines was indicated by high abundance of birds in August.

Human impacts in the area include spring migration of the Nenets people with reindeers and seismic surveys. These will likely become widespread next year in the framework of a base line construction. However, low river depth, even when in flood, make this area hard to reach for humans.

E.Y. Loktionov

24. Mongocheyakha River lower reaches, Gydan Peninsula, Russia (72°14'N, 78°35'E)

Snow cover in the area normally reduces to 50% on 20-30 May, and completely disappears in early June, but we do not have records for 2006. Ice broke on the Gyda River on 21 June. Weather was cool and dry with air temperatures around +8°C during the day and reaching –3°C at night in the period from our arrival on 28 June until 3 July. There was already no ice on the river or snow in the tundra, but large ice floes were still present on lakes. Air temperatures increased to +14°C on 3 July and a period of daily rains started. During 10-16 July mean air temperatures dropped to +12°C and rains were infrequent. There was little precipitation during the following week (17-23 July), but mean temperatures reached +17°C, a relatively high value for the area, with a maximum +25°C. Rains occurred daily and often lasted for several hours on 24-30 July, and mean temperatures decreased to +16°C. Permafrost was reduced to a depth of 10-12 cm by the time of our arrival on 28 June. Water levels did not change significantly in the river,

rising at high tide by 50-60 cm. Extreme weather events probably did not occur except for unusually hot weather during several days.

Solitary Siberian Lemmings were recorded. Two records of Arctic Foxes were made during the study period from 28 June to 1 August, and two large unoccupied dens were checked.

All breeding pairs of birds were already incubating in late June. Among divers the Red-throated Diver was rare, while Black-throated Diver was a common breeder. Red-breasted Geese *Branta ruficollis* occurred in small numbers, and we found 2 of their nests, one of which survived to hatching. A flock of 69 non-breeding Red-breasted Geese was observed on the Mongocheyakha River. White-fronted Geese were common in the area. They bred in the Mongocheyakha River valley, and non-breeding birds moulted on the river. Approximately 30% of goose nests were destroyed by Arctic Foxes. We observed Bean Geese only on migration and during the moult period. A single Bewick's Swan was also recorded. Ducks were rare. There were breeding Long-tailed Ducks, wandering King Eiders and a single record of Greater Scaup.

Rare birds of prey included Peregrine Falcons and two breeding pairs of Rough-legged Buzzards. Both the Rock Ptarmigan and Willow Grouse were common, the former occurring in slightly higher numbers. In total 11 species of waders were recorded. The status of Eurasian Golden Plover and Pintail Snipe was not clear. Pacific Golden Plover *Pluvialis fulva*, Ringed Plover and Temminck's Stint were rare breeders; the two species of phalaropes, Grey Plover, Little Stint, Dunlin and Ruff were common breeders.

Gulls and skuas were generally rare, with the exception of the common Herring Gull. The Long-tailed Skua was more common than Arctic Skua, but breeding was not confirmed in either species. Wandering Snowy Owls were recorded on 3 occasions.

Among passerines the Red-throated Pipit and Lapland Bunting were numerous, Shorelarks were common, and 6 other recorded species were rare.

Generally, low predation pressure and warm weather were favourable for reproduction of local birds.

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25. Medusa Bay, Taimyr Peninsula, Russia (73°21'N, 80°32'E)

Spring was early in 2006. At our arrival on 8 June snow cover was reduced to 30% in the station vicinity, but melting slowed down, and approximately 10% of the area was still snow-covered by the end of June. Ice broke on 11 June on the Medusa River, compared with 17 June in an "average" season. Summer was relatively cold. Air temperatures did not exceed +10°C in the first half of June, and the highest temperature of +22.3°C was recorded on 22 July. The weather was unusually warm and calm in the third week of July. Precipitation was most abundant in late June and early July. The sea ice had started to recede in early July in the Shirokaya-Severnaya Bay, and the bay in the vicinity of the field station and more distant areas were mainly ice-free by 12 July. The Slobodskaya and Brazhnikova bays, 30 km to the south of the station, cleared of ice on 8 July.

Lemming numbers were very low in 2006, and had probably reached the record low value for the period 1998-2006 (a period when there was continuity of field teams). Six observers recorded a single Siberian Lemming in the tundra during the whole season, and one was seen carried by a wandering Snowy Owl male. It is noteworthy that the physiognomy of the tundra was changed dramatically in 2005 due to the activities of lemmings which were very numerous then. There were very many new lemming burrows compared with recent years, which indicated that the peak of abundance in 2005 was the highest for several decades (several 11-year cycles). The unusually high abundance in 2005 was followed by unusually low lemming numbers in 2006.

Abundance of Arctic Hares started to increase in 2006 after a period of low numbers in 2004-2005. One animal was seen close to the station, and several tracks were recorded across the study area. In the Krestiyanka River area the abundance of hares was as high in 2006 as during the previous visit in 2003. It seems likely that this area 55-75 km to the south from the station differs from the station area in the dynamics of hare numbers. Wild Reindeer migration was more intensive in the station vicinity in 2006 compared with 2005. The first small herds of several animals were recorded 20 km to the south of the station at the Efremova River on 8 July, and solitary animals appeared near the station on the next day. Reindeers were common to the south of the Efremova River and were numerous between the Krestiyanka and Ragozinka rivers. Ermines and wolves, or tracks of these animals, were not recorded in 2006.

Numbers of Arctic Foxes were very low, and, probably, the lowest for the period 2000-2006. The impact of Arctic Foxes on birds was unusual, because they apparently affected nest success of only large tundra birds. In contrast, apparent nest success in waders was very high and ranged from 77% in Little Stint to almost 100% in Curlew Sandpiper *Calidris ferruginea*. Breeding started early and almost simultaneously in different species of waders: complete clutches were found in Little Stint and Pacific Golden Plover on 18 June. Breeding success was very low in large birds. All clutches of Taimyr Herring Gulls on Oleniy Islands were destroyed by Arctic Foxes, which made daily visits across the ice to the islands 5-8 km from the sea coast (which they did not do in good lemming seasons). A single breeding attempt of Brent Geese on the islands was recorded. Their nest was also destroyed by foxes. Successful nesting of Brent Geese was recorded only on a sea island 60 km to the south from the station near the Krestiyanka River mouth.

Snowy Owls did not breed, which is typical for a low lemming year. However, non-breeding of Rough-legged Buzzards was recorded for the first time since 1998. Buzzards occupied a maximum of 13 territories and 10 birds started to build nests, but not a single pair was formed. Pomarine Skuas did not breed, but birds passing in different directions were recorded until 28 June. Long-tailed Skuas established 8 territories, on which 3 nests were found, but chicks hatched only in one nest.

The duration of migration to moulting areas in White-fronted Geese was similar in 2006 to 2002-2005. The migration started on 3 July which is 6 days later than in 2005, and continued until 20 July, with the highest number of birds passing on 3-7 July. The moult migration of Brent Geese started also on 3 July (cf. 27 June in 2005), but was of very low intensity and the last flock was recorded on 8 July. Several flocks of Brent Geese were observed migrating to the south. This was unusual for the study area where normally they are heading north-eastward. The Rock Ptarmigan had an average hatching success of approximately 50%.

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26. Cape Wostochny, Pyasina River delta, Taimyr, Russia (74°08'N, 86°45'E)

Snow covered 98% of flat surface on 3 June; it reduced to 50% by 14 June and completely melted by 29 June. Ice disappeared from Lidia Bay between Cape Vostochny and offshore islands on 3 July. Snowfalls did not occur after 15 June. The season was cold in early July, warm after 20 July, and dry.

Siberian Lemmings were not seen at all, except for one observation of one live lemming in July. In spite of intensive trapping not a single lemming was caught.

Only a few individuals of Arctic Foxes were seen. In June and July all old fox dens were inspected, but no sign of breeding animals was found. A few fresh tracks of wolves were found, but animals were not seen. Reindeers were observed early in June near Cape Vostochny, with a maximum of 10 in a group. In late July/early August single animals were seen in the vast plains of the Pyasina Delta. Least Weasels, an abundant and often seen predator in 2005, were absent in 2006.

In the study area Snowy Owls were sometimes seen trying to catch adult Little Stints and also chicks of gulls and even adult King Eider females. Pomarine and Long-tailed skuas were only recorded in early spring but soon left. Two nests with eggs of Arctic Skuas were found outside the study area. Compared to other years Grey Phalaropes *Phalaropus fulicarius* were nesting in exceptionally high numbers, but again, many of these assembled in flocks in late June, apparently having given up breeding. Contrary to 2005, when many Ruffs were displaying, they were hardly seen during spring migration in 2006, and were abundant migrants only in August. Gulls were regularly seen on the tundra and were probably the main egg predators.

In summer we frequently checked all nests of waders and passerines in the same area as in 2004 and 2005 to record nest fate. Nest success was estimated according to the Mayfield method (Mayfield 1975). For the Little Stint and Curlew Sandpiper we counted 541,5 nest-days and 15 predated nests. Assuming an incubation period of 21 days, the probability that a nest will survive one day was 97% and the probability that a nest would survive the entire 21 nesting days was 56.3%. This is rather high for a season after a lemming peak year (2005). This surprisingly high nest success could be the result of very low fox numbers in our study area. However, on 4 July there were also observed on Farwaterny Island flocks of Curlew Sandpipers that had apparently given up nesting.

On the mainland tundra hardly any White-fronted Geese were nesting, but on Farwaterny Island many nests of this species were found, most of which hatched successfully, despite the presence of 1-2 Arctic Foxes on this large island. Brent Geese hardly raised any young due to high predation pressure by Herring Gulls. The low, but increasing number of Red-breasted Geese nesting on Bird Islands, were more successful and some goslings were raised successfully.

In late July, when the hatching of geese started, the weather was favourable, even quite warm.

About 92,000 White-fronted Geese were moulting on a surveyed stretch of 89 km of streams in the delta, while their total number in the Pyasina Delta was probably 500,000-1,000,000. We also observed not less than 7000 moulting Brent Geese, 11 Barnacle Geese and 30 Bean Geese.

B. Ebbinge, R. Bom, Y.I. Kokorev, I. Popov, J. de Raad, W. Tijsen

27. Domashny Island, the Kara Sea, Russia (79°31'N, 91°06'E)

The mean monthly air temperature was 0.2° above the long-term average (+0.9°C) in July 2006 in the area of the Sedov archipelago (includes Domashny Island), Severnaya Zemlya, based on the data of weather station on Golomyanny Island. Minimum and maximum air temperatures were –1.9°C and +4.6°C, respectively. Mean daily temperature dropped to –1.2°C on the coldest day of the month, 23 July. The weather was close to normal for the area with frequent rains and drizzle in the period of our studies on Domashny Island on 7-17 July. Snow and rain occurred on 13 and 18 July.

Pack ice prevailed in the Kara Sea in the area of the Severnaya Zemlya Archipelago, and fast ice did not break in the area of the Sedov Archipelago.

Collared Lemmings *Dicrostonyx torquatus* are known for the Severnaya Zemlya Archipelago, but they were found neither on Domashny nor on Golomyanny islands in this year.

Owls and other birds of prey were not recorded.

Breeding conditions for seabirds were favourable in 2006 in the Kara Sea. Breeding Ivory Gulls on Domashny Island and Kittiwakes on Sredny Island were more abundant in 2006 than in 1993-1996. Clutch size of the former species was also larger, while hatching occurred slightly earlier and was successful. Numbers of Glaucous Gulls and Brent Geese on Domashny Island remained low, as in earlier years. Nesting of Glaucous Gulls started ca. 6 days earlier in 2006 than in 1996 based on the inspection of their egg clutches.

M.V. Gavrilo, A.E. Volkov

28. Kureika River middle reaches and Dupkun Lake, Putorana Plateau, Russia (67°05'N, 93°00'E)

Snow reduced to 50% on flat surfaces on 25 May and completely melted on 4 June. Ice broke on large rivers in the period

from 25 May – 6 June. Cool weather with drizzling rains and mean daily air temperatures +3-8°C prevailed in the end of spring until 12 June, and then warm weather with recurring rains and temperatures of +12-15°C established until 25 June. Warm and moderately hot (+20-25°C) dry conditions prevailed from 26 June – 2 August, which resulted in water bodies becoming notably shallower. Then rainy weather with moderate temperatures established. Generally the season was early in timing, warm and relatively dry. In particular, such weather prevailed during incubation and brood-raring by most birds. A considerable adverse impact of abiotic factors on breeding success of birds was not recorded in the period of observations.

Northern Red-backed Voles and Grey-sided Voles were common (rank 3 on a scale of 5) and their abundance gradually increased during the summer. Tundra Voles were rare (rank 1) early in the season, but became common in the middle and late summer (rank 3). Wood Lemmings were rare (rank 1), probably, due to lack of suitable habitats. Trapping data are available for all species.

Numbers of Red Foxes and Brown Bears were not high, while Wolves and Wolverines were relatively common. Arctic Foxes were not recorded. Hawk Owls, Rough-legged Buzzards and Merlins were rather common. White-tailed Sea Eagles were not numerous. Northern Goshawks were rare. Skuas were not recorded. Herring Gulls and Arctic Terns were common breeders. Predation pressure on breeding birds was moderate.

Willow Grouse was very rare almost everywhere, and approached moderate abundance only locally. Rock Ptarmigans were common locally in mountain tundra. Numbers of most other species of birds corresponded to typical values for the western part of the Putorana Plateau. Successful breeding was recorded in a number of species of waterfowl and waders. Three nests of the Grey-tailed Tattler *Heteroscelus brevipes* were found, with clutches of eggs and hatching chicks. Generally, the season was favourable for reproduction of most species of birds. Human impact is minimal in the area.

A.A. Romanov, S.V. Rupasov, E.A. Zhuravlev, A.V. Golubev

29. Verkhnyaya Taimyra River mouth, central Taimyr Peninsula, Russia (74°08'N, 99°34'E)

Snow melted on 50% of flat surface in 2006 on 15 June, which was an intermediate date between extremes in 2004 (20 June) and 2005 (9 June). However, most phenological events in plants and insects in 2006 occurred later than in 2004 and 2005 due to colder weather in June. Thus, mosquitoes appeared only on 11 July, compared with 5 July in 2004 and 27 June in 2005. Mean daily air temperatures did not exceed +8°C until 5 July, while in two previous years they reached +15°C by 25 June. July temperatures in 2006 did not differ markedly from the previous years, although the first half of the month was slightly colder and the second half slightly warmer than in 2004-2005. The number of days with precipitation in June 2006 was notably higher than in 2004-2005, while in July it was similar to the relatively wet season of 2005. Accordingly, snowmelt was close to average in 2006, but June was cold and wet, while July was moderately warm and also wet. Extreme weather events were not recorded.

Lemming numbers were low in 2006, following the peak abundance in 2005. Five observers recorded 4 Siberian Lemmings in total during the period of surveys, which is a record low abundance since the start of monitoring project on Taimyr in 1994. On completion of snowmelt, on 30 June, under snow lemming nests were counted on a transect located on the slopes of the first river terrace and watershed slopes. A density of 1.25 nests/km was low, although not as low as could have been expected based on the number of rodents recorded in summer (4). This compares with a nest density of 3.25 per 1 km in 2005 when 725 lemmings were reported during the field season by 4 observers.

Arctic Foxes did not breed in 2006 in the study area (86 km^2), where 7 inhabited dens were recorded in 2005. Adult Ermines were regularly observed in the camp vicinity from mid June to early August and they apparently contributed the destruction of nests of passerine birds. Snowy Owls and Rough-legged Buzzards did not breed in the study area, although adult birds were recorded there during the whole season. Snowy Owls were observed successfully hunting incubating White-fronted Geese. Pomarine Skuas did not breed. Arctic Skuas nested successfully at a very low density which is usual for this species. Only 3 nests of Long-tailed Skuas were found in 2006, and all of them failed. A nest of Peregrine Falcon, found with 1 egg on 13 June, contained 4 chicks on 24 July.

Most species of birds in 2006 nested earlier than in 2004 and later than in 2005 in accordance with annual differences in snowmelt timing. Grey Phalaropes reached a record high density in 2006 in the floodplain of Bolshoi Island (81.3 nests/km^2), while numbers of Little Stints, in contrast, were the lowest for 3 years in most habitats. Numbers of Curlew Sandpipers, Pectoral Sandpipers *Calidris melanotos* and Ruffs were low in most habitats in 2006. Generally, numbers of the common species of birds in the principal habitats in 2006 were intermediate between numbers in 2004 and 2005. Noteworthy is the confirmed breeding record of the Dotterel *Eudromius morinellus* in the area.

In spite of low lemming abundance the nest success of birds was not low in 2006. The proportion of nests, that successfully survived to hatching, was 63.2±4% (n=144) in waders, 53.4±6.5% (n=58) in other non-passerine birds and 88.6±3.1% (n=105) in passerines, which at least in waders exceeded values recorded in 2004-2005, when lemming numbers were considerably higher. This apparently was due to the low abundance of Arctic Foxes and skuas. Nest success of ducks and skuas was low. White-fronted and Red-breasted geese, in contrast, were unusually successful (81.8±8.2%, n=22 and 100±0%, n=5, respectively). White-fronted Geese were, apparently, able to protect their nests from skuas, while the numbers of Arctic Foxes were low. All 5 nests of Red-breasted Geese were located in the vicinity of a Peregrine Falcon nest, which provided them with protection against predators.

Breeding success of waders was difficult to evaluate as we did not control the fate of individual broods until fledging. How-

ever, most broods with individually marked adults disappeared soon after hatching and numbers of wader broods were generally low, which indicated strong predation pressure by skuas on chicks.

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30. Khatanga settlement, Taimyr Peninsula, Russia (71°58'N, 102°26'E)

Mean daily air temperatures rose above freezing on 31 May, when snow covered 70% of the surface in open larch forest in the vicinity of the settlement. Creeks started to run in the settlement and water appeared over the ice on lakes after this date. The migration of Snow Buntings ended and there was a mass arrival of Herring Gulls on 31 May. The passage of Dusky Thrushes *Turdus eunomus*, Bar-tailed Godwits, Pintail Snipes, Curlew Sandpipers and Lapland Buntings was recorded on the same day, as well as displays of Red-throated Pipits and Pintail Snipes. Long-tailed Duck, Merlin, Northern Harrier, Ruff, Siberian Accentor *Prunella montanella*, Little Bunting, and Pallas's Reed Bunting *Emberiza pallasi* arrived on 1 June, when there was also the continuation of migration of geese, Dusky Thrushes and Fieldfares *Turdus pilaris*. The latter two species were recorded at an approximate ratio of 10:1. Willow Warbler, Wigeon, Greater Scaup and Spotted Redshank arrived on 4 June; Wheatear, Bluethroat, Yellow Wagtail, Red-necked Phalarope and Dunlin on 5 June. On the latter date migration of Pacific Golden Plovers, Dusky Thrushes and Lapland Buntings ended, the majority of Herring Gulls left the vicinity of the settlement and Bluethroats were singing actively.

The weather turned cold on 8-10 June, when air temperatures dropped to –1°C and there were squalls of snow. Gulls appeared again in the area in the evening of 10 June. Ice started to break near the shore on the Khatanga River on 9 June, and floated down the river in the evening of 13 June.

The first mosquito was recorded on 15 June, and 2 days later buds started to unfurl in dwarf birch, alder and larch. A nest of Yellow Wagtail with 2 eggs was found on 17 June. The river cleared of ice on 18 June, when also the flowering of several plant species and greening of willow had started. Common Swifts *Apus apus* were observed on 18 June in the settlement. A complete clutches of Little Bunting and Willow Grouse (9 eggs) were found on 19 June, and a Bumblebee was observed. Dusky Thrushes started egg-laying on 19 June. Arctic Hares started moult on 20 June. A Yellow Wagtail carrying food was observed on 3 July, while fledglings were recorded on 13 July. Poppy started to flower on 13 July.

Spring was considerably later in 2006 compared with 2005. Precipitaion was not abundant in the first half of summer.

Rodents were not seen. Long-tailed Skuas were very rare. Pomarine Skuas are always rare in this area. Owls were not recorded.

A.A.Gavrilov

31. Oboynaya River mouth, Khatanga River lower reaches, Taimyr, Russia (72°27'N, 104°07'E)

The second half of the summer was characterized by warm weather with a low amount of precipitation. A cyclone with strong winds occurred from 16-19 July. Cloudy weather with drizzle prevailed from 3-7 August and light rains were also recorded in late August. The weather turned cold on 1 September when air temperature dropped to freezing, and wet snow fell. Temperatures remained low until 15 September with –8°C recorded on 8 September.

Rodents were not recorded in the period of surveys from 16 July to 15 September, and they were also absent in the first half of summer according to the report of a local resident.

Arctic Foxes were not recorded. A track of a Wolf was seen on the river bank in September. The first southward migrating Reindeers appeared on 15 August. Later they were recorded sporadically in small herds of 3-6 animals, indicating a low intensity of migration. Arctic Hares occurred at a density 3.3 animals/10 km of transect in open larch forest, but they also inhabited riverine ravines in high numbers. Nests of Rough-legged Buzzards were not found within a 5 km-wide range. A Snowy Owl was seen on the river island on 20 August. A nest of Gyrfalcon with 2 large chicks was found on a light-house, 2 km from the camp, in mid July. Paws of juvenile Arctic Hares were found near that nest, and we observed an adult Gyrfalcon hunting a juvenile grouse in August. The Gyrfalcon chicks left the nest on 1 August. Long-tailed Skuas were rare. A nest of a Raven with 4 downy chicks was found on a light-house on 22 May (reported by M.Y. Karbainov). Eurasian Golden Plovers were common in open larch forest and in shrub-sedge-moss tundra. Up to 14 Herring Gulls, 3-4 Glaucous Gulls and 4 Ravens stayed in the camp vicinity, but most Herring Gulls departed eastward by 12 September.

A majority of passerine birds moved from forests to riverine willow stands in late August, when migration of Lapland Buntings had also started. A migration of geese up the river (southwestward) was observed in early September. Long-tailed Ducks, in contrast, migrated downstream (northeastward). There was a noteworthy observation of 2 Siberian Jays *Perisoreus infaustus* and 2 juvenile White-winged Crossbills *Loxia leucoptera* on 11 August in open larch forest.

A.A.Gavrilov

32. Afanasievskiye Lakes, Anabar Plateau, Russia (71°36'N, 106°05'E)

The study area of about 500 km^2 is situated between the Fomich and Eriechka Rivers. It is represented mostly by a plateau 300-320 m above sea level, formed by Cambrian limestone. Vegetation is extremely sparse there, and rarely exceeds 10% coverage, except for in the depressions where shrub-dryas-moss-sedge tundra can reach up to 70% of the surface coverage. Open larch forest can be found in mountain valleys up to 200 m above sea level.

At the start of fieldwork on 11 June snow was present on 30% of the flat open surface. The snow melted completely on 16 June (but on 25 June in the forests). Ice broke on 16 June on

the Fomich River. Weather conditions were clearly atypical in 2006. Spring was cold and prolonged; air temperatures rarely exceeded +7°C before 6 July and dropped below freezing on several occasions. Ice on lakes broke on 11 July due to a strong wind. Very hot weather with day-time temperatures exceeding +25°C and maximum value of +32.8°C on 24 July prevailed in the second half of July. Distant forest fires caused dense haze in the air and poor visibility during this period. Precipitation reached 26 mm during the night on 3 August. It resulted in a higher water table on all rivers and creeks. This could have caused mortality of broods of Eurasian Golden Plovers in the valleys (at least, their density approximately halved after 3 August). In August the weather was generally typical for this period, but temperatures dropped 20°C during 12 hours on 17-18 August, which was followed by a hurricane force wind reaching 25 m/s. The lowest daily mean temperature (+2.5°C) was recorded on 18 August which was followed by phenological autumn with the complete yellowing of shrub leaves and start of larch yellowing. Precipitation occurred frequently in small amounts except for on 3 August. Apart from 17-18 August, strong winds occurred on 3 days, mostly in spring.

Thus, spring was cold, summer generally hot and short, and autumn early and cold. The whole season was quite rainy, except for the dry early summer period.

Neither rodents, nor signs of their activities were recorded in the beginning of the survey period. Lemmings appeared in the area in mid July, and at least 10 visual records were made. Although only 2 Siberian and 1Collared lemming were captured with the total effort of 1820 trap-nights, lemming numbers in the second half of summer were evaluated as average, because the distribution of effort was not even across habitats and animals were seen mostly in relatively remote areas. Among voles, 73 Northsiberian *Microtus hyperboreus* and Middendorff's voles were captured, as well as 3 shrews (presumably Arctic Shrews *Sorex tundrensis*). Northern Pikas *Ochotona hyperborea* appeared in the vicinity of the camp in early August and stony tallus, 10-15 km to the south, was inhabited by them during the whole season.

Arctic Foxes were rare, and only a single animal was seen in spring, but tracks of Arctic Foxes and Wolves were regularly recorded in the Fomich River floodplain. The Afanasievskiye Lakes area was visited by a Brown Bear. Spring migration of Reindeers ended by 20 June and autumn migration started on 15 August. Reindeers migrated mostly in areas to the east and in relatively small numbers. Among avian predators the Long-tailed Skua was rather common in the area. There were several pairs of Herring Gulls. Other predators were extremely rare. As a result only one nest of 28 monitored was destroyed. It was a nest of a Black-throated Diver, started during the high water period, but later lay 100 m from the edge of the water as the floods receded. Non-breeding territorial Rough-legged Buzzards were common, but only one nest with 3 chicks was found. A single chick of 3 survived in a nest of the Merlin. Both chicks fledged from a nest of the Gyrfalcon. All 3 found nests of Herring Gulls produced 3 chicks each. Birds of prey can probably be abundant in the area in favourable seasons, as numerous nests were found on rocks. These had apparently been inhabited recently.

Bird migration was not intensive in the area, but the diversity of species was relatively high. Dusky Thrushes had an incomplete clutch of 2 eggs on 24 June. Lekking behaviour was observed until 25 June in Ruffs, and up to 25 males were visiting one of hillocks in a bog. Hatching occurred on 22 July in the Long-tailed Duck, 12 July in Merlin, 18 July in Rock Ptarmigan, 20 July in Eurasian Golden Plover, 11 July in Ruff, 20 July in Bar-tailed Godwit, 16 July in Herring Gull, 11 July in Arctic Tern, 2 July in Shorelark and Lapland Bunting, 4 July in Redpoll and 6 July in Little Bunting. All these dates were approximately one week later than those observed in the area in 2003 in the middle reaches of the Fomich River. Fledging was recorded on 10 July in Gyrfalcon, White Wagtail and Redpoll (first wave of breeding in the latter species), 11 July in Lapland Bunting 18 July in Little Bunting, 27 July in Rock Ptarmigan, 9 August in Ruff, 14 August in Arctic Tern, and 15 August in Eurasian Golden Plover. A delay in fledging dates of non-passerine birds was less pronounced compared with the late hatching dates.

Breeding success can be evaluated as average in most species of birds, although information on fledging success is scarce. Lapland Buntings and Redpolls raised to fledging 2-3 of 6-7 and 1-2 of 4-6 hatched chicks, respectively. Alarm calls of Bar-tailed Godwits with broods were common before 10 August, but stopped after that date.

In total 55 species of birds were recorded in the area, including 38 breeding or probably breeding species. Most birds occurred in the valleys, while wide areas of the limestone plateaus were extremely poor in bird diversity and numbers. The Pacific Golden Plover and Dotterel inhabited plateaus during the whole season at a very low density, while Snow Bunting, Wheatear and White Wagtail deserted these habitats after fledging. The Lapland Bunting and locally Eurasian Golden Plover and Arctic Tern were amongst the few numerous species. It was unexpected to find breeding in notable numbers such tundra species as the Red-necked Phalarope, Long-tailed Duck, Long-tailed Skua and Rock Ptarmigan, in the same area where several forest tundra species were common (White-winged Scoter, Wigeon, Dusky Thrush, Little Bunting and Red-breasted Merganser). Red-breasted Mergansers were observed neither on migration, nor as breeders, but many broods of this species showed up after mid August on the Afanasievskiye Lakes, presumably having arrived by the Afanasievskaya channel from the Eriechka River basin. The Bean Goose, Teal, Willow Grouse, Wood Sandpiper and Ringed Plover inhabited mostly the forested valleys of the Fomich and Eriechka rivers. Three broods of Grey-tailed Tattlers in 8 km of the Kamenistaya River valley were recorded 15 km to the south of the main study area.

Noteworthy observations include a Bewick's Swan pair which inhabited the easternmost of the Afanasievskiye Lakes during the whole season, and repeated records of an alarming Curlew Sandpiper female near small hillock bog, indicating probable breeding. Adult and juvenile Little Gulls were recorded in mid August. White-fronted Goose and Red-throated Diver were recorded only on autumn migration. Numbers of Temminck's and Little stints were higher in the autumn compared

with spring. The prevailing direction of autumn migration was westward.

I.N. Pospelov

33. Lena Delta, southern and eastern parts, Yakutia, Russia (72°48'N, 129°19'E)

Spring was earlier and warmer than usual in the area. According to the data of the weather station "Stolb" in the south of the delta (72°24'N, 126°48'E), mean daily air temperatures were 0.8°C and 1.7°C above the long-term average in May and June, respectively. Mean daily air temperatures occasionally reached +2°C on 24-25 and 29 May. However, consistently above zero temperatures began on 6 June, which is close to the long-term average. The period 10-20 June was the warmest in that month, with mean daily air temperatures reaching +17.8°C, exceeding the long-term average by 5.2°C. The last 10 days of June were 2°C colder than usual. Snow cover decreased to 50% by 29 May, 90% by 1 June on level areas in the southern and south-eastern parts of the delta, and completely disappeared by 5 June. Heavy snowfalls occurred on 9 and 11 June, and snow blanketed the ground with a 5 cm thick layer, but melted on the next day. High tide in the tidal parts of the delta was caused by strong winds on 13 July and resulted in flooding of replacement clutches of the Temminck's Stint and Arctic Tern on small islands of the low floodplain.

The timing of ice-break was close to average developing quickly during 9-17 June, when there was average flood level. The south-easternmost channel of the delta, Bykovskaya, cleared of ice in 3 days (8-10 June). The outermost parts of the channels cleared of ice by 18 June.

Lemming abundance was low in 2006, following a two-year period of high numbers. Lemmings were recorded only during snowmelt in a 20-30 km coastal belt of the delta.

Arctic Foxes were rare. Neither breeding, nor predation on bird clutches was observed. Non-breeding Pomarine Skuas concentrated in June in a 20-30 km coastal belt of the delta where lemmings were present during the snowmelt, but most of the skuas departed in early July. Few Long-tailed Skuas bred (*e.g.*, one nest with eggs was found near Tiksi). Numbers of Arctic Skuas were lower than in the previous years, and their breeding was not confirmed in the surveyed parts of the delta. Solitary non-breeding Snowy Owls were observed from time to time, and a Short-eared Owl was recorded on 2 June in the south of the delta. Rough-legged Buzzards nested only in the south of the delta at a typical density for years of low lemming abundance. The breeding abundance of Peregrine Falcons was normal. The first confirmed breeding record of Ravens was made in the south of the delta.

The weather was favourable for birds, and they arrived earlier than average. Most species of waterbirds were already present in the delta by early June. A vagrant Barn Swallow was seen in the south of the delta on 14 June. The abundance of waterbirds recorded on plots and transects was high during the prenesting period, but only geese and swans nested successfully. Breeding numbers of Brent Geese, Bean Geese, White-fronted Geese and Bewick's Swans were record high for the whole period of studies. However, nest success of Brent Geese was the lowest (62.3%) on record for 8 years due to predation by skuas and large gulls. Only one nest of White-fronted Geese was destroyed out of 7 under observation.

Ducks and Sabine's *Xema sabini* and Ross's *Rhodostethia rosea* gulls nested at a very low density in the coastal parts of the delta due to frequent and heavy predation pressure by Pomarine Skuas, Glaucous and Herring gulls. All nests of ducks and small gulls were destroyed. All nests of the Steller's Eider *Polysticta stelleri* in their typical habitat, polygonal bog, failed, as well as all nests of the King Eider, Sabine's Gull, Arctic Tern and a single nest of Baikal Teal *Anas formosa*. Bird nesting was more successful in colonies of Brent Geese on small isolated islands. Some Steller's Eiders probably laid replacement clutches, as we found 3 nests with 1, 2 and 4 eggs in mid July. Two of these nests were situated in an atypical habitat – low willow stand on the periphery of a Brent Goose colony.

Most nests of waders on large and medium-sized islands were destroyed, with an overall nest success of 20.3% on the main plot. Apparent nest success was 0% in Grey Plover (*n*=1), 33.3% in Pectoral Sandpiper (*n*=3), 33.3% in Turnstone (*n*=3), 26.3% in Red Phalarope (*n*=19), 0% in Curlew Sandpiper (*n*=2), 20% in Little Stint (*n*=15) and 11.5% in Temminck's Stint (*n*=26). Most nests of waders survived on small isolated islands, in particular on those with Brent Goose colonies, although available scarce data resulted in a nest success of 90.5% (*n*=21) that appears to be an overestimate.

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34. Yana River lower reaches and southern delta, Russia (70°43'N, 135°26'E)

All meteorological parameters in the study period from 25 July – 9 September indicated average timing of the season. Ripening of berries occurred at average dates, and their crop was moderate, while the crop of mushrooms was good. Autumn was warm and late. The first night frost was recorded on 2 September and the next on 6 September. The amount of precipitation was not high, and water levels did not increase for a long period of time in the Yana River.

No rodents were recorded. Arctic Hares were common on floodplain islands with willow stands.

Solitary adult and juvenile Ermines were the only mammalian predators recorded. There were no sightings and no tracks recorded of Brown Bears, Arctic and Red foxes, and Wolves. According to reports of local hunters the abundance of Arctic Foxes was very low in the previous winter.

Only one pair of Rough-legged Buzzards and one pair of Peregrine Falcons inhabited the study area. Falcons nested on a ledge of ground precipice, but the nest was destroyed in late June due to the collapse of soil caused by melting of the permafrost. Carrion Crows bred, and a wandering brood was recorded on 16 August. Migrating Herring and Glaucous gulls became common from 11 August. Juveniles were very rare among Herring Gulls and were not recorded in Glaucous

Gulls. Two pairs of Arctic Skuas were observed migrating up the Yana River on 1 and 8 August.

In total 29 species of birds were recorded, of which 27 are known as breeders for the area. Observations of juveniles proved successful reproduction in the Pintail, Willow Grouse, Carrion Crow, Siberian Jay, Dusky Thrush and White, Yellow and Grey *Motacilla cinerea* wagtails, Pechora Pipit *Anthus gustavi*, Wheatear, Bluethroat, Willow and Yellow-browed *Phylloscopus inornatus* warblers, Brambling, Common *Acanthis flammea* and Arctic *Ac. hornemanni* redpolls. Solitary Ringed Plovers were the only waders observed. Solitary Nutcrackers *Nucifraga caryocatactes* stayed in the area during the whole period of surveys. Departure and autumn migration were not pronounced in any species. The last observation dates were 8 August in the Yellow-browed Warbler, 11 August in Wheatear, 12 August in Bluethroat and Yellow Wagtail, 15 August in Brambling, 16 August in Ringed Plover and Grey Wagtail, 18 August in Willow Warbler, 20 August in Carrion Crow and Little Bunting, 31 August in Glaucous Gull, 1 September in Pechora Pipit and Dusky Trush, 3 September in Pintail and 9 September in White Wagtail.

V.I. Pozdnyakov

35. Djukagirskoe Lake, "Kytalyk" Resource Reserve, Indigirka River basin, Russia (70°30'N, 145°30'E)

According to observations made from 30 April to 21 June spring warming started on average dates. Snow started to melt from mid May, reduced to 50% on flat surfaces on 28-30 May and completely disappeared on 3-5 June, i.e. before the start of the mass migration of birds. The season was average in timing and warm, without relapses to cold weather and snowstorms. The first mosquitoes appeared on 18 June.

The abundance of lemmings and voles increased compared with the two previous years, and was average according to visual evaluation.

The first flock of 12 Baikal Teals was recorded on 26 May on a sandy beach of the Elon River. The intensity of migration of waterfowl was not high, probably, due to the shifting of the mass migration route to the north closer to the melting snow borderline. Siberian Cranes *Grus leucogeranus* were observed migrating northward along the Elon River stream at the height of 15-20 m on 26 May. We recorded 4 pairs and a flock of 4 birds (in total 12 cranes) during 3.5 hours. Siberian Cranes appeared on their territories on 31 May. Incubation started simultaneously with construction of the nest on 2 June in a pair in the vicinity of Krugloe Lake, and another incubating pair was discovered at the same time. Nesting of Sandhill Cranes *Grus canadensis* started earlier: we observed a single bird on 31 May (which presumably indicated start of incubation) in a pair which first appeared on 27 May. Siberian Cranes in immature plumages were unusually abundant: a flock of 4 birds passed eastward on 2 June and flocks of 7 and 3 sleeping birds were seen on 4 and 6 June, respectively. A solitary immature Siberian Crane was observed during ca. 4.5 hours in the vicinity of the observation point. It was feeding on large insects, probably, bumblebees, which were abundant on that day. Six birds passed northward on 17 June. Incubating birds were observed on 9 nests, and 4 other pairs were recorded on their territories.

Numbers of Arctic Foxes were average, and a Red Fox was recorded for the first time in 10 years of observations. Two nests of Rough-legged Buzzards contained 4 and 5 eggs. All three species of skuas bred, and their numbers were higher than in 2005. Herring and Ross's gulls were abundant breeders, while numbers of Glaucous and particularly Sabine gulls were lower. Among owls only rare non-breeding Short-eared Owls were observed. Abundance of Willow Grouse was average.

Generally, breeding conditions were favourable for birds in May and June.

S.M. Sleptsov

36. Alkyrgytkyn Lake and Segodnya Pingo, Kolyma Lowland, Yakutia, Russia (69°05'N, 158°28'E)

The weather was quite warm for late September – early October, although there were night frosts. Mean daily air temperatures dropped below freezing from 1 October, but there was no snow. Rivers did not start to freeze up, but the shores of lakes began to freeze over.

Lemming abundance was visually evaluated as moderate. Arctic Foxes and owls were common. Birds of prey and grouse were not seen. Broods of swans, ducks and passerines were recorded.

D.G. Fedorov-Davydov

37. Maly Chukochy Cape, Kolyma Lowland, Yakutia, Russia (70°05'N, 159°55'E)

Cloudy, cool weather with drizzle prevailed in the period of surveys from 11 August – 1 September. Heavy rains occurred on 3 days. June and July were probably quite dry judging by the condition of the soil and reports of residents. Night frosts and snowfalls did not occur in August.

Lemmings were numerous, voles common, but Arctic Foxes and owls were not observed. Rough-legged Buzzards were common and bred successfully. Willow Grouses were not recorded.

D.G. Fedorov-Davydov

38. Akhmelo Lake vicinity, Kolyma Lowland, Yakutia, Russia (68°50'N, 161°01'E)

The weather was windy with frequent night frosts and several snowfalls from 9-20 September. Then the weather turned calm, clear and relatively warm, but still with frosts at night.

Lemmings were seen rarely. Owls were also rare. Arctic Foxes and birds of prey were not recorded. Willow Grouses were considered to be common birds. Siberian Jays were abundant. Waders were numerous and skuas rare in the summer according to the reports of local people. It seems that swans, ducks, waders, Willow Grouse and passerines bred successfully.

D.G. Fedorov-Davydov

39. Chaun Bay area, western Chukotka, Russia (69°00'N, 169°15'E)

According to the reports of the local people the season was average in timing, and there was no flood in the rivers. During the period of studies from 11 July to 7 August the weather was cold and rainy, in particular in the second half of July when 2-3 snowfalls occurred. With the exception of late broods of waders and swans this would not have had much affect on bird breeding success.

Neither lemmings, nor voles were recorded across the vast study area.

We did not conduct focused surveys aimed at evaluation of bird breeding numbers or standard counts of geese on rivers. However, the nesting density of Bewick's Swans was 1-1.3 nests/km^2 at a permanent study area on Ayopechan Island in the Chaun-Palyavaam River delta. There were recorded 0.15 birds/km in 3 species of divers (the Red-throated, Black-throated and Pacific *Gavia pacifica* divers) on a transect along the southern, western and northern coasts of the Chaun Bay. The density of White-billed Diver *Gavia adamsii* near coast of the Kyttyk Peninsula and Ayon Island was 0.24 birds/km.

Rodent-specialists, including the Arctic Fox, Rough-legged Buzzard and Long-tailed Skua, were rare and did not breed. Snowy Owl and Pomarine Skua, which are also heavily dependent on rodents, were not recorded. However, predators strongly reduced the breeding success of waterfowl, particularly ducks and geese. Breeding success was very low in geese (maximum 15% juveniles in early August) and Common Eiders (1.1% chicks in July flocks). However, 15% of females of Long-tailed Ducks successfully completed incubation. Bewick's Swans were affected by predation of Arctic Foxes to a lesser extent. Also colonies of gulls in tundra were not strongly affected, as Arctic Terns, Sabine, Herring and Glaucous gulls (the latter were rare in mixed colonies) bred successfully. The Willow Grouse occurred in average numbers and flying juveniles were recorded in this species. Among waders, broods were recorded in the Ringed Plover, Temminck's Stint, Bar-tailed Godwit and Red-necked Phalarope. Snowfalls in late July could have affected adversely survival of wader chicks. However, this was not confirmed.

D.V. Solovieva

40. Tundrovaya River valley, Wrangel Island, Russia (71°18'N, 179°48'W)

Air temperatures increased notably in the second half of May, which indicated an early spring on Wrangel Island. In contrast, at the same time, the temperatures in Pevek town vicinity, north-western Chukotka, corresponded to a spring delay of 7-10 days. During our helicopter trip from Pevek to Wrangel Island on 23 May we noted that phenological events were more advanced on the island compared with the mainland coastal areas north-east of Pevek. Hill slopes to the east of Pevek were completely snowcovered, and there was no water in rivers and streams. At the same time, snow patches remained only in depressions and valleys of rivers and streams on the southern coast of Wrangel Island and water was running in many rivers and streams, in particular already for several days in the Somnitelnaya River. Snow cover was more extensive in the central parts of the island. In the area of a Snow Geese *Anser caerulescens* colony snow cover reduced to 50% very early, on 24 May. This was due to the early warm weather and little snow during the winter. The Tundrovaya River also started to flow on 24 May. There was rain on 27 May. This is the first time it has rained so early in the season for many years. There was frosty weather from 29 May to 4 June. This did not affect to any great extent the numbers of breeding geese, but delayed by almost one week the mass arrival of waders and their dispersion through the breeding grounds. June, July and August were generally cold, sometimes with freezing air temperatures, snowstorms and snow on the ground.

Breeding phenology of Snow Geese at the Tundrovaya River colony was one week earlier than average in 2006. Geese arrived *en mass* to the colony area on 24-25 May, first nests were initiated on 24 May, and the peak of nest initiation occurred on 29-31 May. Of all clutches only 4% remained incomplete by 7 June. Hatching started at night on 21-22 June, which was earlier than the average (June 27 for the period from 1970-2004). First broods started to leave the colony already on 22 June, moving to the northern plain, named Tundra of Academy.

The first fledglings were recorded in early August, and all juvenile geese were able to fly by 10 August. Mass departure of geese with broods was observed on 14-17 August on the southern coast of the island. This was one week earlier than in the 1980s.

Lemming numbers were low across most of the island, including the area of the main colony. However, there was some increase after the low in 2005. Snowy Owls bred. Three owl nests were found in the vicinity of the main geese colony. Pomarine Skuas were rarely seen there. They stayed in the first half of June mostly in areas with remaining snow patches where lemmings were still near or in their winter habitat.

Arctic Foxes were rare in the area of the main geese colony, but one pair bred. The area was frequented by wolves in spring and summer, which apparently resulted in the absence of Muskoxen *Ovibos moschatus* during the geese breeding period.

The density of breeding Snow Geese was high and relatively uniform across the colony area of 875 hectares. According to ground transect counts 46,600 nests (or more than 93,000 geese) were present in the main colony in the Tundrovaya River valley. Mean clutch size was 4.05±0.03 (n=737). The proportion of nests with at least one egg hatched was 87.7% (n=40,850), mean brood size was 3.74±0.06 (n=510) at the time of departure from the main colony, and the total number of departing chicks exceeded 150,000. According to transect counts only 70 birds were killed by predators and diseases at the colony, which represents 0.07% of all breeding geese. This very low value indicated both low predation pressure and low liability to disease in 2006. Generally the reproduction of geese was successful and the proportion of juveniles on the wintering grounds was approximately 25%. Accordingly, the Wrangel Island population of Snow Geese continued to grow, and we predict that numbers will reach 140,000 birds by spring 2007.

Turnstone and Dunlin were common among the waders regularly breeding in the study area. The Red Knot *Calidris canutus* and Grey Plover occurred in lower numbers than usual. There were only observations of solitary Pectoral Sandpipers, and they probably did not breed.

V.V. Baranyuk

41. Neizvestnaya River upper reaches, Wrangel Island, Russia (71°14'N, 179°20'W)

Spring was early and intensive snow melt started in mid May. The snow cover was reduced to 50% by 25 May, and ice broke on rivers on 24 May. Temperatures dropped to –10°C during a period of adverse weather with gale force winds in late May. This coincided with the mass arrival and start of breeding by tundra birds. June was cold. There were short term periods of especially cold weather in July and August, but overall July was warmer than average and August colder.

Lemming numbers were assessed by counting undersnow nests and also visual evaluation in the permanent study plot and other regions of the island. Lemming numbers increased after the low in 2005, and populations of both species were increasing, but numbers were still low overall. Collared Lemmings *Dicrostonyx vinogradovi* were more common than Siberian Lemmings *Lemmus sibiricus portenkoi* everywhere, and the two species occurred at a proportion 2.4:1 (*n*=48). The average density of undersnow nests increased two-fold compared with 2005, and was 1.96 nest/km in 2006.

Numbers of Arctic Foxes in 2006 were above the expected level on the study area of 45 km^2. Five territories were occupied, and the density was 0.22 foxes/ km^2, which was almost twice the value in 2005. While numbers were low overall, they did not decrease after the lemming low in 2005. The study area was inhabited only by territorial animals and wandering foxes were not recorded during the whole breeding season. Fox survival was high during winter 2005/2006, based on the rarity of records of winter carcasses and the stable numbers in 2005 and 2006. Arctic Foxes were observed at an average density of 0.15 animals/km across the island. The frequency of records did not differ notably between landscapes. The high proportion of Arctic Foxes, breeding in the study area (80%, *n*=10), indicated successful wintering, in spite of low lemming numbers for the second year in a row. Mean brood size was 5.1 cubs (*n*=16). Adult foxes destroyed bird nests and captured adult birds and chicks. Approximately 10 Wolverines and 15 Wolves inhabit the island. In spite of the marked decrease of ungulate numbers, Wolves did not apparently suffer from shortage of food, since we observed partly consumed and whole carcasses of reindeers and muskoxen which had failed to survive the winter. Wolves also took adult Snow Geese and destroyed bird nests, but their impact on the Snow Goose population was small. In contrast 16% of Snowy Owl clutches on the island were lost in 2006 due to predation by Wolves and Wolverines.

Lemming abundance was not high enough for the successful reproduction of Snowy Owls in 2006, and the diet of some pairs entirely consisted of other prey in July, during the hatching period of tundra birds. A body of an Arctic Fox cub was found in an owl nest for the first time in 13 seasons of observations. Lemmings were the most numerous prey in owl diet only in May and June. Other prey comprised 79-100% (*n*=105) of the diet in July and August. The diet of owl chicks consisted of chicks of waders, Snow Buntings, Long-tailed Skuas, and adult females of Common Eider and Snow Geese, depending on the abundance and availability of prey species.

Numbers of Snowy Owls were low to average in 2006 in different landscapes. They occurred at an average density of 0.31 bird/km (range 0.05-0.77) in a total transect length of 484 km. In spite of low lemming numbers all regions of the island were inhabited by owls, but they were most abundant in the Northern Mountains and the Gusinaya River valley. Owl numbers in the eastern part of the island were lower.

Based on breeding plumage, the proportion of young owls was high in 2006, particularly in males. Most of the population bred in 2006 in spite of low lemming abundance. The proportion of breeding birds in females was 80% in the study area (*n*=10) and 74% (*n*=89) elsewhere on the island.

The early spring allowed an early and synchronous start of egg-laying by Snowy Owls, and 95% of pairs started incubation from 14-31 May. Early breeding resulted in large clutch size: 28% of females laid 8 eggs. Mean clutch size was 6.8 eggs (*n*=18). Large clutches are typical for the owl population of the island in early seasons even when lemming numbers are low. However, 19.4% of nests (*n*=31) were deserted during incubation, probably partly due to a high proportion of breeding young females. Unfavourable weather conditions during egg-laying resulted in the loss of 13% of eggs (*n*=94) prior to hatching particularly in large clutches. Chicks fledged in 58% of pairs, but the mortality of chicks in the first 10 days after hatching was 72% (*n*=82) in 2006. This was apparently due to the shortage of the main prey. Low lemming abundance was also the main reason for the death of 6% of chicks (*n*=23) after they had left the nest. 18% of chicks fledged; mean brood size was 1.4 chicks (*n*=23). All the chicks in 4 broods were taken by Wolves and Wolverines.

Short-eared Owls have not bred on the island since 1994, and only 3 solitary birds were observed in 2006. Pomarine Skuas were not seen in the inner parts of the island during the summer, and their breeding was not recorded.

Numbers of Long-tailed Skuas were moderate in the study plot, where they occurred at a density of 0.67 birds/km, and 93% (*n*=30) of birds bred. Nest density was 0.31 nests/km^2 and breeding success was extremely low due to heavy predation on broods by rodent-specialists which could not find lemmings. Chicks of Long-tailed Skuas made up 10.5% (*n*=105) of the Snowy Owl diet. Not a single brood of skuas was found in the study plot in the first half of August. Adult birds left their territories after their chicks had perished. Long-tailed Skuas occurred in usual numbers elsewhere on the island, and started breeding by 10 June. Fledgelings were rarely recorded in the valleys of the Tundrovaya and Gusinaya rivers and on the Southern Plain.

Snow Geese and/or Common Eiders nested in the vicinity of 81% of the nests of Snowy Owls (*n*=31). Mass arrival of Snow Geese to the study area was observed on 25-26 May, and

formation of colonies occurred from 25 May to 8 June. Good weather after 20 May favoured the start of nesting by geese immediately after arrival and somewhat earlier than usual. Mixed colonies of Snow Geese and Common Eiders were the norm (64%, *n*=14). Single-species colonies constituted 21% and 14% for Snow Goose and Common Eider, respectively. The breeding success of Snow Geese, nesting in the vicinity of owl nests, was on average 38% in 2006 (0-95%, *n*=13). All nests failed in 4 colonies, whose size did not exceed 18 nests. Breeding success in larger colonies varied from 12-95% (*n*=9). Snowy Owls and Arctic Foxes captured 0.01% and 1.4% of incubating geese, respectively (*n*=567). Mean clutch size was 4.2 eggs (*n*=108) in Snow Geese. Mean brood size in small colonies was 3.4 chicks (*n*=82) by the time of the movement of families to moulting sites. Remains of geese chicks and adults were recorded at all dens of Arctic Foxes with cubs on the northern plain of the island in the Tundrovaya River valley. However the proportion of birds taken was not high overall due to low fox numbers.

Breeding Brent Geese were not recorded in the vicinity of owl nests in 2006. The great majority of Common Eiders (92%, *n*=106) bred in the vicinity of owl nests, but only 63% of owl nests had eiders nearby. Mean clutch size was 4.8 eggs (*n*=21) and mean brood size was 4.3 chicks (*n*=3) in eiders. The last eider was observed on nesting territory on 17 July. Nest success of the Common Eider was 26% (*n*=97) and 22% (*n*=9) for nests associated with Snowy Owls and solitary ones, respectively. Snowy Owls from 12 different pairs captured 14% (*n*=97) of eider females incubating in the vicinity of owl nests. Thus, nesting near owls was not beneficial to Common Eiders in a season with low lemming abundance.

The low reproductive success of Snow Geese associated with Snowy Owls was mostly due to predation by Arctic Foxes. Predation was possible in a low lemming season, as some owls deserted their clutches, while others protected their nests less actively, having been forced to survey wide areas in search for food. Also, at least 5 nests of Snowy Owls were destroyed by Wolverines and Wolves. In contrast to the large colonies of geese which had high reproductive success, all nests in all large colonies of Common Eiders failed. This could be due to the earlier breeding by geese having allowed their eggs to hatch before the failure of the majority of owl nests.

The numbers of common waders were below average in 2006 in the inner parts of the island. This could be due to cold weather when they arrived in early June. Waders could have moved from the mountain regions to the southern plain where there were more favourable spring conditions. Wader chicks constituted 13.25% (*n*=105) of Snowy Owl's diet in July, and breeding success of waders was very low due to predation pressure. Broods of waders were rarely recorded in the study area or on other parts of the island.

Thus, poor weather in June and strong predation pressure were responsible for low reproductive success in most species of birds on Wrangel Island in 2006.

I.E. Menyushina

42. Mukhmornaya weather station, Enmyvaam River lower reaches, central Chukotka, Russia (66°23'N, 173°20'E)

Observations were carried out from 23 April – 1 July. In late April air temperatures ranged from –32°C to –13°C and winter conditions prevailed, but ice-holes which were present on the river during the whole winter gradually increased in size, and there was open water in most of the river from 1 May. On 1-10 May temperatures varied from –22°C to –1.5°. Ice was broken up where there were springs in the river. Ice was carried away by the river near the weather station by 9 May and started to break on the whole river by 19 May. The air temperature rose above freezing for the first time on 12 May, and from 13 May mean daily temperatures were above freezing. This was 5 days earlier than the long-term average. In the period 10-20 May temperatures ranged from +2-3°C in the day and did not drop below –2-3°C at night. Day temperatures reached +13°C in late May, while night frost was not severe, and snowmelt accelerated. Snow cover reduced to 50% on the flat surface in the valley on approximately 20 May and the snow melted almost completely by 25 May. Ice drifting along the river intensified on 25 May, was the most marked on 28-29 May and cleared by 1 June. This was followed by an increase of water levels which reached a maximum (415 cm) on 2 June. Spring flood was over on 15 June. Air temperatures reached +20.5°C on 31 May and 1 June, but decreased on 2-4 June, when they dropped to –5.5°C at night. The final warming occurred on 5 June, and thunderstorm with pelting rain were recorded on 9 June.

Summer started on 5-6 June, when the greening of leaves on trees and flowering of plants started. The first mosquitoes appeared on 25 May and they emerged *en masse* after 20 June.

Rodent numbers were probably average, as a dog caught about 20 of them in the station vicinity during two weeks. Rodents were seen occasionally floating on the river during the flood.

Few animals were recorded in the vicinity of the weather station before 10 May. We observed tracks of Arctic Hare, Squirrel *Sciurus vulgaris*, Elk *Alces alces* and Ermine, and a Wolverine was discovered by dogs. Brown Bears turned up on the snow-free river spits feeding on the previous year fish remains in the second half of May, and they became fairly numerous later. Fish carcasses were also eaten by many other animals including birds and hares. Willow Grouse, several Ravens, Magpie and a flock of Snow Buntings were recorded. A pair of White-tailed Sea Eagles appeared in the vicinity of their nest on 2 May. Birds arrived *en masse* by 20 May including cranes, ducks, geese, gulls, cuckoo and woodpecker. The first House Martin arrived on 19 May, and in spite of the apparent absence of insects for several days, over 100 birds were present in the colony of more than 200 nests under the roof of the weather station. House Martins were warming each other in aggregations of 20-30 birds under the roof during frosts. A female elk with a calf was recorded in June. Ducks nested on a channel near the house.

A.Y. Evstifeev

43. Kanchalan River lower reaches, Chukotka, Russia (65°22'N, 177°00'E)

According to the reports of local people spring was average in timing. Snow was completely melted on the flat surface by the start of our observations on 6 June, but remained until late June on shadowy slopes and in ravines. Ice cleared before our arrival in the upper reaches of the Kanchalan River, and on 8 June in the Kanchalan settlement vicinity (solitary ice-floes were seen until 10 June). The flood was average in area and water level (the water level dropped more than 1 m during 10 days in the middle reaches of the river). Small relatively shallow lakes were ice free by mid June, but ice had melted only near the shores on large deep lakes. In June the weather was very warm with maximum daily air temperatures averaging +23.5°C in June (maximum +31.4°C), and minimum daily air temperatures averaging +5.8°C (minimum +3.0°C). There were 6 rainy days in the period of observations until 3 July, and weather was clear or with few clouds on 11 days. A strong north-western wind was recorded on 6-7 June, while the other days were calm. Mosquitoes were few before 20 June, but then appeared *en masse* and their numbers increased daily. The flowering of *Rhododendron* started on 11 June, and flowers were everywhere after 15 June. Generally, weather conditions were favourable for reproduction of birds.

Observations in several floodplain localities of the Kanchalan River in its lower and partly middle reaches showed that voles were abundant, particularly in sites with shrubs. Lemmings were not recorded. Arctic Ground Squirrels *Citellus parryi* bred, but they only occurred locally and their numbers were not high due to the lack of suitable habitat.

Neither Arctic Foxes, nor Red Foxes were seen. Brown bears were not recorded, and only one old track of a bear was seen.

Few Northern Goshawks were recorded. One nest of Rough-legged Buzzards and one nest of White-tailed Sea Eagles were found; most of the 9 encountered birds of the latter species were immature non-breeders. Short-eared Owls were relatively common and apparently bred. Herring Gulls were common breeders across the whole surveyed area, but wandering birds were not numerous. We did not record predation of gull egg clutches. Long-tailed Skuas were common and bred. The total number of territorial pairs of Arctic Skuas did not exceed 10. Non-breeding skuas in flocks up to 30-40 birds wandered in a limited area. Ravens were rare. Only three nests were found all in the vicinity of the settlement. The rest of the area was inhabited by wandering birds. The abundance of Ravens has increased considerably in recent years according to the information of local people. The Magpie was rare across the whole surveyed area.

Red-throated and Pacific divers were common breeding birds. Pintail, Teal, European Wigeon, Greater Scaup and American Scoter *Melanitta americana* were the most numerous breeding ducks. White-winged Scoter *M. deglandii*, Long-tailed Duck and Red-breasted Merganser bred in lower numbers. Whooper Swans were rare breeders with only 3 territorial pairs found. Bean Geese bred on sloppy tundra, White-fronted Geese prevailed in flat tundra at low altitudes, and Lesser White-fronted Geese occupied patches of tundra with sparse shrubs on the large islands of the Kanchalan River. Among geese, Bean and White-fronted geese were estimated to be the most and the least abundant species, respectively. Willow Grouse and Rock Ptarmigans were common. Sandhill Cranes were extremely abundant.

The Whimbrel was one of the most numerous waders in moss-sedge-tussock tundra. The Red-necked Phalarope was also abundant. Common species included the Wood Sandpiper, Pacific Golden Plover, Ruff, Dunlin, Long-billed Dowitcher *Limnodromus scolopaceus* and Common Snipe. Bar-tailed Godwits, Spotted Redshanks and Ringed Plovers were common locally. Numbers of Common and Terek sandpipers increased along the Kanchalan River valley to the north in accordance with the change in floodplain habitats. We observed hatching of chicks in Spotted Redshank, Long-billed Dowitcher, Wood Sandpiper and Ruff. Chicks of other species presumably hatched after the end of our fieldwork.

Species diversity of passerines increased northward. 50 km to the north of Kanchlan settlement Dusky Thushes were numerous and Gray-cheecked Thrushes *Catharus minimus* were common. The Little Bunting, Siberian Rubythroat *Luscinia calliope*, Bluethroat and Brown Shrike *Lanius cristatus* were common breeders in floodplain shrubs. Rustic Bunting *Emberiza rustica*, Red-breasted Flycatcher *Ficedula parva* and Brambling were rare breeders. Yellow Wagtails were numerous in open tundra. Arctic Redpolls occurred at sites where at least some shrubs were present. Only Arctic Redpolls were recorded in the first half of June; Common Redpolls appeared *en masse* in the second half of the month. Sand Martins *Riparia riparia* bred in small numbers on the river bluffs, while 15 pairs of House Martins nested on the settlement buildings.

Generally, the weather was very favourable for reproduction of birds and predation pressure relatively low in June 2006. Successful breeding could have been expected, although data on hatching success were not available for most species of waterfowl and waders.

N.N. Yakushev

44. Russkaya Koshka Spit, Anadyr District, Chukotka, Russia (64°38'N, 178°44'E)

At the start of observations on 9 July the sea along the ca. 20 km long spit was completely covered with ice, which finally disappeared from the coast on 14 July. The high amount of ice in the area resulted in relatively low air temperatures in the day and at night. Maximum and minimum daily air temperatures averaged +18.1°C and +4.1°C, respectively, in the period 9-29 July. By the start of the fieldwork snow had melted completely on flat surfaces and was only local on the coastal slopes. Five of 22 days of our stay in the area were clear and the rest were cloudy; precipitation occurred on 7 days. Dense fog frequently occurred at night, but only on 3 days during the day. Moderate to strong variable winds were recorded almost daily. A moderately strong storm was recorded on 21-23 July. The weather was generally variable during the day, usually with foggy mornings, sunny at midday, and rainy in the evening. Weather conditions appeared to be unfavourable for the reproduction of

birds, particularly at night, when some chicks perished due to low temperatures.

Lemmings and voles were not recorded. Arctic Ground Squirrels occurred in low numbers in spite of the availability of suitable habitat, and many burrows were not occupied.

Arctic Foxes were not recorded, and local people reported a considerable population decrease in recent years. Red Foxes were rare and only one inhabited den was found. Brown Bears appeared on the spit after the first storm when 3 different animals were seen. Terrestrial predators were considerably more common at the base of the spit compared with the outer part due to permanent presence of the light-house workers at the latter locality. Among birds of prey a Peregrine Falcon was recorded once and White-tailed Sea Eagle twice. Rough-legged Buzzards and owls were not seen. Ravens were recorded on 3 occasions. Wandering Arctic Skuas occurred in considerable numbers, but breeding birds were not numerous. Observations of Arctic Skuas searching for chicks of waders were numerous. Herring and Glaucous gulls were numerous, with at least 100 pairs of both species nesting on a sandy island in the Klinovstrem Bay. Several pairs of Herring Gulls successfully raised chicks on wet areas on the spit. The Arctic Tern was a numerous breeding species and nests with eggs were encountered until 20 July. Successful hatching and fledging of young was observed. A colony of Aleutian Terns *Sterna aleutica* containing 50 nests was found 500 m from the lighthouse, where several juveniles were also later observed.

Common Eider and Pacific Diver were the most numerous breeding species among waterfowl. Their chicks hatched in late July. In three geese species, the Emperor *Anser canagicus*, Bean, and White-fronted geese, hatching had already occurred by the start of studies on 9 July and their broods were observed on tundra lakes at the spit base. Broods of Bean and White-fronted geese were abundant, but broods of Emperor Goose were considerably rarer. Approximately 10,000 Brent Geese moulted on the spit, but breeding was not recorded.

Among breeding waders Ringed Plover and Red-necked Phalarope were numerous, Dunlin, Turnstone and Temminck's Stint common, Grey Plover, Spoon-billed Sandpiper *Eurynorhynchus pygmeus* and Red-necked Stint *Calidris ruficollis* rare and only one brood of Knot and Terek Sandpiper were found. Fledged juveniles of all these species were observed, although approximately half of the recorded broods perished, and only 1-2 chicks remained in the surviving broods. Low night temperatures at the start of the brood-rearing period and predation by Arctic Skuas were possibly responsible for the notable reduction in breeding success.

Species diversity and numbers of passerines were very low. Fairly successful breeding and fledging of juveniles was confirmed in three species, the White Wagtail, Wheatear and Snow Bunting. Other recorded species were the Yellow Wagtail, Red-throated Pipit and Redpoll.

Generally, the season was favourable for the reproduction of waterfowl and gulls and unfavourable for waders.

N.N. Yakushev

45. Krasnoe Lake, Anadyr River lower reaches, Chukotka, Russia (64°37'N, 174°46'E)

Spring was average according to reports of local people. Ice-break occurred on 5-6 June. The weather was clear and calm during our stay in the area from 6 June to 7 July, without snowfalls. Storm wind occurred only on the last day of our expedition. Rains were recorded on several days, and day-time air temperatures exceeded +20°C since about 16 June.

Rodent abundance was, probably, below average as we did not record signs of their activities, with an exception of undersnow pathways. The season was probably favourable for most groups of birds. We recorded broods and nests of many passerine species, Herring Gull, Red-necked Phalarope, Terek Sandpiper, Ruff, Wood Sandpiper, Pintail, European Wigeon, Rough-legged Buzzard, and White-tailed Sea Eagle. Birds of prey and owls were not abundant. Mammalian predators were represented by Brown Bears.

V.Y. Arkhipov, E.A. Koblik, Y.A. Red'kin, F.A. Kondrashov

46. Nygchekveem and Tumanskaya rivers basin, Chukotka, Russia (63°53'N, 177°46'E)

The weather was clear and calm in the period from 12 July – 2 August, without gale winds. Rains were recorded on several days in late July – early August.

Microtine rodents and signs of their activities were not recorded. Arctic Ground Squirrels were observed.

Two Brown Bears and a Red Fox were the only mammalian predators recorded. Avian predators were represented by White-tailed Sea Eagles and Short-eared Owls, which were not numerous. We found nests and broods of different species of passerines, Willow Grouse, Herring Gulls, Common Gulls, Arctic Terns, Dunlins, Red-necked Phalaropes, Terek Sandpipers, Ruffs, Wood Sandpipers, Temminck's Stints, Pintails, and European Wigeons in floodplains of the Nygchekveem and Tumanskaya rivers and southern watershed tundra. Broods of Pacific Divers, Red-throated Divers, White-fronted Geese, Emperor Geese, Bewick's Swans, and Sabine's Gulls were recorded on the coastal tundra of the Tymna Lagoon. Moulting aggregations of thousands of White-fronted Geese were observed at the latter locality. Generally the season was probably favourable for most groups of birds, with the average or above breeding success.

V.Y. Arkhipov, E.A. Koblik, Y.A. Red'kin

47. Beringovsky Settlement, Chukotka, Russia (63°04'N, 179°22'E)

By spring snow accumulation was generally close to average (or slightly below along a 100 km section of the coastline), although strong winds in winter caused an uneven distribution of snow. Dates of snowmelt and flood were several days earlier than the long-term average; local people were able to use snowmobiles until early June. Extensive pollution of the snow with coaldust from boiler-houses in the settlements at Beringovsky and Nagorny caused a 5-7 days earlier snow melt in an area of up to several kilometers from the settlements' vicinity, compared with the rest of the area.

By the start of field surveys on 13 June the snow covered area did not exceed 20-40% in the mountains and hills to the south of the Alkatvaam River mouth, and did not exceed 5-10% on the plain surface, where it remained in depressions, and in accumulations behind hillocks and buildings in the settlements. Snow depth was still considerable in late June in deep valleys of rivers and streams. Some of these snow deposits still existed in mid July, and at foothills of coastal rocks even in early August. By mid June there was only ice on mountain lakes and sea lagoons, where it melted by the end of month. Drifting sea ice covered 5-40% of the Ugolnaya Bay in June, and melted by 7-8 July. Ice completely disappeared on 10 July to the south of Otvesny Cape. Spring flood on rivers was low and brief, and there were no floods in summer.

Spring and summer were generally slightly warmer than usual. There were no frosts, large falls of air temperatures, snowfalls or heavy rains. The amount of precipitation was considerably below average and tundra became dry almost everywhere by the end of July. The minimum air temperatures ranged in the period 13-30 June from +2-8°C and the maximum temperatures from +8-20°C. Ranges in the period 1 July – 8 August were +3-13°C and +8-26°C, respectively.

The typical maritime climate in summer resulted in frequent strong southern and south-eastern winds, fogs, low overcast and drizzle. Weather was highly variable even during one day, and could differ considerably along 5-20 km of the sea coast. Adverse weather, prevailing to the south of Otvesny Cape, improved only rarely for periods of 10-15 hours.

Strong gusty south-eastern winds reached 30-35 m/s on 24 June and caused the formation of numerous local waterspouts over the sea, some of which spread also onto the land surface to the north of the Ugolnaya Bay. Numerous flocks of colonial seabirds, primarily murres and Kittiwakes, were sucked in by the spouts. Although we did not observe dead birds, we recorded birds rolling over water surface and dispersing in the air. In colonies on rocks to the north of Barykov Cape and on adjacent uplands, nests of almost all birds, with an exception of nests of Horned *Fratercula corniculata* and Tufted *Lunda cirrhata* puffins in burrows, could have been destroyed in the belt of the 20-40 m wide waterspout passage. There were almost constant strong winds from 24-29 June and waves of up to 4-4.5 m on the sea. These winds were very unusual for this period of year, in contrast to late summer and autumn. The entrances to almost all streams, small rivers and channels from the lagoons were blocked by pebble ridges, and spawning salmon and other fish had to stay *en masse* in the nearby sea.

Most phenological events occurred slightly earlier than usual. Mosquitoes appeared in high numbers from 29 June. The ripening of berries was average in timing. The crop of bog bilberry, crowberry, Arctic Raspberry *Rubus arcticus,* and particularly cloudberry, was rather small. The crop of mushrooms was lower than usual almost everywhere.

Numbers of all species of small rodents were low or very low, even at patches of recent snowmelt, and did not increase by autumn, based on signs of their activities. Inhabited burrows and latrines were very rarely encountered. We observed a single vole and no lemmings during the whole season. Following very high numbers in 2005 Arctic Ground Squirrels were locally common, but also rare in many sites, and a considerable proportion of animals did not breed. Hares were not recorded. Numbers of Brown Bears were high on the coast, particularly in the vicinity of seabird colonies and river mouths. Bears, or their fresh tracks, were recorded almost daily. The majority were medium-sized males. A single female bear with cubs was observed. Tracks of a wolf were seen once. Red Foxes were common everywhere. We observed a breeding female near the Otvesny Cape, but many foxes did not breed. Arctic Foxes, Wolverines and Ermines were not recorded.

Among large birds of prey a single adult White-tailed Sea Eagle was recorded in the vicinity of a colony of Horned Puffins. Peregrine Falcons were rare and their breeding was not confirmed, although a pair was observed 3 times near the Razboinik Cape during the second half of July. Rough-legged Buzzards were rare, and only 3 apparently breeding pairs were recorded during the whole season. Owls were not seen.

Numbers of Ravens were unusually high, and they were encountered everywhere, particularly in the vicinity of seabirds colonies (where they successfully bred) and in the settlements. Raven broods consisted of 4-5 fledglings in mid July. Although Slaty-backed Gulls *Larus schistisagus* were much more numerous than Ravens, the latter were the most active avian predators, destroying clutches and chicks of all birds, primarily murres and Kittiwakes at the colonies. Glaucous Gulls were less numerous than Slaty-backed Gulls by a factor of 10. Herring Gulls were rare. These species of large gulls successfully bred in the colonies, and in at least 60-70% of pairs chicks survived by early August. In spring and autumn large gulls fed on eggs and chicks of birds in colonies. In June they concentrated at the numerous dumps in the settlements of Beringovsky and Nagorny, and in late June – early July they fed on spawning Far-eastern Capelin *Mallotus villosus* in the Ugolnaya Bay where they were accompanied by tens of thousand Kittiwakes. Only three records of non-breeding Pomarine Skuas were made in July (20 birds in total). Arctic Skuas did not breed, but they were often seen from 6 July to 8 August (102 birds in total). Long-tailed Skuas occurred in small numbers, and were recorded almost daily in June and until approximately 20 July.

Red-throated, Black-throated and Pacific divers were common on the sea and on lagoons, from where they carried food to the lakes where they bred.

White-fronted Geese nested in the vicinity of Zabytaya Lagoon, and most pairs produced chicks (up to 5 in a brood). Common Eiders were numerous breeders in the study area, but their reproductive success was very low; rare broods contained a maximum of 4 chicks. Pintails, Long-tailed Ducks and Greater Scaups occurred in small numbers, and their breeding success was low. King and Steller's eiders were common on the sea near shore, but did not breed. Approximately half of Sandhill Crane pairs produced chicks. Apart of Ravens and large gulls a narrow seaside belt was inhabited by Horned and Tufted puffins and Pigeon Guillemots *Cepphus columba*, successfully breeding in burrows and cavities. Survival of clutches and chicks in the most abundant (100,000s) seabirds, Kittiwakes, Thick-billed and Common murres, was very low,

not exceeding 5-10% by late July – early August. Chicks were present in 10-30% of pairs of Pelagic Cormorants *Phalacrocorax pelagicus* in late July.

At least 70-80% of pairs of Ringed Plovers which were breeding on seaside gravel flats in considerable numbers, lost their clutches, and the survival of broods was, probably, also low. Breeding success of this and other wader species (Dunlin, Temminck's Stint, Red-necked Phalarope, Mongolian Plover *Charadrius mongolus*) was somewhat higher farther from the sea, but the numbers were low there. A single brood of Wandering Tattler *Heteroscelus incanus* was observed.

All species of small passerines occurred in small numbers across most of the study area. Breeding was fairly successful in Red-throated and Buff-bellied *Anthus rubescens* pipits, White and Yellow wagtails, Dusky Thrush, Wheatear, Bluethroat, Dusky and Arctic warblers, House Martin and Snow Bunting, while Common and Arctic redpolls were common wandering birds, but rare breeders.

Remains of numerous colonial seabirds (Kittiwakes, murres) were regularly encountered, but mass mortality did not occur in these species. Apparently sick murres were recorded on a few occasions, while previous observations of perishing of seabirds in high numbers made by local people were not unusual. The weather was generally favourable for reproduction in 2006, but breeding success was low in most species of birds.

A.I. Artyukhov

48. Meynypilgyno lake-river system, Chukotka, Russia (62°46'N, 176°48'E)

A channel from Vaamochka and Pekulneyskoe lakes to the sea was established at the usual dates, in mid June. Accordingly, the spring flood did not prevent the start of breeding in birds, as happened in 2004. The amount of precipitation was not high in June and July, and long-lasting rains, causing increased water levels, started in early August. Extreme weather events were not recorded during the breeding period.

Microtine rodents and Arctic Ground Squirrels occurred in considerable numbers, although slightly lower than in 2005.

Regular observations of broods of Common Eiders, Ringed Plovers, Lesser Sand Plovers, Dunlins and Whooper Swans indicated successful breeding of these birds. In contrast, broods of White-fronted Geese were recorded considerably less often than in 2005. For the first time since the start of observations in 1997, moulting Whooper Swans (3 adult birds) were recorded on the Pekulneyskoe Lake in early August. There was still human impact in the accessible colonies of Common Ediers and Herring Gulls. Three adult divers, including one White-billed Diver, were killed during the breeding period in fishing nets on the Pekulneyskoe Lake. The numbers of Brown Bears continued to increase and they had a strong impact on the nest success of birds.

Autumn was very late and calm. As a result the mass departure of birds was delayed compared to the long-term average. The mass departure of White-fronted Geese from the Rynnatanmelgyn River valley continued until 24 September, while normally it terminates before 20 September. Mass migration of Ross's Gulls was observed in the vicinity of the Russkaya Koshka Spit in the Anadyr Bay on 3 December, while it normally occurs in late October.

E.V. Golub, A.P. Golub

49. St. Paul Island, Pribilof Islands, Alaska (57°10'N, 170°15'W)

A prolonged spell of warm weather in February brought hope of an early spring. Then a late spell of winter with subfreezing temperatures and much snowfall came in March. Upon my arrival in early May the ground was still 100% snow covered and all lakes were frozen over. The Big Lake (the largest one on the island) had traces of ice until the end of May. The snow and ice melting dates were the latest in about 20 years. May and June were sunny, with air temperatures only 0.4°C, lower than average.

Besides birding rarities, spring migration brought in a large influx of Wood Sandpipers and Common Snipes (15 were seen in one evening). Snipes were winnowing – a behaviour not reported in the last 6 years, if ever, and low numbers (mainly single birds) were seen until July 18. Thus some breeding attempts might have occurred. Species that typically nest on the Island were all nesting and hatching, but I have no data on numbers and success. Of species that do not nest every year Common and Arctic redpolls nested (immature birds seen), Buff-bellied Pipits most probably nested (courtship seen in the spring, agitated behavior typical for birds with brood seen in summer), while McKay's Buntings *Plectrophenax hyperboreus* were seen only during migration.

J. Klima

50. Alaska Peninsula, Alaska, USA (57°24'N, 158°04'W)

This year's work is part of an ongoing wader inventory started in 2004. The inventory includes 64 plots in two strata systematically dispersed across lowland areas of the Alaska Peninsula from the Naknek drainage to the end of the peninsula. Point transects are conducted on the plots during the period from 10-31 May. All waders and avian predators are recorded, as well as all other birds. To date 629 points have been surveyed on 42 plots. Distance estimation is being used with hopes of generating density estimates. Habitat data are collected at each point; incidental records are kept on mammal, invertebrate observations and conditions. Nests found incidentally were recorded, but no return visits could be made to evaluate success.

Weather data were collected in King Salmon and are briefly reported for the Naknek River account.

Voles were rare and lemmings were not recorded. The Rough-Legged Buzzard, owls, skuas and Red Fox were rare, gulls were common. Buzzards and gulls bred.

At least nine wader species demonstrated evidence of breeding. Dunlin and Least Sandpiper *Calidris minutilla* nests were found. Nests of several predators were also found. We did not remain at any one plot long enough to evaluate breeding success. We have not visited these plots previously so no between-year changes could be noted.

S. Savage

51. Naknek River, Alaska Peninsula, Alaska, USA (58°42'N, 156°46'W)

According to observations from 14 March – 16 May the season was late in timing, cold and rainy. Naknek River at King Salmon broke on 19 March, refroze on 22 March, and final break-up occurred on 29 March. Air temperatures in King Salmon in March through mid-May were below the 50 year average, but the end of May was well above average resulting in a monthly mean above average in temperature. Total precipitation in April twice exceeded the typical amount.

The total waterfowl peak count (11,550 birds) occurred on 28 April on the upper route with a previous peak (of 11,375 birds) on 24 April. On the lower route the peak occurred on 12 April at 3,225 birds. Peak abundances of 11 of 13 principal species on the upper route were notably higher than average (by at least one third) in 2006. Peak abundances of four of eight principal species on the lower route were also notably higher than average this year. In general, peak counts were high (especially for dabbling ducks, geese and swans) and many arrival and peak count dates were late for many species compared against 15 year averages for the same study. Peak numbers may have been triggered as weather conditions further north held birds at this staging location. This study did not focus on breeding success. Rough-legged Buzzards, skuas, owls and Red Fox were rare while gulls were common, but no information on their breeding is available.

S. Savage

52. Katmai National Park and Preserve, slopes of Mt. Douglas, Alaska, USA (58°43'N, 153°59'W)

In the final year of a three-year project to inventory the montane-nesting birds of National Parks of southwest Alaska, we visited six sites in Katmai National Park and Preserve and three sites in Lake Clark National Park and Preserve from 29 May – 5 June, 2006. All nine sites were located in mountainous terrain adjacent to the Shelikof Strait (Katmai) and Cook Inlet (Lake Clark) coasts. Weather conditions were typical for the season, with generally mild temperatures, little precipitation, and with thick fog occasionally present along the coast. Spring phenology was normal, with low elevation sites mostly snow-free and nearly all lakes and ponds in the region free of ice upon our arrival. At many high elevation sites (>1,000 m), snow cover was extensive but birds were present and active during our period of study. We experienced no extreme weather events during our one-week stay.

A single vole or lemming (unidentified) was noted at two sites in Lake Clark during our survey period; the overall abundance of microtone rodents was probably very low.

In contrast to the previous two year's efforts at interior sites in both parks, waders were uncommonly detected during this year's inventory. Only Spotted Sandpiper *Actitis macularia* (observed on one study plot), Wandering Tattler (two plots), and Wilson's Snipe *Gallinago delicata* (one plot) were detected despite visiting numerous montane and alpine sites containing suitable wader habitat. The most widespread raptors were Bald Eagle *Haliaeetus leucocephalu*s and Golden Eagle, observed on eight and four 10 x 10 study plots, respectively. Merlin, Northern Harrier, and Rough-legged Buzzard were all encountered on only two plots each. Brown and Black Bears, Wolf, Moose, and Arctic Ground Squirrel were observed throughout the survey region. Willow Grouse, Rock Ptarmigan, and White-tailed Ptarmigan *Lagopus leucurus* were rare breeding species.

D.R. Ruthrauff, T.L. Tibbitts, R.E. Gill, C. Handel

53. Naskonat Peninsula, Yukon-Kuskokwim Delta, Alaska, USA (60°58'N, 165°05'W)

Snow melt and habitat availability was late in 2006 in comparison to the near average spring phenology in 2005 and early phenology in 2003 and 2004. Weather and habitat conditions, although delayed, were favourable prior to hatch and good waterbird productivity is expected. Flowering dates for *Carex spp.*, *Petasites frigidus*, *Cornus canadensis* were 2-5 days later than in 2005. Green-up of *Salix ovalifolia* and *Hippuris vulgaris* was 10 days later than in 2005 as was the first large mosquito emergence on 17 June.

No microtines were observed and there was little over-winter sign indicating their presence.

The hatching of geese was a minimum of 10 days later than in 2005, following our departure from the field on 19 June. All waterfowl clutch sizes were down from 2005 except for Cackling Geese *Branta hutchinsii* which was similar in 2006. Arctic Fox tracks were scarce but present throughout the 25-30 km^2 area surveyed and were more common than in 2005. Fox predation on nesting waterbirds appeared to be low. The only hatching observed prior to our departure was a Sandhill Crane on 16 June and a Semipalmated Sandpiper *Calidris pusilla* on 17-18 June.

Very few Red Phalarope and Ruddy Turnstones were observed providing continuing documentation that abundance of these species is below historic levels.

C.P. Dau, C.J. Norment

54. Yukon-Kuskokwim outer Delta south-west, Alaska, USA (61°15'N, 165°38'W)

Despite a late onset of the breeding season (about 10 days later than in recent years), in general conditions were good. Vole and fox populations were low (based on snap trapping 3 voles in 1080 trap nights at six sites in July and snow tracking of foxes along 360 km of snow machine transects in April); the occurrence of historically high coastal flooding in fall 2005 was the probable cause of these low populations in 2006. Total number of brant nests was fewer than 2005. Nineteen foxes were trapped in a 54 km^2 area at the Tutakoke River colony; consequently, nest losses to foxes were negligible compared to 2005. Although 8 foxes were trapped on Kigigak Island (as in 2005), the estimated number of nests there were reduced from 2005. The number of nests at Kokechik Bay increased again in 2006, likely a result of decreased human activity in the colony compared to the problem years of 2003 and 2004. The trend in the annual mean of estimates continues to be negative.

R.M. Anthony

55. Tutakoke River, outer Yukon Delta, Alaska, USA (61°15'N, 165°37'W)

According to observations between 2 May and 8 June, the season seamed to be a late one after two extremely early preceding springs on the Yukon-Kuskokwim Delta. However, in a long-term scale the spring was not that late. The first pools of water on the early snow-free patches appeared on 3 May, and mean daily air temperature crossed the freezing point for the first time on the same or next day, although night frosts were recorded until 23 May. Sunny weather predominated on 1–3 May and from 23 May – 5 June. Strong winds occurred on 8 days, all in May with one stormy day, 20 May. Precipitation was recorded on 11 days during the study period, mostly with snow (8 days) till 20 May and rain/drizzle (3 days) in June.

Snow cover was only ca. 20-30 cm deep judging by observation of the tops of dry grasses poking out of the snow in many places. Nevertheless snow-free patches were developing at first mostly along the river, where 50% of the ground became snow free on 9 May (complete disappearance of snow there on 18 May), while large areas at a distance were still untouched white. The following percentages of snow cover on the Brent Geese extensive plot reflect progress of snow melt: 97% on 13 May, 93% on 16 May, 75% on 22 May, 50% on 24 May, and the rest of snow almost completely gone by 28 May. Ice on the river became broken on 15 May when it started to "breath" with tides, but ice floats started to move with currents along the river only on 30 May. This date is only slightly later than the almost 30-year long regression line predicts for 2006. Mass emergence of small flies took place on 29 May; the first bumblebee was seen on 4 June. Meadows on areas earliest released from under the snow got green tint from growing vegetation on 1 June, and first flowers were recorded on 2 June in sedge *Carex sp*., on 4 June in *Nardosmia frigida*, on 5 June in dwarf willow *Salix ovalifolia* and Crow Berry *Empetrum nigrum*.

The only sign of the presence of small rodents in the area was a winter nest found close to mudflats on 6 May that was undoubtedly excavated by an Arctic Fox.

In spite of efforts to trap fox in the area during April through early May (USGS project), Arctic Foxes were common judging from fresh tracks on the snow (they could be regularly recorded until mid May), barking heard (on 4 days in May) and animals seen (on 5 days in May and 3 days in early June). We observed no signs of fox after 4 June. A Mink was seen once. Surprisingly, not a single bird of prey was recorded during the whole season. The most common avian predators were Glaucous, Common and Sabine's gulls that were seen, or suspected to be taking eggs, and Arctic Skuas that were chasing waders, gulls and Arctic Turns. Long-tailed Skuas were uncommon only during migration, and occasionally a Common Raven was observed.

In early May, Tundra Swans, White-fronted Geese, Willow Grouse, Sandhill Cranes, Glaucous Gulls, and Snow Buntings were already in the area, hanging around mostly in flocks. However, the bulk of birds of various species arrived only by mid-May. The earliest wader was a Grey Plover on 4 May. The first arrival dates for common and numerous local breeders were 5 May for Bar-tailed Godwit, 6 May for Pintail, Common Gull, and Lapland Bunting, 7 May for Emperor Goose, 9 May for Cackling Goose and Semipalmated Sandpiper, 10 May for Brent Goose, Black Turnstone *Arenaria melanocephalas* and Dunlin, 13 May for Sabine's Gull and Arctic Tern, and 18 May for Spectacled Eider *Somateria fischeri*. First eggs were laid on 24 May by Emperor Geese, 25 May by Brent Geese, 26 May by Bar-tailed Godwits and Common Gulls, 27 May by Spectacled Eiders, Semipalmated Sandpipers and Glaucous Gulls, 29 May by Dunlin, 30 May by Black Turnstones and Sabine's Gulls, and 1 June by Arctic Tern. Dates of nest initiation in geese were 10 days later than in 2005 and 5 days later than in 2004, but at about the date indicated by the long-term regression line (Patrick Lemons, pers. comm.).

The coastal meadows of the study area were considerably changed by tidal flooding in September 2005, causing difficulty for some birds to find appropriate cover for their nests. Thus, of 14 nests found in Black Turnstone, 12 were completely open and only two had some grass cover. Probably this was a reason for the low survival rate of incomplete clutches in this species – only 23% of egg-clutches under observation (n=13) were completed before depredation, and these three clutches were subsequently successfully incubated. In three other wader species (Dunlin, Semipalmated Sandpiper and Bar-tailed Godwit), 53% of nests under control (n=15) survived between repeated checks in early incubation. We do not have precise figures, but it seems like gulls and Arctic Terns were nesting with higher success than waders probably due to their aggressive behaviour. Our general impression was that birds were nesting with moderate success, and at least in geese nest survival was higher than in 2004 and 2005.

P.S. Tomkovich, M.N. Dementyev, B. Comstock

56. Old Chevak, Yukon Delta National Wildlife Refuge, Alaska, USA (61°26'N, 165°27'W)

Spring was significantly later than in 2004 and 2005 with snow-free patches comprising <5% of the surface around the field station in early May. The same bird species were recorded in the area as at the Tutakoke field station in that period. Our main field activity in this area took place in the first half of June when we were searching for nests of Bar-tailed Godwits to catch these birds for attaching satellite transmitters as part of a migration research project.

Overcast and rainy weather predominated in that period, and we had only several days with sun in early June and on 15 June, the day of our departure. There were some showers of rain daily from 9-14 June, but there was no obvious influence of this weather on bird nesting success. In the second week of June vegetation was still at the spring phonological stage; by that time dwarf birches were only getting their green leafs and only few plant species had flowers (*Eriophorum* sp., *Nardosmia frigida*, *Arctostaphylos alpina*, *Empetrum nigrum*). During that second week of June willows and *Pedicularis sudetica* started mass flowering and the first flowers in cloudberries and dwarf birches were found. The first biting mosquito was recorded on 10 June, and these insects became noticeable two days later.

Rodents were rare; voles were regularly seen only near the wooden cover for trails in the field camp.

Mink is the most common ground predator in the area; live animals were seen near the camp both in early May and several times in June. Footprints of Arctic Foxes were found in early May, but there were no sight records of animals. As to avian predators, Northern Harrier, Peregrine Falcon, and Arctic Skua were recorded only few times. Glaucous Gulls, Long-tailed Skuas and Sandhill Cranes were more common and the latter two species were locally breeding. Common and Sabine's gulls were most abundant.

In total 44 bird species were recorded with breeding confirmed for 21 and suspected for 13 species. We did not revisit bird nests that were found for tracking nesting success, apart of Bar-tailed Godwits. However, no loss was recorded among a dozen or two of nests belonging primarily to geese, waders and gulls. Thus, nesting was apparently rather successful in most birds, at least in the beginning of the breeding season.

B.J. McCaffery, R.E. Gill, Jr., L. Tibbitts, D.R. Ruthrauff, S. Lovibond, M.N. Dementyev, P.S. Tomkovich

57. Kanaryarmiut Field Station, Yukon Delta National Wildlife Refuge, Alaska, USA (61°22'N, 165°08'W)

Generally it was a late, cold and windy season. Arrival and nest initiation dates by birds were later than in the previous two years. The late start potentially was the cause of the low renesting frequency. We found that many waders whose nests were depredated late in the incubation period did not renest.

Northern Red-backed Voles were seen 3 times in the period of studies from 3 May-24 July.

Arctic Foxes were common, while the American Mink was abundant. Pomarine Skuas and Rough-legged Buzzards were not recorded; Short-eared Owls were rare and did not breed. Long-tailed Skuas were common breeders, and Arctic Skuas were rare. Willow Grouse bred in high numbers, and the Dunlin occurred at a density 57 nests/km^2.

S.E. Jamieson

58. Kougarok River (Quartz Cr.), central Seward Peninsula, Alaska, USA (65°26'N, 164°39'W)

During a trip to capture and satellite-tag large waders (Whimbrel, Bristle-thighed Curlew *Numenius tahitiensis* and Bar-tailed Godwit) in the last week of June we surveyed a large area of upland tundra in the drainage of the Kougarok River. The area was dominated by gently sloping hills and low mountains with large patches of snow-covered bushes and recently emerged willow and birch bushes along smaller drainage channels. Tundra vegetation on most slopes had greened-up and spring and early summer flowers were in full bloom. The observed pattern of melt could have resulted from an uneven distribution of the abundant snow at the end of the winter and probably created a patchy distribution of breeding habitats available for birds. Blood-sucking mosquitoes were already rather common on warm windless days in some areas. During the survey period moderate to strong southerly winds prevailed in the day-time and typically calmed down at night-time. Four of 7 days were either sunny or had long periods of sunshine, it rained for two days, and there were a few local showers on the other days.

Signs of the winter presence of voles were abundant in bushes on some slopes of lateral valleys, but even with a crew of 6 people a *Microtus* vole was seen only once in the valley of the Kougarok River. This indicates that the vole population probably declined substantially during spring-time. Arctic Ground Squirrels were rare.

Mammalian predators were rare in the area, with only one Red Fox and one Brown Bear seen during extensive helicopter flights. Among other mammals, moose (mostly females with calves) were recorded almost daily, and small groups of Caribou were observed. Few avian predators were present with Ravens and Long-tailed Skuas being the most common; several widely scattered breeding pairs of the latter species were found and wandering flocks of up to 15 birds were seen. Nests of Ravens were found on man-made constructions south of the survey area along the road to Nome. A pair of Merlin appeared to be breeding in the survey area. In the short time we were present, we did not observe evidence of breeding by Rough-legged Buzzard, Northern Harrier, Gyrfalcon, and Peregrine Falcon, and individuals of these species were recorded only few times. The absence of breeding by Buzzards may be related to the low abundance of rodents. We did not see any owls. Densities of other species that occasionally depredate eggs and chicks (e.g., Glaucous and Common gulls and Sandhill Crane) were very low.

Some species were present in unusually low numbers: Willow Grouse, Buff-bellied Pipit, and Yellow Wagtail. During the 10 days we were present, we observed actively hatching nests and recently-hatched chicks of one Long-tailed Skua and several pairs of Bristle-thighed Curlew, which is the average timing for these populations. Many other species appeared to have also nested successfully based on observations of birds alarm-calling and carrying food, such behaviour was observed in Sandhill Crane, American Golden-Plover *Pluvialis dominica*, Wilson's Snipe, Whimbrel, Shore Lark, Lapland Bunting and a number of bush-bird species. Some species (American Golden-Plover and Whimbrel) still had nests. Thus, our general impression was that most local bird pairs were nesting successfully.

R.E. Gill, Jr., T. L. Tibbitts, D.R. Ruthrauff, P.S. Tomkovich, M.N. Dementyev, S. Lovibond

59. Barrow, Alaska, USA (71°17'N, 156°38'W)

June was unusually warm early on, causing a rapid melt of snow over the entire North Slope in a matter of days during the first week of June. Thus, snow-cover reduced to 50% by 9 June, and completely melted on 12 June. The rest of June remained warm to average, but then July and August turned colder and rainy. The spring and summer were similar to 2005. No severe winter storm took place during the field season that lasted from 2 June till 10 September. Weather data are available from NOAA weather station located near Barrow.

Lemming numbers around Barrow were extremely high in 2006 – magnitudes more than in past years. Between 4 and 105 Brown Lemmings *Lemmus trimucronatus* were seen every day between 5 and 30 June. Denver Holt, who was studying Snowy Owls in the area and laid out traps to capture small mammals, indicated this was a high year in his 14 years of trapping. Greenland Lemmings *Dicrostonyx groenlandicus* and Tundra Voles were observed on 2 and 8 days out of 90-day field season, respectively.

Near record numbers of Snowy Owls nested near Barrow, and Pomarine Skuas were nesting on most of our 6 plots. As in 2005, hatching success of wader nests was extremely high in 2006, compared to the dismal levels observed in 2003 and 2004. This is most likely because Arctic Foxes were removed (killed) from the study area as part of a Steller's Eider Recovery Management Action.

We located and monitored nests in six 36-ha plots in 2006. All six plots are the same as those sampled in 2005. We used the same search intensity and methodology as in 2004 and 2005. The first wader clutch was initiated on 3 June and the last on the 3 July in 2006 (on or within 1 day for both dates in prior years). The peak initiation date was the 12 June and the median initiation date was the 15 June; this is within 1-2 days of median dates in earlier years. Median nest initiation dates for the more abundant species were the 11 June for Dunlin, 12 June for Semipalmated Sandpipers, 15 June for Red Phalarope and 16 June for Pectoral Sandpipers. This pattern is similar to prior years.

The breeding density of all wader species on our study area was 52.1 nests/km^2 in 2003, 66.6 in 2004, 63.0 in 2005, and 150.5 in 2006 (overall average density across years was 83.0 nests/km^2). The exceptionally high density of nests in 2006 far surpassed previous years. As in 2005, our ability to find nests was probably enhanced by a fox removal program that allowed many nests to survive through to hatching, giving us more time to find the nests. While this may partially explain the high nest densities, it seems likely that the high wader numbers are somehow related to the extremely high lemming, Snowy Owl and skua numbers.

In 2006, we recorded the highest breeding density of the four most abundant wader species in the four years of our study. These included Red Phalarope (50.5 nests/km^2), Pectoral Sandpiper (48.2), Dunlin (17.6), and Semipalmated Sandpiper (8.3). We also had record densities of Long-billed Dowitchers (11.1), Buff-breasted Sandpipers *Tryngites subruficollis* (8.3), American Golden Plovers (2.8), and Red-necked Phalarope (3.2 nests/km^2). A total of 325 nests were located on our plots and another 92 nests were found outside the plot boundaries. Nests on plots included 104 Pectoral Sandpiper, 109 Red Phalarope, 38 Dunlin, 18 Semipalmated Sandpiper, 24 Long-billed Dowitcher, 7 Red-necked Phalarope, 6 American Golden Plover, and 1 Baird's Sandpiper *Calidris bairdii*. For the first time since the beginning of this study, we located Buff-breasted Sandpiper nests on the tundra plots in 2006 (*n*=18). Western Sandpiper *Calidris mauri* and White-rumped Sandpipers *C. fuscicollis* were not observed on our plots in 2006, and have only been documented nesting in 2004.

Predators destroyed only 8.3% of the nests in 2006 compared to 11.2% in 2005, 67.9% in 2004, and 42.6% in 2003. Across the more abundant species, hatching success (number of nests hatching at least one young/total number of nests) was highest in Pectoral Sandpipers (90.4%, *n*=94), followed by Red Phalarope (86.6%, *n*=103), Semipalmated Sandpipers (93.6%, *n*=29), and Dunlin (85.7%, *n*=42). These numbers are even higher than in 2005 when predator removal appeared to substantially increase nest success. Alternative food sources in the form of high lemming abundance may have further enhanced wader hatching success, although other factors may be involved. A comparison across study plots indicated that hatching success was greater than 90% in plots 2 and 3, greater than 80% in plots 5 and 6, and equalled 72.7% in plot 8.

In 2006, we captured and colour-marked 342 adults and 707 young. These numbers are about two times higher than 2005 captures and three times higher than 2003-2004 captures. Thirty adults (mostly Dunlin and Semipalmated Sandpipers) captured in 2006 had been banded in a prior year.

R. Lanctot

60. Arctic Coastal Plain, Chukchi Sea/Beaufort Sea Coastline, Alaska, USA (69°23'N, 152°15'W)

During coastal aerial surveys from 25-27 June 2006, shore fast ice cover was observed to be more extensive than in 2005 (24-27 June) in the Chukchi Sea and similar in the Beaufort Sea. Shore fast ice cover east to Brownlow Point on the Beaufort Sea coast was as or more extensive than in 2005 but it appeared darker and was probably melting more rapidly. As in previous years since 1999, open water was present near all large river mouths. From Brownlow Point east to the Canadian border, shore fast ice cover was similar to 2005 but with more open water in lagoons. Again, ice appeared darker suggesting more rapid melting this spring. The Beaufort Sea barrier islands, favoured as nesting sites by Lesser Snow Geese, Brant, Common Eiders, Glaucous Gulls, Sabine's Gulls and Arctic Terns, were mostly inaccessible to terrestrial predators due to open water during the survey.

Lesser Snow Goose nests on Howe Island had mostly hatched and many broods were seen compared to 2005 when numerous incubating birds and few broods were observed. A single Lesser Snow Goose brood and two White-fronted Goose broods seen near the north end of Kasegaluk Lagoon, on the Chukchi Sea coast, were the only other indications of hatching. In 2005, with the exception of Lesser Snow Geese at Howe Island, there was no indication of hatching in other species.

No snow was present onshore throughout the survey area; however, most larger lakes along both the Chukchi and Beaufort sea coastlines were mostly ice covered. There was no observable indication of green-up in coastal meadows.

Snowy Owls were broadly abundant in 2006 and several Pomarine Skuas were observed in the Barrow area indicating increased microtine populations.

C.P. Dau

61. Prudhoe Bay Oilfield, Alaska, USA (70°17'N, 148°42'W)

Our snow cover surveys indicate that snow cover in the flat areas was about 20% on 4 June, and it completely melted on approximately 13 June. It appeared that the study plots closest to the Beaufort Sea had the deepest snow and highest snow cover. At this site, our study plots range 2-13 km inland from the coastline. Days were consistently warmer than in 2005 for much of the season (especially June). There were no major snow storms during our time in the field.

Lemmings were commonly observed and seen in the highest numbers since 2003 based on our field observations though we did no trapping. We observed 19 lemmings in 2006 during incidental predator surveys versus 3 in 2005. Two lemmings were observed during timed surveys.

Arctic Foxes were common and bred. Red Fox as well as both Snowy and Short-eared owls were also recorded without signs of breeding however. Pomarine Skuas were also observed more frequently this season. Willow Grouse and Rock Ptarmigan were common breeders.

We conducted three 10-minute point count surveys for potential nest predators on each of 12 study plots at three different times (three replicates) during the course of the season. A total of eight potential predators were detected (*n*= no. of detections): Glaucous Gull (*n*=44), Arctic Skua (*n*=25), Pomarine Skua (*n*=6), Arctic Fox (*n*=6), Long-tailed Skua (*n*=2), Red Fox (*n*=2), unidentified lemming (*n*=2) and Northern Harrier (*n*=2).

We sampled at the same plots we sampled in 2005 (12 10-ha plots). Nest densities were the highest at this site in the 4 years since monitoring began in 2003 (101.6 nests/km^2; the previous high being 75.8 nests/km^2 in 2005). We discovered and monitored all nests on (or near) the study plots. Nests were monitored every 3-6 days until nesting fate was determined. We found 157 nests of 16 species from 9 June to 20 July. Of the 157 nests, 32 were found off-plot. Ninety-five nests successfully hatched/fledged and 47 failed. We were unable to reliably assess the fate of 15 nests. Nest predation was the most important cause of nest failure (43 of 47 nest failures, 91%). Other sources of nest failure were abandonment (*n*=2) and predation due to observers (*n*=2). Mayfield estimates of nesting success for the three most common species were: 0.758 in Semipalmated Sandpiper (*n*=26), 0.659 in Lapland Bunting (*n*=24), 0.705 in Pectoral Sandpiper (*n*=19) and 0.771 in Red-necked Phalarope (*n*=13). Nest success for 2 of the 3 most common nesters (Pectoral Sandpiper and Lapland Bunting) was noticeably higher in 2006 versus 2005.

J.R. Liebezeit

62. Teshekpuk Lake – Olak, Alaska, USA (70°26'N, 147°06'W)

There was less than 50% snow cover on our arrival on 3 June. There was approximately 30% snow cover on 6 June and it completely melted on 14 June. The stream next to our camp broke up on approximately 5 June. With respect to 2005, snow melt occurred earlier in 2006. On 6 June, snow cover was nearly twice as much (~55%) in 2005 compared to 2006. Likewise, snow melt was complete approximately two days later in 2005 (16 June) compared to 2006. June was warmer than in 2005 (with mean daily temperatures >+5°C), but early July was cooler. There were no major snow storms during the field season. We did have more rainfall this season particularly in July. The first mosquitoes emerged on 20 June, about 10 days earlier than in 2005.

2006 was a year of high lemming abundance. We detected lemmings 159 times during incidental predator counts on our study plots (only 7 detections in 2005). We did not capture lemmings. We believe we saw both Brown and Collared lemmings although we did not try to identify them to species.

We conducted three10-minute point count surveys for potential nest predators on each of 16 plots at three different times (three replicates) during the course of the season. A total of eleven species of potential nest predators were detected (*n*= no. of detections): Pomarine Skua (*n*=66), Arctic Skua (*n*=47), Sabine's Gull (*n*=32), Long-tailed Skua (*n*=30), Glaucous Gull (*n*=25), unidentified lemming (*n*=5), Arctic Tern (*n*=4), Short-eared Owl (*n*=3), unidentified skua (*n*=2), Snowy Owl (*n*=1), Golden Eagle (*n*=1), and Arctic Fox (*n*=1).

All lemming-specialized predators, the Arctic Fox, Pomarine Skua, Snowy and Short-eared owls were common and bred. Pomarine Skua abundances were much higher than in 2005 and at least 5 active Pomarine Skua nests were seen on or near study plots this year. Willow Grouse and Rock Ptarmigan were common breeders.

We found and monitored all nests on (or near) 16 10-ha study plots every 2-6 days until nest fate was determined. We found 246 nests of twenty species from 7 June to 15 July. Of the 246 nests, 33 were found off plot. One-hundred sixty-two nests successfully hatched/fledged and 70 failed. We were unable to reliably assess the fate of 14 nests. Nest predation was the most common cause of nest failure (63 of 70 nest failures; 90%). Other sources of nest failure were abandonment (*n*=3), predation due to observers (*n*=2), and trampling (*n*=2). Trampling was most likely due to caribou. Mayfield estimates of nesting success for the 4 most common species were: 0.756 in Lapland Bunting (*n*=64), 0.797 in Pectoral Sandpiper (*n*=32), 0.941 in Red Phalarope (*n*=24), and 0.722 in Semipalmated Sandpiper (*n*=15). Thus, nesting success was very high at this site with most species having Mayfield nesting success estimates greater than 50%.

J.R. Liebezeit

63. Canning River Delta, Arctic National Wildlife Refuge, Alaska, USA (70°10'N, 145°51'W)

This was our 5th year at the study site and the earliest melt observed thus far. There also was an early snow melt in 2002, but not quite as early as 2006. Snow completely melted before 5 June when we arrived to the study area.

We do not have a reliable measure of small mammal abundance other than observational data and the presence of nesting Snowy Owls and Pomarine Skuas (both species usually only nest in high lemming years). Observations of small mammals were at least an order of magnitude higher in 2006 than the

previous 2 years (when we also quantified observations), and anecdotal observations 2003 and 2002 indicate small mammal abundance was relatively low in those years.

Conditions at the Canning River Delta in 2006 were atypical compared to the previous 4 years. Snow melt was early, and small mammal and predator abundance were higher than previously observed. In 2006, we found two Snowy Owl nests and four Pomarine Skua nests, but suspected that several more were present. Total predators observed during predator surveys were also higher in 2006 compared to all other years, due primarily to the higher abundance of Pomarine Skuas. In addition there were at least three Arctic Fox dens at the study site, one with nine cubs. Breeding of the Rough-legged Buzzard was recorded. The Rock Ptarmigan was common.

A commonly held assumption is when small mammals are abundant, predators switch their focus away from birds resulting in higher nest success. This was not true at the Canning River Delta in 2006. For all nesting species nest survival in 2006 was much lower than most of the previous years. Mayfield estimate of nest success was 0.022 in Dunlin (*n*=5), 0 in Pectoral Sandpiper (*n*=13), 0.126 in Semipalmated Sandpiper (*n*=16), 0.193 in Stilt Sandpiper *Micropalama himantopus* (*n*=5), 0.118 in Red Phalarope (*n*=13), 0.023 in Red-necked Phalarope (*n*=23) and 0.037 in Lapland Bunting (*n*=73, including incubation and nestling stages). It appears that benefits of a higher mammal prey base may have been offset by the higher predator abundance.

At the Canning River Delta in 2006 we located and monitored 180 of nests of 12 species. The most abundant wader species were Semipalmated Sandpipers (density = 16.0 nests/km^2) and Red-necked Phalaropes (density = 11.5 nest/km^2). This was the highest density we have observed for Red-necked Phalaropes at the study site, which was not surprising as higher abundance of phalaropes are expected in years of early snow melt. However, Red Phalaropes nesting density in 2006 was much lower than in 2002, an early snow melt year with the highest density observed for this species at the study site. In 2006, Pectoral Sandpipers had the lowest nest density observed for that species (6.5 nests/km^2) at our site.

S. Kendall

64. Taglo Island, Kendall Island Bird Sanctuary, the Mackenzie River Delta, Canada (69°22'N, 134°58'W)

The season was average in timing and warm. We had a major wind storm on 2 July. Water levels in the study area rose approximately 5 cm.

In total 5 Brown Lemmings were recorded during study period from 9 June – 18 July.

An Arctic Skua nest was in the area which resulted in higher levels of predation, which increased when skua eggs hatched. Arctic Foxes were rare. Rough-legged Buzzards were rare breeders, but survived to hatching. Pomarine Skuas and Snowy Owls were not recorded, while Short-eared Owls were rare.

V.H. Johnston

65. Mackenzie River delta, Canada (68°13'N, 134°24'W)

Surveys carried out in the region in June and August 2006 indicated good numbers of nesting Tundra Swans and a relatively early nesting season. Overall, 40% of the indicated pairs nested and 62% of those nests produced broods meaning that 25% of the pairs successfully raised broods. Nest success and productivity declined from those estimated in 2005. However these estimates are still above the productivity measured during 2001-2003 when the three parameters averaged 39%, 35% and 14% respectively (J. Hines, CWS, pers. comm.).

Canadian Wildlife Service Waterfowl Committee. 2006. Population Status of Migratory Game Birds in Canada: November 2006. CWS Migr. Birds Regul. Rep. No. 19. http://www.cws-scf.ec.gc.ca/publications/status/nov06/nov06_e.pdf

66. Banks Island, Canada (73°00'N, 121°30'W)

Local Inuvialuit residents indicated that spring snow melt in 2006 occurred very rapidly and earlier than usual and that large numbers of Lesser Snow Geese nested. Observations made during goose banding in July indicate that good numbers of broods were present. Therefore, the production of Snow Geese was predicted to be above average on Banks Island this year.

Canadian Wildlife Service Waterfowl Committee. 2006. Population Status of Migratory Game Birds in Canada: November 2006. CWS Migr. Birds Regul. Rep. No. 19. http://www.cws-scf.ec.gc.ca/publications/status/nov06/nov06_e.pdf

67. Karrak Lake, Queen Maud Gulf Bird Sanctuary, Nunavut, Canada (67°14'N, 100°15'W)

Spring break-up was nearly a month earlier than average near Kugluktuk (west of the Queen Maud Gulf), and average spring temperatures throughout western Nunavut reached record highs in 2006.

Nesting phenology at the Karrak Lake colony of Snow and Ross' geese in the Queen Maud Gulf and on Banks Island was about one week earlier than average and gosling production there is expected to be above average. Overall, production is expected to be better than average for the Western Central Flyway Population of light geese.

U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. U.S. Department of the Interior, Washington, D.C. U.S.A. http://library.fws.gov/Bird_Publications/waterfowl_population06.pdf

68. McConnell River, the west coast of Hudson Bay, Canada (60°50'N, 94°25'W)

The 2006 McConnell Ross's geese colony estimate was about 10% lower than the 2005 estimate and similar to that of 2004. Nesting phenology at the McConnell River appeared to be average or earlier, although local residents reported a colder than average spring. Mean clutch size was 3.3 and predation appeared to be low in 2006.

U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. U.S. Department of the Interior, Washington, D.C. U.S.A. http://library.fws.gov/Bird_Publications/waterfowl_population06.pdf

69. Hudson Bay lowlands, Canada (55°00'N, 87°00'W)

In spring 2006, conditions for breeding were very good, with the early arrival of spring across the Hudson Bay Lowlands, but snowmelt appeared to be delayed at Cape Henrietta Maria as seen during a Canada Goose *Branta canadensis* survey in that area on 22 May (J. Hughes, pers. comm.). Thus, timing of nesting in 2006 was probably close to average. Indeed, breeding productivity (0.91 goslings per adult) measured at banding 5 weeks post-hatch was near average compared to the previous 6 years (Hagey *et al.* 2006). At Akimiski Island, production was above average (1.16 goslings per adult, measured at 5 weeks post hatch) (Hagey *et al.* 2006).

Canadian Wildlife Service Waterfowl Committee. 2006. Population Status of Migratory Game Birds in Canada: November 2006. CWS Migr. Birds Regul. Rep. No. 19. http://www.cws-scf.ec.gc.ca/publications/status/nov06/nov06_e.pdf

70. James Bay, Akimiski Island, Canada (53°00'N, 82°00'W)

Lower than average winter snowfall and above average spring temperatures contributed to a spring thaw in 2006 that was even earlier than in 2005, and 3-4 weeks earlier than average.

Breeding ground surveys indicated 160,400 Canada Geese of the Southern James Bay population in spring 2006, 247% higher than last year's potentially biased survey ($p<0.001$), and 59% higher than the 2004 survey estimate ($p=0.24$). The 2006 level was a record high since surveys started in 1990. Spring population estimates have decreased an average of 2% per year since 1997 ($p=0.646$). The estimate of breeding pairs in 2006 increased to 64,400, 205% higher than in 2005 ($p<0.001$), and 71% higher than in 2004 ($p=0.075$). Biologists believed the 2005 survey results underestimated the population due to unusual variation in survey timing and reduced goose detection resulting from the use of a different survey aircraft. Surveys in 2006 were conducted within the target period with the traditionally used aircraft. Survey biologists indicated that temperate-nesting moult migrants likely were not a factor in survey estimates during 2004-2006. On Akimiski Island, nesting phenology was similar to 2005, which was the earliest recorded since 1993. Nest density and average clutch size on Akimiski Island were above the recent average. Nest success there was lower than in 2005, but still higher than average.

U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. U.S. Department of the Interior, Washington, D.C. U.S.A. http://library.fws.gov/Bird_Publications/waterfowl_population06.pdf

71. Ungava Peninsula, Canada (58°30'N, 69°30'W)

Spring temperatures in 2006 were mild and breeding areas were largely free of snow by early May, leading to a second consecutive year of earlier than average nesting phenology in much of the Atlantic population of Canada Geese (composed largely of *B. c. interior)*. The proportion of indicated pairs observed as singles (62%) surpassed the 2005 record-high level, suggesting another excellent nesting effort this year. The mean nest initiation date (average of all 6 sites) in 2006 was 21 May, which is 3 days earlier than last year and 5 days earlier than the long-term average (1997-2006). A total of 126 nests of Canada Geese were found within the 6 sites surveyed along Ungava Bay, with a mean clutch size of 4.03, slightly higher than the long-term yearly average of 3.97. Nest densities on the Ungava Peninsula study areas in 2006 were slightly above average. Productivity of Atlantic population Canada Geese on the Ungava Peninsula in 2006 should be average to good.

1) Canadian Wildlife Service Waterfowl Committee. 2006. Population Status of Migratory Game Birds in Canada: November 2006. CWS Migr. Birds Regul. Rep. No. 19. http://www.cws-scf.ec.gc.ca/publications/status/nov06/nov06_e.pdf
2) U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. U.S. Department of the Interior, Washington, D.C. U.S.A. http://library.fws.gov/Bird_Publications/waterfowl_population06.pdf

72. Coats Island, Nunavut, Canada (62°51'N, 82°29'W)

There was moderate snow cover upon our arrival to the camp, but warm June weather made the snow melt very quickly: to 50% cover by 5 June and completely by 9 June. In general, June was very warm and dry. However, there was a snowfall on 18 June. This snow layer of 5-10 cm deep melted within 12 h. Another storm on 23 June brought 0°C temperatures, 72 km/h winds and snow. On 7 July, there were extreme winds (high of 98 km/h), and light rain; as this coincided roughly with peak of hatching, I expect that this may have caused problems for some birds. Overall, there was very little rain throughout June and early July, and the flow of small rivers in the area was much lower than in 2004 or 2005. The weather in late July was cooler than average with an average amount of rainfall.

No lemmings exist on Coats Island. Arctic Foxes were common, and we observed 2 pups at one den. With the exception of the extreme weather events noted above, 2006 offered favourable conditions for breeding birds. Hatch success of waders appeared higher in 2006 than in 2004 or 2005. Red Phalaropes, White-rumped Sandpipers and Pectoral Sandpipers bred at this site in much higher abundance in 2006 than in 2004 or 2005, and had atypically high success. The Mayfield estimate of hatch success in waders was 0.34. Snow Geese continue to nest in the Northern portion of this study plot, and the colony appears to have expanded even since 2005. Hatching success of Snow Geese at this site was low, however, due to unique circumstances. The landfast sea ice went out in mid June, about 2 weeks earlier than usual for this area. A strong north wind packed drifting ice against the coast at our study site (on the north side of the island), bringing many bears into the area. These bears (up to 5 at a time) made their way through the goose colony in a matter of days and consumed the vast majority of eggs. We did not observe bears consuming eggs at this colony in previous years, presumably because most bears were out on the ice until the goslings had hatched.

P. Smith

73. East Bay, Southampton Island, Nunavut, Canada (63°59'N, 81°40'W)

Snow cover was heavy upon our arrival on 1 June, but melted quickly: to 50% cover on 5 June, and completely on 10 June.

We encountered a severe storm on 24 June, which happens annually on or very near that day (perhaps a striking coincidence, but consistent within ±4 days over 7 years!). As is normal for this area, winds were moderate to high throughout peak wader hatching. Heavy rains and high winds on 5 and 7 July may have caused problems for newly hatched chicks.

Abundance of Collared Lemming *Dicrostonyx richardsoni* was low to moderate and Brown Lemming low. Capture data were collected using snap-trap transects.

Breeding success continues to decline at East Bay; overall nest success of waders was 9% this year. There has been a striking downward trend in success since 2001. The cause of this trend is unclear, however, lemmings have been scarce to moderately scarce since that year. Uniparental species (Red Phalarope, White-rumped Sandpiper and Pectoral Sandpiper) were much more common breeders in 2006 at nearby Coats Island, but this trend was not seen at East Bay.

P. Smith

74. Southampton Island, Canada (65°00'N, 85°00'W)

Biologists on Southampton Island reported that spring snowmelt was about one week earlier than recent years. Nesting phenology in Brent Geese appeared to be 3-4 days earlier than in 2005 and two weeks earlier than in 2004. Indications of warm spring temperatures and earlier than average spring phenology in 2006 suggest that Atlantic Brant production may be above average this year.

U.S. Fish and Wildlife Service. 2006. Waterfowl population status, 2006. U.S. Department of the Interior, Washington, D.C. U.S.A. http://library.fws.gov/Bird_Publications/waterfowl_population06.pdf

75. Great Plain of the Koukdjuak, Buffin Island, Canada (66°10'N, 73°60'W)

Breeding success of the Atlantic Brant appeared to be below average at the colony on Baffin Island in 2006. Few family groups were seen, and large numbers of birds without young were observed in moulted flocks.

Canadian Wildlife Service Waterfowl Committee. 2006. Population Status of Migratory Game Birds in Canada: November 2006. CWS Migr. Birds Regul. Rep. No. 19. http://www.cws-scf.ec.gc.ca/publications/status/nov06/nov06_e.pdf

76. Bylot Island, Nunavut, Canada (73°08'N, 80°00'W)

The spring of 2006 was characterized by a normal snowmelt at the Base-camp although the conditions during the critical period of goose arrival and egg-laying were quite variable. Air temperature averaged 0.17°C between 20 May and 20 June (0.30°C above normal) and was especially mild during the period of goose arrival and just before at the end of May. In contrast, the temperature turned cold during the normal period of egg-laying (average of 0.97°C during 1-15 June, 0.40°C below normal). Snow depth on 1 June was 29 cm compared to a long-term average of 31 cm. However, there was some indication that snow may have been deeper at the Camp-2 (i.e. in the goose colony) than at the Base-camp and thus that snow-melt may have been slightly delayed there compared to previous years. Precipitation was low in June (17.5 mm of rain), moderately high in July (64 mm) but mostly concentrated during the first 5 days (39.5 mm) and low in August (13 mm up to 21 August). Weather in most of July and August was exceptionally good with lots of sunshine and warm temperature.

During our survey using snap traps, we accumulated 1100 trap-nights at our two trapping sites of the Base-camp Valley from 23 July to 1 August, and 550 trap-nights at the Camp-2 from 7 to 17 July. In the Base-camp sites, we caught 1 Greenland Lemmings in the mesic site and none in the wet meadow site, and no Brown lemmings were caught, which yielded a combined index of abundance of 0.09 lemmings/100 trap-nights, a very low value. In the Camp-2 site, 2 Greenland Lemmings were caught, for an index of 0.37 lemmings/100 trap-nights, also a low value. For the third year of our live-trapping survey, we captured 47 different lemmings (compared to 55 in 2005 and 180 in 2004), of which 25 were captured more than once. However, considering that the trapping effort was 44% higher than in previous years (i.e. 144 traps/grid vs 100 in previous years), the total number of lemmings captured alive was 41% lower in 2006 than in 2005. We captured 12 Brown Lemmings and 11 Greenland Lemmings in the mesic habitat, and 10 Greenland and 14 Brown Lemmings in the wet habitat. Both indices of lemming trapping therefore suggest that lemmings continued to decline in 2006 in the Base-camp Valley and that lemmings were in the low phase of their cycle.

We found 10 new fox dens on the island in 2006, bringing the total to 120 known denning sites. Among the 115 dens that were visited this summer and found to be intact (a few denning sites are destroyed by erosion and collapse every year), we found signs of activity (fresh digging and/or footprints) at 33 of them, a relatively low number. The breeding activity of foxes was very low as we found only 2 different litters (2% of known denning sites) of Arctic Foxes and none of Red Foxes. Two Red Foxes were observed using a den but no young were seen. The level of den use was lower than last year (7% of dens used in 2005) and typical of the proportion of fox dens used in previous years of low lemming abundance (~2-3%). Minimum litter sizes were 1 and 5 pups. A total of 19 adult and 6 juvenile Arctic Foxes were captured during trapping sessions and marked with ear-tags. We also recaptured 5 adults that had been marked in previous years and we resighted 4 foxes that had been ear-tagged in previous years.

We found 17 nests of Glaucous Gulls, 6 nests of Long-tailed Skuas, 1 nest of Arctic Skuas. Nesting success (proportion of nests successful in fledging at least one young) was moderate for gulls (38% vs 80% in 2005) but was very low for skuas (0% vs 8% in 2005). Therefore, nesting success of all these species declined compared to 2005. Average clutch size was 2.1 eggs for gulls (vs 2.9 eggs in 2005); data was insufficient for skuas. No Snowy Owls were found nesting in our study area in 2006.

The number of geese counted on the hills surrounding the Base-camp Valley (the first area used by geese upon arrival) increased from 165 pairs on 1 June to a peak of 580 pairs on 7 June. These values were about twice the number observed

in 2005 and were actually among the highest values ever recorded. This indicates that geese arrived relatively early and in large numbers on Bylot Island this year.

Median egg-laying date was 14 June, which is later than the long-term average. Our field observations indicate that the nest density in the colony was lower than the year before and thus that the reproductive effort of geese was relatively low at the main colony (Camp-2). No nests were found at the Base-camp Valley (predominantly a brood-rearing area), a situation common in years when no Snowy Owls are nesting and lemming abundance is very low. Average clutch size was 3.68, which is very close to the long-term average. Nesting success (proportion of nests hatching at least one egg) was low this year (42%, a value below the long-term average). The activity of predators at goose nests, especially Arctic Foxes, was higher than in 2005. Peak hatch was on 10 July, which is slightly later than the long-term average.

The gosling:adult ratio among geese captured at banding (1.03:1) and mean brood size toward the end of brood-rearing (2.2 young, SD=1.11, *n*=144; counts conducted from 30 July to 3 August) were lower than the long-term averages. By combining information on brood size and young:adult ratio at banding, we estimated that 67% of the adults captured were accompanied by young, also a low value compared to the long-term average, which suggests a high mortality rate of young during the summer. Overall, these results are indicative of a relatively low production of young on Bylot Island by the end of the summer.

Although the phenology of migration appeared to be early in 2006 (i.e. geese arrived on the island in large numbers relatively early), they initiated laying relatively late and their reproductive effort (i.e. nest density) tended to be low. The cold temperature at the onset of egg-laying may be the main reason of the reduced nesting effort.

Egg predation was high this year and resulted in a low nesting success of the geese. Predation rate on goslings was also apparently high as shown by the small brood size (despite a normal clutch size to start with) and especially the large proportion of total brood loss. Predation is the most likely cause because weather conditions during brood-rearing were favourable and plant production was high. The combination of all these effects (i.e. low reproductive effort, late laying, high predation rate on eggs and goslings) lead to a low young:adult ratio at banding, which is indicative of a relatively poor production of young on Bylot Island this year.

The most abundant waders were the White-rumped Sandpiper (20 nests) and the Baird's Sandpiper (33 nests). American Golden Plovers (6 nests), Pectoral Sandpipers (2 nests), Common Ringed Plovers (1 nest), Red Phalaropes (1 nest), Grey Plovers, Purple and Buff-breasted sandpipers and Ruddy Turnstone were also observed on the island during the summer. Clutch size of all wader nests monitored was 4.0 eggs. Mean laying and hatching dates were between 11 and 15 June, and 4 and 13 July, respectively. Overall, American Golden Plovers had a nesting success similar to last year (20% compared to 19% in 2005) but White-rumped Sandpipers and Baird's Sandpipers had a very low nesting success (1% and 2%, respectively, compared to 11% and 25% in 2005).

In 2006, we found a record number of Lapland Bunting nests (*n*=89). Large annual variations in number of nests found in part reflect variations in sampling effort, which increased in the past 2 years. Egg-laying and hatching dates of buntings in 2006 were 18 June (*n*=39; long-term average: 18 June) and 6 July (*n*=15; long-term average: 3 July), respectively. No temporal trends were detected for both laying and hatching dates. The clutch size was 5.1 ± 0.1 eggs (*n*=71), slightly below the long-term average (5.3) and no temporal trend was detected. Nesting success was very low (9%, *n*=79) and below the long-term average (48%).

1) Gauthier, G., Reed A., Berteaux, D., Cadieux, M.-C., Lefebvre, J., Bety, J., Giroux, J.-F. 2006. Population Study of Greater Snow Geese on Bylot Island (Nunavut) in 2006: a Progress Report. 29 September 2006. http://www.cen.ulaval.ca/bylot/files/Report_Bylot_2006.pdf

2) Cadieux, M.-C., Gauthier, G., Gagnon, C., Bety, J., Berteaux, D., Levesque, E. 2007. Monitoring the environmental and ecological impacts of climate change on Bylot Island, Sirmilik national park. 2006-2007 annual progress report. 19 March 2007. http://www.cen.ulaval.ca/bylot/files/NEI_Annual_Progress_Report_2007.pdf

77. Traill Island, Karupelv Valley, Greenland (72°30'N, 24°00'W)

Observations made as part of the ongoing monitoring of the Greenland Lemming population on Traill Island have shown that snow melt was nearly completed by the end of June in 2006. This timing may be considered as being close to the average of a long-term trend assessed over two decades and pointing to a tendency towards an earlier disappearance of snow in spring. In addition, observations of the fjord ice suggested an accelerated break up and melting, in line with the trend becoming apparent in recent years.

The survey of the lemming population determined on the basis of the winter nest surveys pointed to a noticeable recovery (762 nests against only 211 in 2005) as a result of winter reproduction. This figure also matched well with the output of the first trapping session (5 animals caught), suggesting density levels of around one lemming per one hectare, which can be regarded as an intermediate situation.

Evidence was of a good reproductive output in winter nests (nearly 40% of the nests were supporting litters) also with some great aggregations typical for increase phases. With only four winter nests used by stoats as winter quarters, there was evidence that predation throughout winter must have been quite limited.

Patterns observed for other predators meshed together nicely with this availability of lemmings as staple prey. As also suggested by the long term observations in Karupelv Valley, such level of less than 800 winter nests is below the threshold required for Snowy Owls to settle in the valley for breeding. Among Long-tailed Skuas, six pairs were defending nests in early July but only eggs in one nest hatched, and not a single

young fledged. Only two Arctic Fox dens out of eight that were checked had cubs but probably only one whelp survived until the end of the season.

Observations of several pairs of Rock Ptarmigans are notable as they suggested a recovery of their population.

For waders patterns were in general line with earlier observations, including limited numbers of fledged young. As recorded in previous years, the repeated observation of 3 Whimbrels could indicate northward expansion of this species range. A special attention will be paid to checking for possible breeding of Whimbrels in coming years.

Fauna surveys conducted in the surrounding area (Vega Sund and Kong Oscar Fjord) have shown that patterns observed in the main study area were also prevailing on a regional basis (region comprised between 72°N to 73°N).

For the first time, Long-tailed Skuas were fitted with satellite transmitters. The migration pattern of two birds could have been tracked for two months from their departure from NE Greenland until their arrival to the Tropics in the Atlantic Ocean, off the coast of West Africa. Unfortunately, the transmitters stopped working by the end of September for unknown reasons.

New challenges within this long term project will include assessment of the reaction of this high arctic animal community to the changes in environmental conditions that become apparent (trend towards an early snow melt, earlier receding of pack ice).

B. Sittler, A. Aebischer

78. Sandøen Island, Young Sound, Northeast Greenland, Denmark (74°18'N; 20°15'W)

Snow cover reduced to 50% in early July and completely melted on flat areas on 26 July. There are no rivers on the island, but ice in the fjord broke on 23 July. More snow was present on land, and the sea-ice break-up was late, but otherwise the weather conditions were normal.

Rodents were not present on the island.

Arctic Foxes were common. Snowy Owls were not recorded.

We studied the behavioural patterns of gulls and terns in a year with late sea ice break-up and regular predator visits to the colony. We found that breeding initiation of Arctic Terns and Sabine's Gulls was delayed until the breeding attempt was given up and the colony abandoned. However, the birds did not leave the region but returned to the colony soon after sea ice break-up although egg-laying was not started. This indicates that sea ice occurrence alone did not cause breeding failure, but frequent visits by an Arctic Fox adversely affected breeding success.

N. Levermann, A.P. Tøttrup

79. Zackenberg, Greenland, Denmark (74°28'N, 20°34'W)

Snow cover reduced to 50% on 2 July and completely melted on flat areas on 3 July. Thus, snow melt was late, but otherwise the summer weather was quite stable. Ice-break occurred on 12 June.

Lemmings were seen more often than in 2004, but 265 winter nests within the lemming census area suggest that it was a medium year in terms of population size.

The number of encounters of Arctic Foxes was very high, and breeding was recorded in three dens.

Contrary to the previous season, 2006 was a late season in Zackenberg. Only 6.25% of egg laying in all wader nests were initiated before 10 June, and just over 78% before 1 July. Median first egg dates were after 25 June in four of the five species.

Nest success was fairly good for Dunlin and very good for Ringed Plover, whereas the nest success for Sanderling and Turnstone was very low. The all-wader-predation rate was 63.1%, which is above average. In most cases of nest loss, Arctic Fox is suspected.

Unlike 2005, Sanderlings were recorded in record high numbers, even a little above the previous peak year 2003. Dunlin remains the most numerous wader species, although at slightly lower numbers than of late.

Chick survival is assumed low, but the effects of a surge flooding from last year that transformed the coast is suspected to account for reduced juvenile numbers at low tide counts.

Within the census area, 4-7 Rock Ptarmigan pairs were encountered during the census period. Apart from that, early observations and the number of Ptarmigan remains at fox dens suggest that the Rock Ptarmigans were in much higher numbers than in recent years.

Many pairs of Long-tailed Skuas did not breed in this year again, and of 14-31 pairs, only 2 were found breeding. Both these nests contained one egg. One of the eggs survived to hatching, the other apparently did not hatch, although it had developed normally during the first couple of weeks. The hatched chick, probably, did not survive beyond the age of 10 days when it was observed for the last time. Fledged juveniles were not seen in 2006.

The number of Snow Bunting territories was very high, although lower than in 2004 and 2005.

J. Hansen

see also: Klitgaard, A.B., Rasch, M. and Caning, K. (eds.) 2007. Zackenberg Ecological Research Operations, 12th Annual Report, 2006. – Copenhagen, Danish Polar Center, Danish Agency for Science, Technology and Innovation, Ministry of Science, Technology and Innovation, 2007. http://www.zackenberg.dk/documents/publications/ZAR2006.pdf

INFORMATION PROVIDED BY RESPONDENTS
WAS EDITED AND TRANSLATED INTO ENGLISH (IF NECESSARY)
BY PROJECT COORDINATORS

BIRD BREEDING CONDITIONS IN THE ARCTIC IN 2006

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In total 48 filled questionnaires and 20 free-form contributions were received from ornithologists and other researchers who had visited the circumpolar Arctic region in summer 2006. Additional information from 11 sites or wider geographic regions was obtained from the web sources. Thus we have data from 79 localities with the following distribution: 1 in Norway (Svalbard), 11 in European Russia, 36 in Asian Russia (including 12 in West Siberia, 8 on Taimyr, 6 in Yakutia and 10 on Chukotka), 15 in Alaska, 13 in Canada and 3 in Greenland. The total number of surveyed localities was lower in 2006 compared with the record high values in the most recent years (91 in 2005, 88 in 2004 and 2002), but it was very close to numbers in 2003 and 2001 and well above the values in the earlier years of the project. The amount of information still remains insufficient to adequately reflect breeding conditions in many regions of the Arctic, especially in large areas of Canada and Greenland. The absence, or scarcity, of contributions from Iceland and Fennoscandia, including the very interesting Svalbard region, remains one of the main challenges to be addressed in the future development of the project.

Weather and other abiotic factors

Weather and other factors related to climate events such as flood, drought and out-of-season snowfalls, are known to have direct impacts on the breeding productivity by birds, particularly in the Arctic where summer air temperatures frequently approach freezing point.

In contrast to the previous summers, 2004 and 2005, when the broad geographical patterns of air temperature deviations from the long-term average were generally similar in June and July, the patterns were quite different between the summer months in 2006 (Fig. 1 and 2 on page 59). Similar temperature patterns for the two summer months were observed in a few regions in 2006. Warm weather prevailed in both June and July in southern Greenland and adjacent areas of Canada, on Svalbard, in western Siberia and in the Mackenzie delta in Canada. Persistent cold weather in June and July was observed in the extreme south and north of Alaska and in the Kolyma River delta area in Yakutia.

Above average temperatures prevailed across most of the Arctic in June, but there was a particularly cold area in north-eastern Greenland and June was also colder than average in Alaska (with exception of its extreme north-east) and in the north of the Canadian Arctic Archipelago.

Information from respondents on spring phenology was in general agreement with generalised air temperature data for June (Fig. 1 on page 59). Thus, late spring was reported almost everywhere in western Alaska, while early or normal spring was observed in most other localities in the Arctic. The most pronounced deviation from this pattern was represented by a dense group of sites in the Yamal Peninsula, where reports of late spring contradicted to apparently high June temperatures. According to comments by observers high snow accumulation in winter was responsible for long-lasting period of winter conditions in the area (until the end of May), with the subsequent delay of all phenological events, in spite of warm weather in June.

Reports from respondents on summer weather were more ambiguous. They tallied with air temperature data for July in a number of regions, indicating, for example, a cold summer in north-eastern European Russia, eastern Siberia from the lower Kolyma River to Wrangel Island, and in south-western Alaska (Fig. 2 on page 59). However, either high variation among reports from neighbouring localities, or poor correspondence of these reports to July temperature data, was observed elsewhere. We explain this by the high variability of weather during summer 2006, which resulted in increased diversity of the evaluations of conditions by respondents, depending on the timing of their visit to the Arctic. Also, in the regions of a normally early start of summer (*e.g.*, Kola Peninsula, Lower Ob' River, Hudson Bay) respondents could have reasonably characterize summer phenology by referring to June rather than July conditions. It is noteworthy that rainy summer was reported from the north of Europe and western Siberia by a majority of observers. According to observations in the second half of summer, cold weather in July resulted in increased perishing of wader chicks on central Taimyr and Russkaya Koshka Spit on Chukotka.

As to other weather-related factors, catastrophic events for birds were not spread across wide areas in spring and summer 2006, but had certain impact at a local or regional level. Flooding of coastal meadows with bird nests was observed in the Pechora, Lena, and Mackenzie River deltas. High spring flood on rivers, occurring to the west and east of the Urals, delayed the start of reproduction in several species of birds. Rainy weather in July resulted in the flooding of a portion of bird nests in bogs and lake floodplains in the east of the central Yamal Peninsula, and supposedly in perishing of some broods on south-eastern Taimyr. Short-term snowfalls were recorded during summer on north-western Chukotka, Wrangel Island, and Coats Island in the Hudson Bay, while multiple local waterspouts were reported near the Bering Sea coastline of the southern Chukotka.

Abiotic factors also influenced breeding success of birds indirectly in several localities. An Arctic Fox which stayed on Victoria Island during the summer due to the absence of ice on the surrounding sea, destroyed almost all nests of birds there, while ice conditions around Coats Island were responsible for heavy predation by Polar Bears on Snow Geese nests in the local colony.

Several respondents reported adverse impact of human activities. A considerable disturbance by the motor boats of numerous fishermen was observed in the north-west of the Kola Peninsula, while oil drilling and the refinery, as well as Reindeer

husbandry, were noteworthy factors to the east of the Pechora River delta. As in previous years, egg collecting in colonies of gulls and eiders on lagoon islands was practised by local people in southern Chukotka. The drowning of divers in fishing nets reported from this region is undoubtedly widespread in many Arctic regions.

Rodent abundance

Microtine rodents represent an important component of the Arctic ecosystems. Pronounced fluctuations of rodent numbers determine the abundance and reproductive performance of various avian and mammalian predators, and, accordingly, the distribution and breeding success of tundra birds. This is why a particular attention is being devoted in our reviews to changes in rodent abundance, evaluated by respondents either in course of targeted counts, or visually by recording animals and/or signs of their activities.

Low abundance of lemmings (genera *Lemmus* and *Dicrostonyx*) and voles (genera *Microtus* and *Clethrionomys*) prevailed in 2006 across most of the circumpolar region (Fig. 3 on page 60), following high numbers of lemmings in 2005 in a wide area from Yamal to the lower Kolyma in Siberia. High abundance of lemmings in the north of Alaska, where increasing numbers had been already recorded in 2005, was the most apparent exception. Also the abundance of voles had been increasing on the Kola Peninsula and reached a high level in one locality there, as well as at two sites at Lower Kolyma and Anadyr lowlands.

Predators

The Arctic Fox is the most important predator of bird clutches in tundra. Similarly to 2005, low abundance of Arctic Foxes was recorded across most of the Arctic in 2006 (Fig. 1 on page 38), and these animals were numerous only in two localities, in north-eastern Alaska and north-eastern Greenland. Breeding Arctic Foxes were relatively uncommon, having been reported from 14 of 37 sites at which foxes were observed. High lemming abundance in northern Alaska was apparently responsible for reproduction of Arctic Foxes in high numbers there, as was increasing abundance of lemmings in north-eastern Greenland. Arctic Foxes regularly breed on Wrangel Island, even in low rodent seasons, which was also the case in 2006 although they were not numerous there, but still bred. Arctic Foxes were common breeders on Kolguev Island, which is not inhabited by rodents, and predators there depend on numerous breeding geese and other tundra birds.

Red Foxes were observed in 13, mostly southerly, localities. This species is common at least to the northern tree-line, and penetrates the tundra zone as far north as the lower Indigirka River in Siberia, Prudhoe Bay in Alaska and Bylot Island in the Canadian Arctic Archipelago.

Ermines were observed in 6 localities only, although they play an important role in ecosystems of some Arctic regions, for example, north-eastern Greenland. Ermines were rare there in 2006. Least Weasels were not reported at all this year, in contrast with 2005. American Mink can reach high numbers and have a strong impact on bird breeding success in the Yukon-

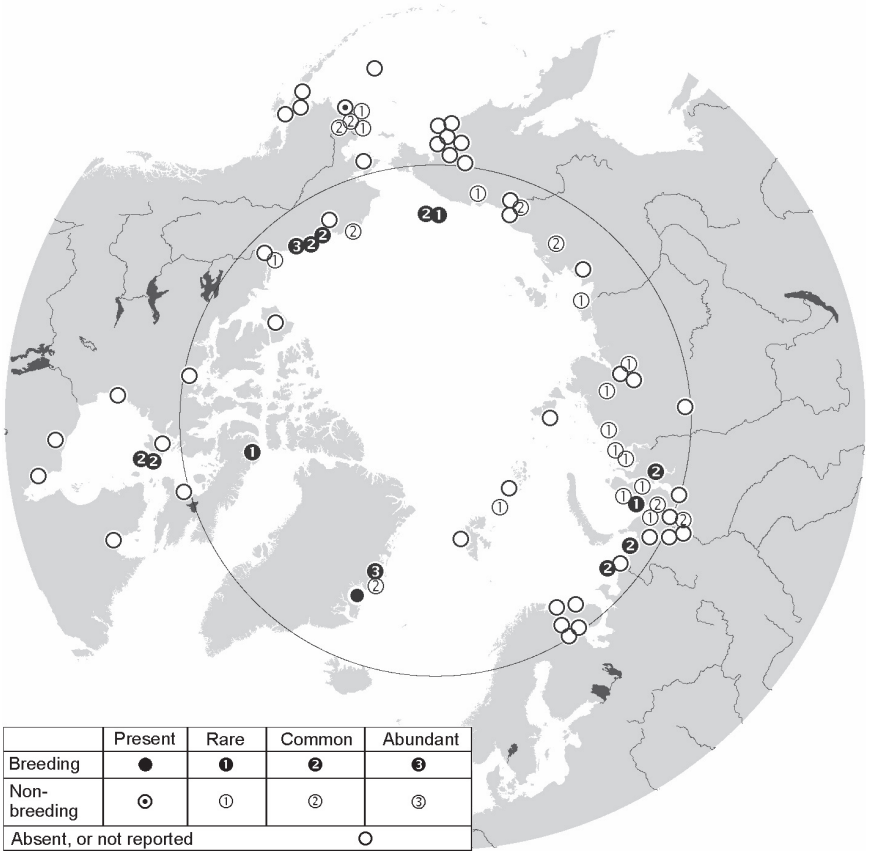

Figure 1. Abundance of Arctic Foxes in the Arctic in 2006

Kuskokwim Delta in Alaska and on the Kola Peninsula in Europe, where these animals were locally common also in 2006. Respondents mentioned Brown and Polar bears, Wolverine and Wolves among other predators, but they had only local impact on the breeding success of tundra birds. An observation of a Snow Geese colony destroyed by Polar Bears on Coats Island in Canada was the only record of really strong, but still local, predation by these animals.

Owls were recorded in over half of the localities (Fig. 2 on page 39), among which Snowy Owls were primarily reported from northern sites and Short-eared Owls from southern ones. Given the predominantly low abundance of rodents in the circumpolar Arctic, reproduction of owls was observed in few localities. Snowy Owls bred in northern Alaska, an area of peak population of lemmings, and on Wrangel Island, where breeding occurs in some numbers annually. Nesting Short-eared Owls were reported in western Siberia, and by solitary pairs in northern Alaska, while wandering non-breeders were observed elsewhere. Due to the shortage of rodents, their principal food, Snowy Owls hunted chicks of gulls, waders, and skuas, as well as adult eiders, geese, waders, and Snow Buntings.

Pomarine Skua is also a rodent-specialist in the breeding period, and, accordingly, reproduction of these birds was recorded *en masse* only in the area of lemming peak in northern Alaska (Fig. 3 on page 40). Non-breeding Pomarine Skuas were common in June on western Taimyr and in the Lena River delta, and in the latter locality they predated heavily on breeding birds.

Rough-legged Buzzards are less dependent on rodents as food compared with owls and Pomarine Skuas, and can breed occasionally in areas where rodents are entirely absent, for example, on Kolguev Island. Accordingly, Rough-legged Buzzards in 2006 bred, as previously, in a wide area across the Arctic, including the entire north of Eurasia and the north-west of America (Alaska and the Mackenzie River delta) (Fig. 4 on page 40). However, buzzards gave up breeding in areas of very low lemming numbers (*e.g.*, northern and central Taimyr), and only had high breeding abundance in a single locality on the Gydan Peninsula. Brood size of 1-2 chicks on central Yamal indicated shortage of food in this area. Thus, generally low rodent abundance in the Arctic adversely affected reproduction of Rough-legged Buzzards in 2006.

Among other avian predators observed by respondents most species were either rare, or had no strong impact on breeding success of tundra birds. Successful hunting of White-tailed Sea Eagles on incubating eiders and White-fronted Geese in the European north of Russia is noteworthy.

Distribution and numbers of tundra birds

Few unusual bird records and long-term changes of abundance were reported in 2006 compared with the previous years, although observations of regional changes in numbers of various species were rather common. Moulting of Barnacle Geese in the Pyasina River Delta on Taimyr was an interesting observation. Nesting of Ravens was recorded for the first time in the Lena River delta. Observation of the Terek Sandpiper brood on

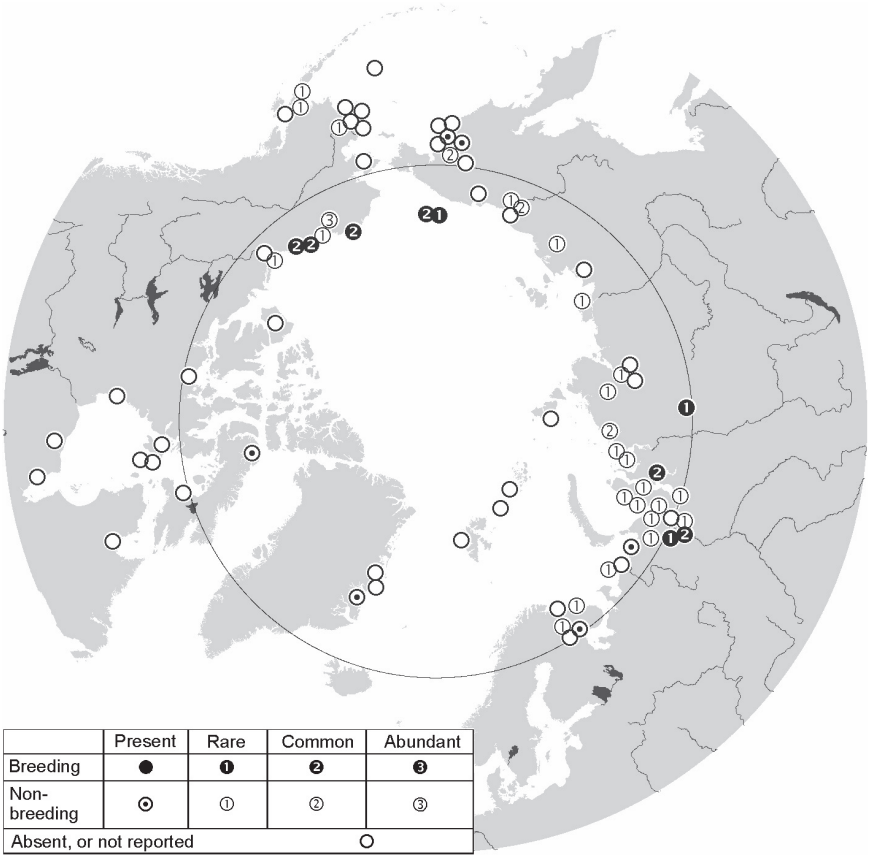

Figure 2. Abundance of owls in the Arctic in 2006

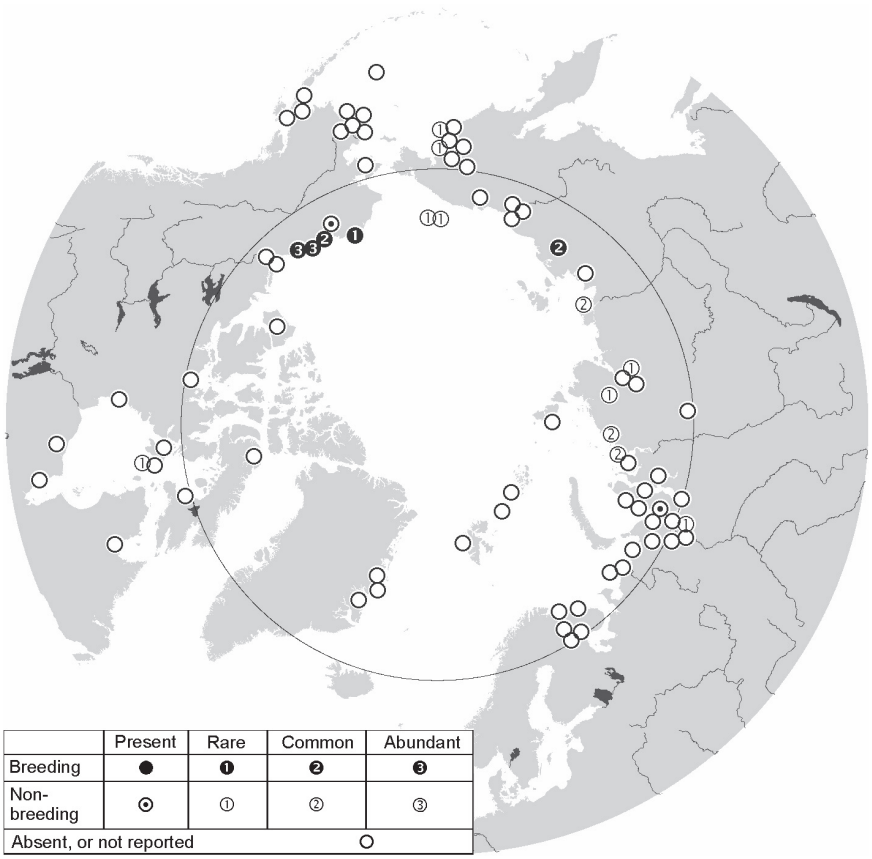

Figure 3. Abundance of Pomarine Skuas in the Arctic in 2006

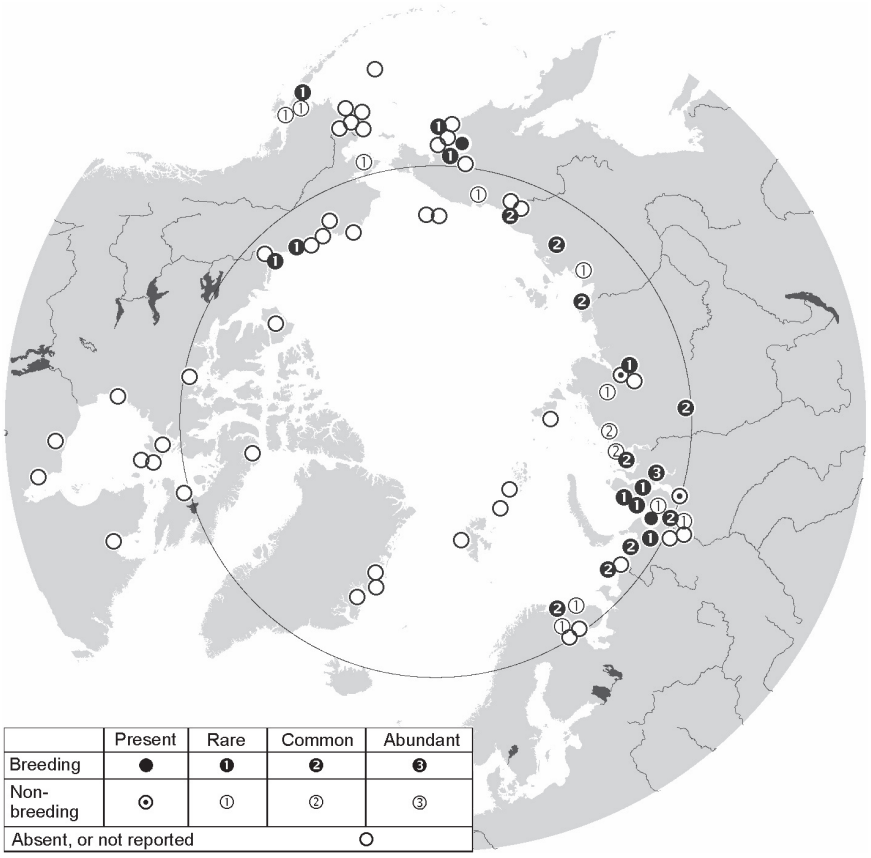

Figure 4. Abundance of Rough-legged Buzzards in the Arctic in 2006

the Russkaya Koshka Spit indicated expansion of the breeding range of this species on Chukotka to the Bering Sea coast.

Long-term trends of abundance included increasing numbers of Gannets in the colony at the Sem' Ostrovov Archipelago, the Barents Sea, and continuing increase in numbers of Black-tailed Godwits in the lower Ob' area. The declining trends in numbers of Turnstones and Red Phalaropes in the Yukon-Kuskokwim Delta in Alaska were once again confirmed by observers in 2006.

Changes in numbers of Willow Grouse and Rock Ptarmigans were reported from some localities (Fig. 5 on page 41). Having started to the west of the mouth of the White Sea in 2005, the decrease of their populations continued in 2006, and these birds were only reported as common from a single locality in the area, the Laplandsky State Nature Reserve. The abundance of grouse did not change considerably across the North-East of European Russia and the north of Western Siberia in 2006 compared with 2005, as they were reported common from most localities (9 of 13) and numerous from the other three. Grouse were common in most localities on Taimyr, north-eastern Yakutia, north-western Chukotka and Anadyr Lowland, which indicated no large change in grouse abundance in the north of Central and Eastern Siberia. Willow Grouse remained numerous at least at one site in the Yukon-Kuskokwim Delta in south-western Alaska. One or both species of grouse still occurred in average numbers in the north-east of Alaska, and Willow Grouse was even reported as numerous from one locality there. The scarce data from Canada indicated low abundance of grouse, while numbers of Rock Ptarmigans in north-eastern Greenland clearly increased.

Breeding success

Evaluations of breeding success by ground-nesting birds were available in 2006 from 39 localities of the circumpolar Arctic (Fig. 4 on page 60), which combined with information on weather and abundance of predators allowed to outline general patterns of reproductive performance in several regions.

The high abundance of Microtine rodents across wide areas of northern Siberia in 2005 gave ground to expect low breeding success of tundra birds in summer 2006 due to heavy predation pressure by Arctic Foxes which were expected to be numerous after the previous year. Apparently this did not happen, because breeding success of birds was mostly evaluated as average to high at least across the area from north-eastern Europe to Taimyr. This unexpected result can be explained only by a low abundance of Arctic Foxes, probably caused by low survival during the winter 2005/2006. Numbers of Arctic Foxes were low also farther east in the Lena River delta, but the breeding success of all birds, with an exception of geese, was low in this area due to high numbers of wandering Pomarine Skuas in June and flooding of many late clutches in the periphery parts of the delta in July. Snow Geese on Wrangel Island initiated nesting before a pronounced spell of cold weather in spring, which allowed them to breed successfully as there were low numbers of Arctic Fox, while other birds had a low reproductive success due to poor weather in spring and a cold summer.

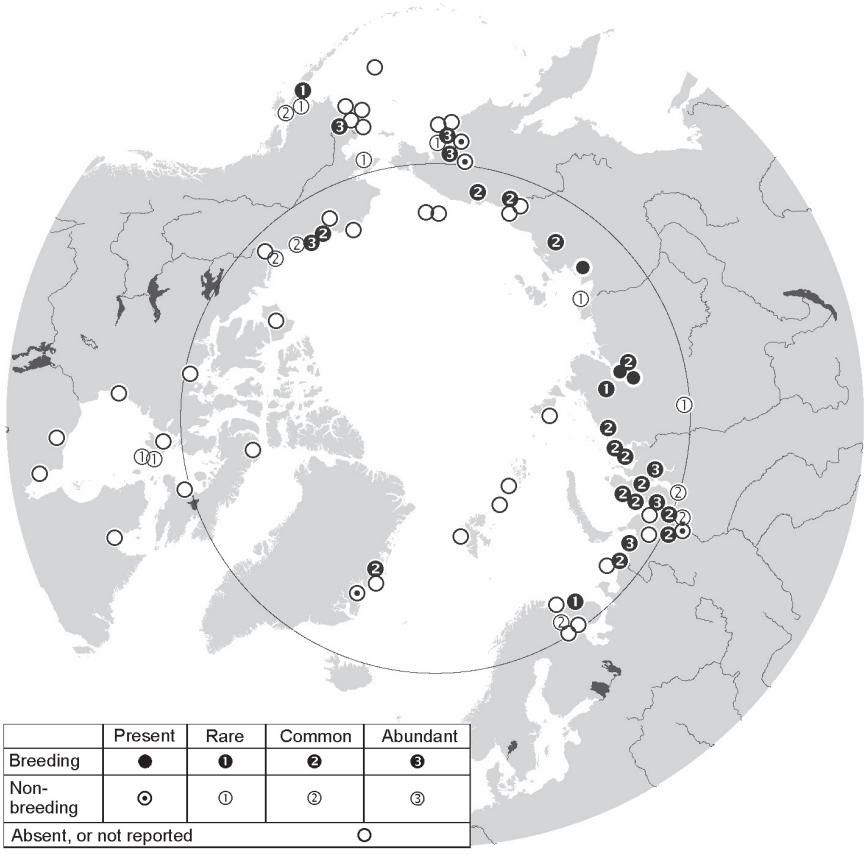

Figure 5. Abundance of grouse in the Arctic in 2006

Breeding success was average to high in most localities of western and northern Alaska and in western and southern Canada. In contrast, reproductive performance was evaluated as low in the north-east of Canada. Specific information is not available for the Kola Peninsula, although the increasing abundance of voles in this region caused a reduced predation pressure on bird clutches and hence successful reproduction of birds. Unfortunately, data were not available from the wide area of northern Yakutia in Siberia, from where many waders migrate to the wintering grounds in Australia. Low proportions of juveniles were recorded in Australia in the Turnstone, Sanderling, Curlew Sandpiper and Knot (see Minton *et. al.* in this issue), which indicated unfavourable breeding conditions in summer 2006 in the area of New Siberian Islands, the breeding area of these birds. A moderate proportion of juveniles in Australia in Bar-tailed Godwits and Sharp-tailed Sandpipers, which breed farther south, suggested better conditions in the southern tundra of Yakutia compared with the northerly islands. Information from other regions of the Arctic is too insufficient or ambiguous for conclusions on breeding success.

Generally, reproduction of birds was successful across most of the Arctic in 2006, with an exception of Yakutia, Wrangel Island and north-eastern Canada.

Comparison with predictions for 2006

The implied regularity of variation in rodent populations, and a corresponding variation in predation pressure on eggs and clutches of ground-nesting birds was used to predict bird breeding performance in several Arctic regions for 2006 ("Arctic Birds" No. 8, page 49). Our current knowledge can be used to compare the predictions to reality.

Increasing rodent abundance in Fennoscandia (including the Kola Peninsula) and in northern Alaska was expected to lead to high reproductive success of birds. This was actually the case in Alaska, but the lack of information from Fennoscandia did not allow us to verify the expected response by breeding birds to the observed increase in the abundance of voles. Poor reproduction of predators in the north-east of Europe in 2005 enabled the successful breeding of birds in summer 2006, as was reported for this area.

The anticipated decrease of rodent abundance across a wide area from Yamal to the lower Kolyma in the north of Siberia was confirmed by field observations in summer 2006. An associated increase of predation pressure on bird eggs should have resulted in low breeding success, with a reservation that mass emigration or high winter mortality of Arctic Foxes could have reduced their impact on birds. This prognosis was, probably, realised in the north of central and eastern Yakutia, judging by the indirect data from the Australian non-breeding grounds, while an alternative scenerio with low abundance of Arctic Foxes and successful reproduction by birds was found in the area from the Urals to the Lena River delta.

It was predicted that the abundance of Arctic Foxes would be low in north-eastern Greenland, with favourable consequences for breeding birds. This did not happen. Insufficient abundance of lemmings caused above average predation rate by numerous Arctic Foxes on waders. A possibility for local increases in rodent abundance was considered for Chukotka, Wrangel Island, south-western Alaska and the Canadian Arctic along with average values of bird breeding success. The situation was variable between localities on Chukotka in 2006, while a specific scenario having developed on Wrangel Island was discussed above. Reproduction was fairly successful in birds in the south-west of Alaska, as well as in Canada (with the exception of its north-eastern part), while rodent abundance did not show a notable increase in the former region and remained mostly undocumented in the latter.

Predictions for summer 2007

Information on the dynamics of Microtine rodents and predators documented in 2006 can be used to predict predation pressure on ground-nesting birds and, accordingly, their breeding success in summer 2007.

The increase in populations of voles on the Kola Peninsula culminated in the peak numbers of some species in autumn 2006, at least in one locality of the central part of the region. This opened a possibility for the peak of rodent abundance to spread over wider areas and enable favourable reproduction of birds due to low predation pressure.

According to the available data, the low abundance of rodents and the principal bird egg predators (Arctic Foxes and Ermines) prevailed in summer 2006 across a wide area from the White Sea mouth in the west to western Yakutia in the east, and, probably, even farther east. Thus we would expect an increase of rodent populations and a relative scarcity of predators, leading to the successful reproduction of birds in a number of regions in this area of Europe and Siberia. An ambiguous situation with abundance of rodents and predators was observed in 2006 in north-eastern Asia, which implies that a variable pattern will persist also in 2007. Lemming populations should continue to recover from the low stage of 2005 on Wrangel Island, and birds will, probably, breed successfully, given the relatively low numbers of Arctic Foxes.

Contrasting scenarios can be expected for the Yukon-Kuskokwim Delta and the Arctic Coastal Plain in Alaska in 2007. Low numbers of rodents and predators in south-western Alaska can result in successful reproduction of birds there, while lemming populations in the north of the peninsula, after having peaked in the previous year, should collapse in 2007 with an accompanying heavy pressure by numerous predators on bird eggs and a low breeding success of birds. There is insufficient data from the Canadian Arctic to make any reliable predictions of breeding success. However rodent numbers were probably mostly low in 2006, and increasing abundance in 2007 could lead to good breeding conditions for birds.

Numbers of Greenland Lemmings should continue to increase and can, probably, reach a population peak in north-eastern Greenland in 2007. However, benefits for birds can be negated by the abundance of Arctic Foxes recorded in 2006 remaining at a high level, especially if there is also an early start in the cycle of decreasing lemming populations.

Generally, successful reproduction of birds can be expected in summer 2007 in the western part of the Eurasian Arctic, on Wrangel Island, south-western Alaska, and, to a lesser probability, in the Canadian Arctic and north-eastern Greenland. Low breeding success of birds is highly probable in northern Alaska.

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BREEDING PERFORMANCE OF TUNDRA BIRDS IN HIGH ARCTIC NORTHEAST GREENLAND 1988-2007

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Meltofte, H., Sittler, B. & Hansen, J. 2007. Breeding performance of tundra birds in High Arctic Northeast Greenland 1987-2007. Arctic Birds No. 9: 45-53.

Abstract. Tundra birds, lemmings and their mammalian predators are monitored at two sites in High Arctic Northeast Greenland; in the Karupelv valley since 1988 and at Zackenberg Research Station since 1995. The birdlife of Northeast Greenland is to a high extent dominated by five wader species, the Common Ringed Plover *Charadrius hiaticula*, Red Knot *Calidris canutus*, Sanderling *C. alba*, Dunlin *C. alpina* and Ruddy Turnstone *Arenaria interpres*, but Long-tailed Skua *Stercorarius longicaudus* and Snow Bunting *Plectrophenax nivalis* are also common. A few species of divers, geese, ducks and other passerines are also found together with highly varying numbers of the Rock Ptarmigan *Lagopus mutus* and Snowy Owl *Nyctea scandiaca*. The climate of High Arctic Greenland is continental, so few instances of severe or inclement weather have occurred during our study years. Early season food availability appears to be the most important factor governing timing of egg-laying in waders, but spring snow-cover takes over, when the snow-cover exceeds a certain threshold. However, regional differences in spring snow-cover are more pronounced than annual variability, with the result that waders rarely fail on population level. We did not find pronounced effects of spring snow-cover and temperature on breeding performance of other species, but our data are very limited for several of these. As expected, we found pronounced effects of lemming abundance on breeding success of the Long-tailed Skua, Snowy Owl and King Eider *Somateria spectabilis*. Yet, so far we have not seen the same strong effect of predation on waders' eggs and young in relation to lemming abundance as is typical especially in the Siberian Arctic. The reason may be that lemmings never reach the same high densities in High Arctic Greenland as they do in Eurasia, where in addition to Collared Lemmings *Dicrostonyx spp.*, communities also include *Lemmus* and vole, *Microtus spp.* and *Clethrionomys spp.*, species and where Arctic Foxes *Alopex lagopus* may also occur in higher numbers than in Greenland.

Introduction

The High Arctic part of Greenland constitutes roughly half the country – North and Northeast Greenland, where almost no people live – while the Low Arctic makes up the populated south-eastern and western parts. The Low and the High Arctic parts have very different bird and mammal faunas, and waders – in particular – are to a high extent confined to the High Arctic tundra (Boertmann 1994). Only the Purple Sandpiper *Calidris maritima* and Red-necked Phalarope *Phalaropus lobatus* breed in appreciable numbers in the Low Arctic part, while the remaining nine wader species of Greenland have their main distribution within the High Arctic (Meltofte 1985).

Lemmings – the Collared Lemming *Dicrostonyx groenlandicus* – are only found in the High Arctic, and so are with few exceptions some of the main predators, the Stoat *Mustela erminea*, the Long-tailed Skua *Stercorarius longicaudus* and the Snowy Owl *Nyctea scandiaca*.

Until 2007, when a monitoring programme was initiated near Nuuk in Southwest Greenland, no long-term monitoring of tundra birds took place in Low Arctic Greenland, while two long-term biological monitoring programmes had been running for more than a decade in High Arctic Northeast Greenland: The Karupelv Valley Project has monitored lemmings, predators and tundra birds since 1988 on Traill Ø at Kong Oscars Fjord (72°30'N, 24°W), while the BioBasis programme has monitored vegetation, arthropods, birds and mammals at Zackenberg Research Station (74°28'N, 20°34'W) on Wollaston Forland since 1995.

Both programmes have provided data for the Arctic Birds Breeding Conditions Survey, and this information, expanded with more quantitative data are presented and commented here up to 2007. The paper was intended for a full circumpolar publication of the ABBCS data, but this failed, and the Greenland data are presented here instead.

We focus on breeding performance of waders, waterfowl and skuas in relation to snow and weather and the abundance of lemmings and foxes. The present paper is not a thorough analysis of BioBasis data, since it only includes data already published in papers and annual reports (*e.g.* Meltofte 2006a). More in depth analyses have appeared elsewhere (see references), but some are updated here.

Study areas, methods and species covered

Both our monitoring areas are situated in south-central Northeast Greenland, where vegetation is more continuous than further north. The study area of Karupelv consists of 15 km^2 valley floor including mainly raised beaches and terraces partly incised by stream gullies. Nearly one third of the area is barren sand-gravel deposits and rocky outcrops. The remaining includes a mosaic of various plant communities depending mainly on topographic features and snow-cover pattern in winter. Besides white Arctic bell-heather *Cassiope tetragona* growth, large tracts are dominated by Arctic willow *Salix arctica* or mountain avens *Dryas* spp. communities, while in wet depressions sedge-moss-meadow communities may be prevailing. Routine zoological surveys are made within the boundary of this restricted area, with additional specific surveys being

conducted in the upper valley (around 70 km^2) such as assessments of Snowy Owl territories and check of known dens of Arctic Fox *Alopex lagopus*.

The Zackenberg bird monitoring area is 19.3 km^2 of similar habitat from sea level and up to 600 m a.s.l. on a gentle mountain slope. The lemming monitoring area is 2.05 km^2 with extensive Arctic bell-heather within the bird monitoring area, while foxes are monitored in a 50 km^2 area surrounding it and holding eight den complexes (see Meltofte & Berg 2006 for detailed manual).

At Zackenberg, the annual field season lasts from around 1 June until around 1 September, while the field season at Karupelv has been from around 20 June until mid August in most years.

In both areas, lemmings are monitored by mapping and counting winter nests, when the snow has melted away. At Zackenberg, birds are monitored at a special effort during June and July (see Meltofte & Berg 2006 for methods), while this is done together with the lemming monitoring from late June through July at Karupelv. This means that only active and successful breeders at the time of the census are included at the latter site, while the census at Zackenberg thrives to cover the entire, potentially breeding populations (Meltofte 2001a, 2006b). Hence, for example Long-tailed Skuas and waterfowl are only recorded when actually nesting at Karupelv, while all pairs and individuals present early in the season are recorded at Zackenberg. This means, that breeders, who have lost their nest before the census at Karupelv, are not recorded.

At Zackenberg, bird breeding success is covered systematically, while this is done more opportunistically at Karupelv. Furthermore, juvenile waders were counted every third day in two delta areas at Zackenberg during late July and all of August 1995-2006 in an attempt to establish an index of regional breeding success (Meltofte & Berg 2004, 2006).

At both sites, fox numbers and reproduction are monitored by checking dens throughout the summer season. Stoat activity during winter is monitored as part of the lemming monitoring, and avian predators and their breeding performance are monitored as part of the bird breeding surveys in both areas.

In both areas, the birdlife is dominated by waders *Charadrii*, Long-tailed Skuas and Snow Buntings *Plectrophenax nivalis* (see below for wader species and Meltofte [2004] for discussion of total populations sizes). Barnacle Geese *Branta leucopsis* and Pink-footed Geese *Anser brachyrhynchus* breed in or near both study areas, while ducks and divers breed in low numbers in the census areas (see Tables 2 and 3 for species). Snowy Owls are common in some years at Karupelv, while only a few pairs have bred at Zackenberg during the study years. Rock Ptarmigan *Lagopus mutus* breeds in varying numbers at both sites, and Gyrfalcon *Falco rusticolus*, Arctic Skua *Stercorarius parasiticus*, Common Raven *Corvus corax*, Northern Weathear *Oenanthe oenanthe* and Arctic Redpoll *Carduelis hornemanni* breed in small numbers (some of them irregularly) in or near our sites, and they are not dealt with here. Neither is the Snow Bunting, but see Meltofte (1983) for influence of spring conditions on this species.

Common Eiders *Somateria mollissima*, Glaucous Gulls *Larus hyperboreus*, Sabine's Gulls *Larus sabini* and Arctic Terns *Sterna paradisaea* breed in nearby islets and Glaucous Gulls even scattered along coasts and rivers, but we have no good data on their breeding performance, which is highly influenced by ice break up on the fjords cutting off foxes from reaching the islets. A number of other species are more irregular visitors.

For Zackenberg, depredation rates in Table 5 were calculated using methods given by Johnson (1979), and foxes encountered on the tundra by one observer during bird census work in June and July were taken as a measure of fox activity. It should be noted that our visits at wader and skua nest probably led to increased fox predation at least during the first few days, so that the predation ratios may be biased.

Spearman non-parametric correlation analyses were chosen as statistical test in order to avoid assumptions of normally distributed data.

Results

Severe weather events

The climate of High Arctic Greenland is continental, generally with sunny summers and few instances of severe weather. At Karupelv, inclement weather with strong wind, rain and/or sleet occurred only in 1988 (21-24 July), 1993 (29 June – 4 July), 1997 (31 July – 3 August) and 2000 (17-19 July), and no records were made of effects on breeding birds. Since observations normally did not begin until mid or late June, possible snowstorms in early and mid June could not be recorded.

At Zackenberg, we experienced two severe weather events: a snowstorm in mid July 2000 (same storm as at Karupelv) and a snowstorm in mid June 2001. The latter made most waders abandon their newly laid clutches, and extensive re-nesting took place. Many Ruddy Turnstones gave up completely, while Long-tailed Skuas were little affected (Meltofte 2003, Meltofte & Høye in press). The July snowstorm in 2000 apparently killed many wader chicks, judged from the large numbers of 'post-breeding' adults that turned up in the deltas at the coast immediately after the event (Meltofte 2001b). Also in the first half of July 1997, weather was cold and rainy at Zackenberg, which apparently hampered the growth of Ruddy Turnstone chicks, but apparently not in the other species, and no major effect was seen on numbers of juveniles on the coast in August (see below).

Weather, snow and food effects on arrival and breeding phenology

Temperatures begin to reach positive values in late May, when the first waders and Long-tailed Skuas appear on the tundra. The coasts are covered in heavy ice until some time in July, and no waders are seen here until post-breeding flocks form in July. Other waterbirds such as divers and ducks arrive in early or mid June, when the ice on ponds and lakes is melting, and arrival of Red-throated Diver and Long-tailed Duck *Clangula hyemalis* was correlated with ice melt on ponds and lakes (Meltofte 2006c). The same applied to Red-necked Phalaropes *Phalaropus lobatus* (p = 0.032). Also egg-laying

in Red-throated Divers was delayed by late ice-melt in many breeding ponds and lakes (Meltofte 2006c).

The snow-cover may be extensive in early June in both study areas, often exceeding 80%, and it may last until late June or even early July before most of it has gone (Tables 1 and 3). Here, it is interesting to note that late and early snow clearance in 1999 and 2000, respectively, corresponded between Zackenberg and Karupelv, and so did the very early snowmelt in 2004 and 2005. The prime effect of late snowmelt is delayed egg-laying in waders, which at Zackenberg was about two weeks later in the snow rich spring of 1999 as compared to early seasons (Table 1; see also Meltofte 1985). However, in most years egg-laying was primarily governed by invertebrate availability in early spring; only in years when snow-cover in early spring exceeded 75%, snow-cover became more important (Meltofte *et al.* 2007). This correlation with early season snow-cover is evident in the extended data series as well; *i.e.* for Dunlin (p = 0.027) and Ruddy Turnstone (p = 0.012), while the correlation for Sanderling was insignificant (p = 0.068). There was no significant correlation between egg-laying and early season temperature.

Also timing of egg-laying in Long-tailed Skuas was (weakly) correlated with invertebrate (*i.e.* wolf spider *Pardosa glacialis*) abundance, whereas there was no correlation with temperature, snow-cover, snowmelt or lemming abundance (Meltofte & Høye in press). Wolf spiders may form an important supplementary source of food early in the season, before lemmings become available above the snow, or they may correlate with other clues of spring progress (Meltofte & Høye in press).

Weather and snow effects on population sizes

The species breeding in our study areas and dealt with here are mainly relatively long-lived and site tenacious species, which show up every year on their traditional breeding sites (Tables 2 and 3). Hence, little effects of annual variation in weather and climate have been found at Zackenberg where we monitor the populations present early in the season. Hence, the wader populations varied much less than a factor two between most years (Table 2), and some of this variation may even be due to census bias (Meltofte 2006b). However, significant correlations were found between population size in Red Knot (p = 0.028) and Ruddy Turnstone (p = 0.010) and July temperatures two years earlier, when young grow up to mature two years later, thus improving the statistical significance presented by Meltofte (2006b).

Also at Karupelv, where populations are monitored later in the season, and figures therefore probably reflect a combination of populations present and their breeding success, waders showed little correlation with snow and weather variables (Table 3). In this connection it is noteworthy that the late and inclement spring of 1992 in many parts of the Arctic following the Mount Pinatubo eruption in 1991 (Ganter & Boyd 2000) was not reflected in late snowmelt or exceptionally low numbers of breeding tundra birds at Karupelv (Table 3). However, the juvenile ratio in British wintering *islandica* Red Knots originating from High Arctic Greenland and Canada was record low in the winter 1992-1993 (Boyd & Piersma 2001).

While only Dunlin showed a significant population trend at Zackenberg (an increase with p = 0.003, but see Meltofte 2006b for possible bias), both Common Ringed Plover (p = 0.039), Dunlin (p = 0.021) and Ruddy Turnstone ($p < 0.0001$) showed significant decrease at Karupelv (Table 3). Furthermore, a number of tundra bird populations correlated positively at Karupelv, but as mentioned above, this is possibly just as much a result of variation in breeding success as it reflects population fluctuations.

Lemmings and foxes and their effects on breeding of tundra birds

While very much the same Long-tailed Skuas show up every year in our census areas, the extent to which they lay eggs differs widely with lemming abundance expressed as winter nests from the preceding winter (Tables 3 and 4; Gilg *et al.* 2006, Meltofte & Høye in press). This is well known, and so is it that Snowy Owls are nomadic and 'track' lemming peaks (Cramp 1983, 1985). Hence, up to 13 pairs of Snowy Owls were recorded in the Karupelv valley in lemming peak years, while none at all were found in most lemming low years (Table 3). Here, it was found that the critical lower limit for breeding of Snowy Owls was two lemmings per hectare (Gilg *et al.* 2006). At Zackenberg, only up to two pairs were found and none in the year with the highest density of lemmings – 1998 (Table 2).

At Karupelv, the density of Long-tailed Skua territories was close to what has been found in many other studies, *i.e.* 0.8-1.0 pairs per 1 km^2, while at Zackenberg it was among the highest ever recorded, *i.e.* 1.2-1.6 pairs per 1 km^2 (Tables 2 and 3; Gilg *et al.* 2006, Meltofte & Høye in press). At Zackenberg, all established pairs laid a full clutch of two eggs in years with a lemming density exceeding about six lemmings per hectare, whereas at lower lemming densities fewer nests and smaller clutches were produced (Meltofte & Høye in press). However, breeding attempts were made by the skuas in all years at Zackenberg and perhaps also at Karupelv (Tables 3 and 4). At Karupelv, juvenile production of Long-tailed Skuas was closely correlated with lemming density at snowmelt (Gilg *et al.* 2006), while at Zackenberg the hatching and fledging success of the Long-tailed Skuas (Table 4) was neither correlated with lemming abundance nor with the numbers of foxes encountered on the tundra in June and July (Meltofte & Høye in press) (see further below).

Also King Eider *Somateria spectabilis* nests were found in varying numbers relative to lemming abundance at Karupelv (Sittler *et al.* 2000), while no effect was seen on waders (Table 3). In King Eider, most nests were found in lemming peak years (p = 0.0001), when also Snowy Owls and Long-tailed Skuas bred extensively ($p < 0.0001$ for both; Gilg et al. 2006), but in King Eiders this probably reflects breeding success more than actual population size at the beginning of the breeding season (see above). Similarly, there was a positive correlation between Snowy Owl and Rock Ptarmigan numbers at Karupelv (p = 0.035).

At Karupelv, a positive correlation was found between lemming abundance and the number of fox dens with pups (p = 0.011; Gilg *et al.* 2006), while at Zackenberg no such correlation was

found (Table 5). Nor was there any correlation between the number of foxes encountered on the tundra and the number of lemming winter nests the preceding winter. Possibly, the lack of correlation between fox numbers and lemming abundance at Zackenberg could be the result of large amounts of alternative food for the foxes in the form of dead Musk Oxen *Ovibos moscatus* (see also Gilg *et al.* 2006) and Arctic Char *Salvelinus alpinus*, which the foxes catch on shallow places in the rivers. Only in 2004 did we experience the classic situation of many lemmings and foxes and little depredation on nests at Zackenberg, so no statistically significant correlation was found in any of these relations (Table 5).

At Karupelv, significantly smaller home ranges of radio collared Arctic Foxes were found in a lemming peak year than in a lemming low year (Zakrzewski *et al.* 1999), which indicates that low fox activity in itself may be just as important a factor concerning reduced nest depredation in lemming peak years as search image phenomena. On Wrangel Island in the Siberian High Arctic, Ovsyanikov (1993) found even smaller home ranges of Arctic Foxes than in Northeast Greenland, which may be related to higher lemming densities (see Discussion).

During the years where the lemming populations have been followed in both areas, cycles have followed each other closely. Even an 'amputated' peak in 2002 evolved relatively similar in both areas, although they are 245 km apart (Tables 2 and 3; Gilg et al. 2006, Meltofte 2006a). However, the lows are significantly deeper at Karupelv than at Zackenberg, which may be related to the strong effect of Stoat predation at Karupelv (Gilg *et al.* 2003, 2006). In total, avian and mammalian predators daily took more than 2% of the lemmings in summers of high and intermediate densities at Karupelv, while the predation dropped to around 1% in lemming low years (Gilg *et al*. 2006). In High Arctic Greenland, the lemming population decreases during summer and normally increases during winter, when the lemmings are better protected under the snow – except from Stoats (Gilg *et al.* 2006).

Combined effects of weather and lemmings on wader juvenile production

An attempt to establish an index of regional production of juvenile waders around Zackenberg was made during 1995-2006 by counting juvenile waders in two delta areas on the coast from late July throughout August (Meltofte and Berg 2004). Of course, much random variability exists in such numbers, but it is striking that the total numbers vary by a factor less than two with the exception of the last two years (Table 6). In the individual species, the variation is higher, but with few 'drop out' figures.

A positive correlation was found between the numbers of juvenile Dunlins in August and spring snow-cover ($p = 0.021$) together with a negative correlation between juvenile Ruddy Turnstones in August and July temperatures ($p = 0.043$), but these correlations give no meaning. No correlation was found in the other species, or with early spring temperature, local predation, skua broods and lemming winter nests.

Effect of spring snow-cover and weather on Barnacle Goose breeding

At Zackenberg, varying numbers of Barnacle Goose families bring their goslings to the valley from colonies on steep rocks probably up to 17 km away (Meltofte 2006c). A comparison of average brood sizes in late July at Zackenberg with average brood size on the wintering grounds in Scotland (Table 7) show a highly significant positive correlation ($p = 0.005$) in spite of the small samples from Zackenberg. Brood size in Scotland also correlated highly significantly with juvenile proportion in the population ($p < 0.001$).

A strong negative correlation was found between brood size and spring snow-cover ($p = 0.009$), while only a weak correlation was found with spring temperature ($p = 0.059$). This confirms the then non-significant correlation between brood size and spring snow-cover found by Meltofte (2006c).

Trends in tundra bird populations in High Arctic Greenland 1988-2007

We have little evidence of population trends in tundra birds in High Arctic Greenland. Apparently, Red Knots and Ruddy Turnstones are particularly prone to periodic fluctuations (Meltofte 1985, 2006b, Boyd & Piersma 2001), which may be related to the apparently larger sensibility to early season snow-cover in these species (Meltofte 1985).

It is possible that waterfowl populations were larger at Zackenberg during the period up until about 1960 when intensive trapping of foxes took place in Northeast Greenland (Meltofte 2006c). In those days, hundreds of foxes were taken by fur trappers per year (Mikkelsen 1994). Also the re-colonisation by Arctic Wolfs *Canis lupus arctos* in Northeast Greenland since the 1960s may have suppressed tundra-nesting populations of Pink-footed Geese (Meltofte 2006c).

Previous census results from the Karupelv area in 1974 and 1979 are within the range from 1988-2007 (Green & Greenwood 1978, G.R.E.A. 1982).

Apparently, Ravens decreased in Northeast Greenland during the first half of the 20th century (Meltofte 1975), but they have come back now. Interestingly, this decrease in Raven numbers was concomitant with a decrease in the ratio of blue foxes in the Arctic Fox population from 40% to 6% during the same period (Vibe 1967, Mikkelsen 1994). The ratio of blue foxes is still low, however (own data).

Perhaps as a result of climatic amelioration during the second half of the 20th century, the European Golden Plover *Pluvialis apricaria* and Whimbrel *Numenius phaeopus* have started breeding in southernmost High Arctic Greenland (de Korte 1975, Boertmann *et al.* 1985). At the same time, the number of immature Icelandic Pink-footed Geese migrating to Northeast Greenland to moult increased to tens of thousands, and they now occupy moulting areas all the way to the northernmost land in the world, Peary Land (Boertmann 1991, Boertmann & Glahder 1999, Madsen *et al.* 1999). This, and a similar increase in the breeding population of Barnacle Geese is ascribed to better protection from shooting together with improved feed-

ing on the British and Irish wintering grounds (Madsen *et al.* 1999).

During the last few years, spring and summer temperatures have been exceptionally high in Northeast Greenland, and the phenology of a number of plants and invertebrates has progressed considerably (Høye *et al.* 2007). Furthermore, no pack ice has been present off the coast in late summer. This has not been recorded previously during almost 100 years of record (Keld Q. Hansen, Ice Charting and Remote Sensing Division, Danish Meteorological Institute, *in litt.*). Reduced ice results in a more maritime climate in Northeast Greenland, but the effect on the ecosystems is still to be seen, if the trend continues.

Discussion

The continental High Arctic climate of North and Northeast Greenland is very favourable for tundra birds. Apart from the foggy outer coasts towards the Greenland Sea, summer weather is sunny and fine in most years. The most pronounced annual variable in breeding conditions for tundra birds is spring snow-cover, but regional differences are higher than the annual variability with spring snow-cover decreasing heavily from south to north and from the outer coast to the inland areas (Meltofte 1985). At the same time, we do not see the same extreme effect of predation and its relation to lemming abundance as in other parts of the Arctic. This means that juvenile production on population level in waders and waterfowl do not vary to the same extent as found especially in Arctic Siberia (see Meltofte *et al.* 2007). Only in the specialised lemming predators, the Long-tailed Skua and Snowy Owl we do find pronounced fluctuations in breeding performance and success, but these fluctuations were more complex than previously stated in that there was no straight forward relation to lemming and fox abundance that both few foxes and many foxes together with many lemmings – and combinations of these – could result in good breeding success (Meltofte 2006c, Meltofte & Høye in press). Hence, skua breeding success at Zackenberg was relatively high in years with many lemmings and few foxes (such as 1997 and 1998; Table 4) and very low in years with few lemmings and/or many foxes (such as 1996, 2000, 2003 and 2006), but could also be relatively high in years with good numbers both of lemmings and foxes (such as 2001, 2002 and particularly 2004).

A possible reason for the low correlation between fox predation on birds' eggs and lemming abundance may be the difference in lemming abundance between High Arctic Greenland and Siberia, where extreme annual variation in juvenile production among tundra birds in relation to lemming numbers is found (Summers & Underhill 1987, Underhill *et al.* 1993). In Siberia, lemmings may reach several fold higher densities of more than 100 animals per hectare, against less than 25 in optimal habitat in Greenland (Tupikova & Emelyanova 1975, Dorogoi 1987, Travina 2002, Berg 2003, Gilg *et al.* 2006) and thereby constitute a much richer alternative prey to nest predators. As a response, these predators may also occur in greater numbers – especially foxes that may then have a greater impact on breeding birds as soon as lemmings become scarce.

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Table 1. Snow-cover (%) on 10 June and mean temperature for the period 21 May – 10 June together with median first egg dates for waders at Zackenberg 1995-2007. Data based on less than 10 nests/broods are in brackets, less than five are omitted. n.d. = no data

Zackenberg	1995	1996	1997	1998	1999	2000	2001[1]	2002	2003	2004	2005	2006	2007
Snow-cover on 10 June, %	84	82	76	80	91	53	84	79	83	48	28	86	70[2]
Mean temperature 21 May - 10 June	n.d.	-0.8	-1.0	-1.2	-0.6	-2.2	-0.9	1.0	-1.0	-1.0	0.3	-0.3	-0.7
Sanderling		(16 June)	18 June	18 June	23.5 June	16 June	22.5 June	17 June	13 June	8 June	(15 June)	(29 June)	15 June
Dunlin	(18 June)	11.5 June	13 June	16.5 June	22 June	11.5 June	25 June	8 June	12 June	12 June	12 June	15.5 June	15 June
Ruddy Turnstone	(12 June)	18.5 June	13 June	12.5 June	24 June	11 June	23 June	9 June	8 June	8 June	11 June	(21 June)	7 June

1 – Almost all clutches in 2001 probably were replacements after a snowstorm in mid June
2 – Snow-cover estimated visually

Table 2. Census results (potentially breeding pairs) for selected species from the 19.3 km^2 census area at Zackenberg together with lemming winter nest densities from the preceding winter within our 2.05 km^2 lemming monitoring area, 1996-2007

Zackenberg	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007[2]
Red-throated Diver	1-2	3	3	2-3	2-3	2	3	2	3	4-5	4-5	4-5
Pink-footed Goose	0	1	0-1	2	1	1	1	0	0	0	0	0
King Eider	2-3	2	1	2-3	2-4	3-4	4-6	1	1-2	1-2	1	1-2
Long-tailed Duck	5-8	4-6	6-8	7-8	5-8	5-7	6-7	7-9	6	6-8	5-7	5-8
Common Ringed Plover	54-56	40-48	38-45	51-65	41-43	51-54	37-41	29	46	17-20	41-53	31-34
Red Knot	33-43	35-44	27-32	25-33	24-27	27-30	24-27	24-25	19	30-36	27-40	32-41
Sanderling	50-63	55-70	62-70	60-67	59-66	58-72	49-55	67-74	62	38-49	73-87	73-82
Dunlin	69-81	75-91	75-94	81-94	98-103	104-111	120-132	105-114	122	92-102	106-126	105-131
Ruddy Turnstone	41-51	49-58	56-63	43-49	48-50	45-51	31-37	33-34	50	65-74	63-78	49-60
Red-necked Phalarope	0-1	0-2	1-2	1-2	1-2	1-2	1-2	1-2	1	1	2	0-1
Red Phalarope	0	0	0-1	0	0	1	0	0	0	1	5-7	0
Long-tailed Skua	25-29	22-25	21-24	19-24	21-28	22-25	23-26	25-29	21	24-29	21-30	19-27
Snowy Owl[1]	0	1	0	0	0	2	0	0	0	0	0	0
Lemming winter nests per km^2	77	176	346	158	89	156	152	46	210	114	129	242
July temperature	5.8	3.7	4.7	6.2	5.3	4.9	5.7	7.7	7.2	6.9	6.6	5.3

1 – Snowy Owl figures cover the entire valley (50 km^2)
2 – Includes extrapolated bird population figures

Table 3. Termination of extensive snow-cover period, breeding tundra bird populations (numbers of breeding pairs), numbers of foxes and lemming winter nests in the 15 km^2 monitoring area at Karupelv 1988-2007

Karupelv	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Date of 5% snow cover	27.6	29.6	24.6	23.6	25.6	9.7	11.7	22.6	24.6	28.6	2.7	8.7	18.6	27.6	24.6	22.6	19.6	1.6	25.6	13.6
Red-throated Diver	2	2	2	1	1	1	2	2	2	2	0	0	0	0	2	2	1	0	0	0
King Eider	0	1	2	0	0	0	3	0	0	0	3	1	0	0	0	0	0	0	0	0
Rock Ptarmigan	1	4	6	1	1	0	1	1	2	2	3	2	3	0	0	0	0	0	1	3
Long-tailed Duck	0	0	0	0	0	0	1	1	1	1	2	1	1	1	1	0	1	0	0	1
Common Ringed Plover	15	14	13	16	15	16	13	16	10	14	14	7	14	11	15	12	15	13	10	11
Red Knot	9	4	12	6	4	4	10	6	7	6	5	3	5	5	5	6	7	3	4	5
Sanderling	13	14	10	13	7	11	10	13	14	13	15	8	13	15	8	12	11	11	12	11
Dunlin	7	7	6	6	5	4	6	6	6	6	5	5	4	4	4	2	6	6	5	5
Ruddy Turnstone	7	7	8	8	4	6	5	6	5	6	5	2	5	4	3	2	3	3	4	4
Long-tailed Skua	0	8	13	0	0	0	13	3	5	4	14	5	0	2	0	0	11	5	6	0
Snowy Owl[1]	0	6	12	0	0	0	5	0	0	0	13	3	0	0	0	0	1	0	0	0
Fox dens with pups	0	1	2	0	0	1	1	0	0	0	1	0	0	0	1	0	1	0	1	1
Lemming winter nests per km^2	15	127	369	28	11	15	294	101	20	31	352	150	11	30	40	6	89	21	76	21

1 – Snowy Owl figures cover the entire valley (70 km^2)

Table 4. Breeding effort and success in Long-tailed Skuas from the 19.3 km^2 census area at Zackenberg 1996-2007. Numbers of clutches found include replacement clutches, while numbers of young fledged is the estimated breeding output of the season. Also densities of lemming winter nests from the preceding winter are given for 2.05 km^2 lemming monitoring area

Long-tailed Skua breeding	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
No. of clutches found	8	17	23	8	5	21	14	7	21	8	2	15
No. of young hatched	1	25	16	2	2	18	14	5	36	6	1	11
No. of young fledged	0	5	6	1	0	5	4	2	22	1	0	1
Lemming winter nests per km^2	77	176	346	158	89	156	152	46	210	114	129	242

Table 5. Predation rate on wader nests at Zackenberg 1996-2007 (mean of min. and max. estimated predation in all species pooled together with the number of fox encounters during June and July by one observer and the number of fox dens with pups and the densities of lemming nests from the preceding winter within our 2.05 km^2 lemming monitoring area

Wader nest predation	1996	1997	1998	1999	2000	2001	2002	2003[1]	2004	2005	2006	2007[1]
All species pooled (%)	37-67	0-48	63-68	61-62	56	57	57	56-58	10-13	82	63	82
No. of wader nests	17	27	44	44	47	32	21	47	54	15	28	60
Fox encounters	14	5	7	13	11	14	21	11	16	18	22	23
Fox dens with pups	2	0	1	0	2	2	1-2	2	3	0	2	3
Lemming winter nests per km^2	77	176	346	158	89	156	152	46	210	114	129	242

1 - The high predation rates in 2003 and 2007 may partly have been the result of intensive researcher activity at nests

Table 6. Cumulative numbers of juvenile waders recorded at low tide in two deltas at Zackenberg during counts every third day in the period 20 July - 31 August, 1995-2006. n.d. = no data

Juveniles at Zackenberg	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Common Ringed Plover	96	126	249	42	44	142	320	140	170	253	176	166
Sanderling	304	726	149	333	445	366	540	156	242	346	78	72
Dunlin	325	360	323	232	509	273	326	554	309	308	173	91
Ruddy Turnstone	80	108	82	109	23	73	162	183	75	19	52	28
Juvenile wader totals	805	1320	803	716	1021	854	1348	1033	796	926	479	357
Waders total[1]	810	1342	803	722	1021	854	1351	1040	803	928	479	357
Mean temperature 21 May – 10 June	n.d.	-0.8	-1.0	-1.2	-0.6	-2.2	-0.9	1.0	-1.0	-1.0	0.3	-0.3

1 – Including small numbers of Red Knots

Table 7. Average brood sizes of Barnacle Geese in Zackenbergdalen during July and early August, 1995-2007, together with the total number of broods brought to the valley. Samples of less than 10 broods are given in brackets. Data from autumn on the Isle of Islay in Scotland are given for comparison, including percent juveniles in the population (Malcolm Ogilvie *in litt.*)

Barnacle Geese	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Early July		(3.0)	3.1	(2.9)	1.9	(3.2)	(1.8)	2.4	(1.8)	2.6	(1.7)	(2.0)	1.3
Mid July		(2.3)	2.7	2.3	1.8	(3.1)	(1.7)	2.4	(1.2)	2.3	2.7	(1.5)	1.3
Late July	(2.0)	(3.0)	2.6	2.2	1.7	3.1		2.3	(1.1)	2.3	(2.2)	(1.1)	(3.3)
Primo August	(2.3)	(2.3)	2.4		1.8		(2.0)	2.2	(1.2)	(1.9)		(1.5)	
No. of broods	>7	6-7	19-21	>18	29	11	4	32	8	26	14	9	28
Scotland	2.00	2.30	1.95	2.28	1.92	2.20	1.94	2.23	1.59	2.35	1.67	1.15	
% juveniles	7.2	10.3	6.1	10.5	8.1	10.8	7.1	12.5	6.4	15.9	6.3	3.23	

BREEDING SUCCESS OF ARCTIC WADERS IN 2006, BASED ON JUVENILE RATIOS IN AUSTRALIA IN THE 2006/2007 AUSTRAL SUMMER

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Introduction

Data on the breeding success of waders in the Arctic, based on the juvenile ratios of birds caught for banding in Australia, has been published in the Arctic Birds newsletter each year since 2000 (Minton *et al.* 2000, 2005a, online Arctic Birds 2006). This paper gives the results for 2006, based on birds caught in the 2006/2007 season.

Information is, as usual, presented for two different regions of Australia, some 3000 km apart. The data for North-West Australia (NWA) again comes from cannon-net catches on the beaches of Roebuck Bay, near Broome, and from Eighty Mile Beach, some 175 km to the South-West. Most was obtained during the annual Australasian Wader Studies Group "expedition" there, between 4th and 25th November 2006.

The data from south-east Australia (SEA) was generated by the Victorian Wader Study Group (VWSG). Most was from cannon-net catches at various locations along the central coast and bays of Victoria and on the coast of the south-east of South Australia. However this year, for the first time, Ruddy Turnstone (see Tables for scientific names) data was also collected on King Island, Tasmania, situated in Bass Strait 200 km south of the Victorian coast.

Results for 2006 are compared in detail with those previously published in the Arctic Birds newsletter covering the period since 1998/1999. Reference is also made, however, to earlier data generated by the VWSG in SEA, which in some species goes back as far as the 1978/1979 season (Minton *et al.* 2005b).

Methods

Only data arising from cannon-net catches is presented and used in the main analysis. However good data on a number of species was gathered this year by mist-netting on Roebuck Plains, near Broome, in NWA and this is included also, in a separate table. Some NWA mist-netting data, mostly for the same species, was also presented in the 2004/2005 report (Minton *et al.* 2005a).

Catch conditions were the same, as far as possible, as in previous years. The period of data collection was timed to be when most adult and juvenile birds would be on their non-breeding locations. This is 1 November to 21 March in NWA and 15 November to 21 March in SEA.

The data presented below in the tables belies the vast amount of fieldwork effort which is necessary to obtain it. The Victorian Wader Study Group was in the field catching waders for more than 50 days in the mid-November to late-March period. Efforts became increasingly targeted on building satisfactory totals for the "difficult" species. For example it took nine catches, and several unsuccessful attempts, to amass a total of only 204 Curlew Sandpipers. When Curlew Sandpipers were much more numerous 25 years ago, they were usually caught mixed with Red-necked Stints in a ratio of around 1:3. Nowadays the ratio is 1:10-20.

In NWA 25 days of fieldwork were needed to collect the data presented in Table 2. Even then the total on one key species, Red Knot, only reached 74 birds, spread over six catches. A further five days were needed to generate the mist-netted samples.

As stated in former issues of the Arctic Birds newsletters, we consider breeding success in a population was poor in the proceeding breeding season when the proportion of juveniles in Australia is 0-10%, moderate – 10-20%, good – 20-30%, and exceptional – over 30%.

Results and discussion

The 2006/2007 data for SEA is presented in Table 1 and for NWA in Table 2. These data are compared with that of the previous eight seasons in Tables 3 and 4 respectively. The mist-netting data for six species in NWA are given in Table 5.

Satisfactory catch totals were accumulated for all the usual main study species, except for Sanderling and Whimbrel in NWA. However this year sufficient Oriental Plover were captured there for this species to be included.

South-East Australia

The 2006 breeding season for the eight species monitored in 2006/2007 appears to have been the worst in the 29 years for which data has been collected. Ruddy Turnstone, Sanderling and Great Knot had almost total breeding failures (but see NWA), and the Curlew Sandpiper result was not much better. The breeding outcome for Sharp-tailed Sandpiper and Red-necked Stint was close to the long-term average. Only Bar-tailed Godwit and Red Knot had good breeding seasons.

The result for Sanderling (0.5% juveniles) was the lowest ever in the 16 years for which data are available. For Ruddy Turnstone (1.3% juveniles) it was the second poorest breeding season in 17 years of data. Only 1989/1990 was worse, with no juveniles found in 109 birds caught. Great Knot data is obtained only intermittently in SEA, but clearly zero juveniles in 37 birds caught (out of a core roosting wader flock) must be an indication of a poor breeding season.

It was pleasing that Red-necked Stint (13.6% juveniles) had a better breeding outcome than in the previous two years, which were very poor. However only one of the last five years has

had a percentage of juveniles above the long-term (29 year) median. It is most noticeable in the field that Red-necked Stint numbers, which peaked after a series of good breeding seasons in the late 1990s and in 2001/2002, have now returned to more normal levels.

Though the Sharp-tailed Sandpiper breeding success (11.5% juveniles) was close to the 26 year median populations are still well above the low levels of five to ten years ago. This was the fifth successive year in which the breeding success of Sharp-tailed Sandpiper was at or above the level of the long-term median.

The percentage of juveniles in Bar-tailed Godwit and Red Knot catches has fluctuated more markedly between years than in most other species in SEA. However 2006 was the third consecutive year in which the Bar-tailed Godwit (the *baueri* subspecies, which breeds in north and west Alaska) has had a breeding outcome above the long-term median (18 years). This has resulted in populations recovering from the low levels reached in the early 2000s when three of the four breeding seasons in the period 2000 to 2003 had extremely poor outcomes.

Red Knot also had a second successive good breeding year, although not as good as the preceding one. Note that the figures for Red Knot are much higher than for other species because many young birds of this population (likely mostly the *rogersi* subspecies, which breeds in Chukotka in the far north-east of Siberia) spend their first year in SEA before moving to New Zealand for subsequent non-breeding seasons.

North-West Australia

Overall the 2006 breeding season for wader populations which spend the non-breeding season in NWA was not quite as poor as for SEA birds. Nevertheless it is probably the poorest so far recorded in the nine years for which data is available.

As in SEA Curlew Sandpipers and Ruddy Turnstone fared poorly (Sanderling was not monitored in NWA this year). In contrast to SEA Red Knot also fared poorly. This is probably a different subspecies however, being mainly *piersmai* which breed much further north and west in Siberia, on the New Siberian Islands.

The outcome for Great Knot, Bar-tailed Godwit and Red-necked Stint was close to average. Since NWA is the core non-breeding area for Great Knot the breeding outcome recorded there is probably more relevant to the population as a whole than the figure for SEA, where the species is only present in small numbers. The Bar-tailed Godwit juvenile ratio in NWA was much lower than that from SEA. However it is a different subspecies (*menzbieri*), breeding in northern Yakutia, along the north coast of Siberia. Though the Red-necked Stint figure for NWA was higher than in SEA both were close to their respective long-term averages.

As usual, a number of wader species which breed further south in Siberia were monitored. Grey-tailed Tattler had an outstanding performance with 28.4% juveniles, the highest recorded in nine years of monitoring this species. This result appeared to be genuine as it was apparent in most of the 11 samples which made up the catch total of 264. In contrast Greenshank appear to have had an almost total breeding failure with no juveniles found in the 70 birds caught. Terek Sandpiper and Great Sand Plover appear to have had an average breeding year whilst Oriental Plover, which are not regularly monitored, seem to have had a poor breeding outcome.

The percentages of juveniles in all species mist-netted was much higher than is typical for species caught by cannon-netting. This may be partly an effect of the catching method, with mist-netted samples tending to have higher percentages of juveniles than cannon-netted catches (Pienkowski & Dick 1976). But it would still appear that Long-toed Stint, Marsh Sandpiper, Sharp-tailed Sandpiper and Wood Sandpiper must have had good breeding success in 2006.

General conclusions

Whilst the overall outcomes of the breeding seasons for wader populations in SEA and NWA are usually quite clear it is not easily understandable why in most years some species differ markedly from the overall pattern. In 2006 the big exception was Grey-tailed Tattler in NWA. Why should it have bred so successfully when all the other species monitored, from both Arctic and non-Arctic breeding areas, had average to poor breeding outcomes? Why was the breeding success of Sanderling and Ruddy Turnstone populations which spend the non-breeding season in SEA so abysmal in 2006? A similar marked variation between species was apparent in other recent years. For example Red-necked Stints stood out from other species in SEA by their very poor breeding success in 2004 and 2005. And, in contrast, Sharp-tailed Sandpipers in SEA had especially good breeding success in 2003 and 2004.

Examinations of the relationships between snowmelt date, June and July temperatures and predation conditions in breeding areas and the percentage of juveniles recorded in the non-breeding areas have shown that all these factors can have an effect on breeding outcome (Boyd *et al.* 2005, Soloviev *et al.* 2006, Boyd & Minton 2007). The extreme variations in breeding success apparent in the most recent years will hopefully further help examinations of such data to try to find the principal causes of such divergent results between species.

The Future

Monitoring of the percentage of juveniles in the main species of waders spending their non-breeding season in SEA and NWA will be continued in the future. However this does require an enormous commitment of time and effort by a large number of people over a prolonged period to carry out the necessary fieldwork each year. It is hoped that sufficient support will continue to be available to enable the important breeding success demographic to be monitored on a long term basis. This is especially desirable at a time when major changes to habitat at staging areas in the East Asian-Australasian Flyway are occurring and when the effects of climate change will increasingly be felt.

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Table 1. Percentage of juvenile/first year waders in cannon-net catches in South-East Australia in 2006/2007

Species	No. of catches		Total caught	Juv./1st year		S.E., %	Long term median % juvenile (years)	Assessment of 2006 breeding success
	Large (>50)	Small (<50)		N	%			
Red-necked Stint *Calidris ruficollis*	8	10	3931	536	**13.6**	0.5	13.8 (29)	Average
Curlew Sandpiper *C. ferruginea*	1	8	204	10	**4.9**	1.5	9.8 (28)	Poor
Bar-tailed Godwit *Limosa lapponica*	0	4	136	35	**25.7**	3.7	15.4 (18)	Good
Red Knot *C. canutus*	1	1	153	88	**57.5**	4.0	47.0 (16)	Good
Ruddy Turnstone *Arenaria intepres*	2	10	373	5	**1.3**	0.6	9.3 (17)	Very poor
Sanderling *C. alba*	3	1	809	4	**0.5**	0.2	12.4 (16)	Very poor
Sharp-tailed Sandpiper *C. acuminata*	2	6	373	43	**11.5**	1.6	11.1 (26)	Average
Great Knot *C. tenuirostris*	0	2	37	0	**0**	n.a.	-	Very poor

All birds cannon-netted in period 15 November to 28 February except for Red-necked Stint, Ruddy Turnstone, and Sanderling, for which catches up to 24 March are included

Table 2. Percentage of juvenile/first year waders in cannon-net catches in North-West Australia in 2006/2007

Species	No. of catches		Total caught	Juv./1st year		S.E., %	Assessment of 2006 breeding success
	Large (>50)	Small (<50)		N	(%)		
Great Knot *Calidris tenuirostris*	5	7	1154	106	**9.2**	0.8	Average
Bar-tailed Godwit *Limosa lapponica*	5	10	708	60	**8.5**	1.0	Average
Red-necked Stint *C. ruficollis*	1	3	310	65	**21.0**	2.3	Average
Red Knot *C. canutus*	0	6	74	8	**10.8**	3.6	Poor
Curlew Sandpiper *C. ferruginea*	1	8	171	18	**10.5**	2.3	Poor
Ruddy Turnstone *Arenaria intepres*	0	5	33	3	**9.1**	5.0	Poor
Non-Arctic northern migrants							
Greater Sand Plover *Charadrius leschenaultii*	3	8	372	78	**21.0**	2.1	Average
Terek Sandpiper *Xenus cinereus*	3	4	291	33	**11.3**	1.9	Average
Grey-tailed Tattler *Heteroscelus brevipes*	2	9	264	75	**28.4**	2.8	Very good
Common Greenshank *Tringa nebularia*	1	1	70	0	**0**	n.a.	Very poor
Oriental Plover *Charadrius veredus*	1	3	83	9	**10.8**	3.4	Poor

All birds cannon netted in period 1 November to mid-March

Table 3. Percentage of juvenile/first year birds in wader catches in South-East Australia, 1998/1999 to 2006/2007

Species	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	*Average*
Ruddy Turnstone *Arenaria intepres*	6.2	29	10	9.3	17	6.7	12	28	1.3	*13.3*
Red-necked Stint *Calidris ruficollis*	32	23	13	35	13	23	10	7.4	14	*18.8*
Curlew Sandpiper *C. ferruginea*	4.1	20	6.8	27	15	15	22	27	4.9	*15.8*
Sharp-tailed Sandpiper *C. acuminata*	11	10	16	7.9	20	39	42	27	12	*20.4*
Sanderling *C. alba*	10	13	2.9	10	43	2.7	16	62	0.5	*17.8*
Red Knot *C. canutus*	(2.8)	38	52	69	(92)	(86)	29	73	58	*53.1*
Bar-tailed Godwit *Limosa lapponica*	41	19	3.6	1.4	16	2.3	38	40	26	*20.7*

All birds cannon-netted between mid November and third week in March (except Sharp-tailed Sandpiper and Curlew Sandpiper to end February only). Averages (for last nine years) exclude figures in brackets (small samples)

Table 4. Percentage of juvenile/first year birds in wader catches in North-West Australia 1998/1999 to 2006/2007

Species	98/99	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	*Average*
Red-necked Stint *Calidris ruficollis*	26	46	15	17	41	10	13	20	21	*23.2*
Curlew Sandpiper *C. ferruginea*	9.3	22	11	19	15	7.4	21	37	11	*17.0*
Great Knot *C. tenuirostris*	2.4	4.8	18	5.2	17	16	3.2	12	9.2	*9.8*
Red Knot *C. canutus*	3.3	14	9.6	5.4	32	3.2	(12)	57	11	*16.9*
Bar-tailed Godwit *Limosa lapponica*	2.0	10	4.8	15	13	9.0	6.7	11	8.5	*8.9*
Non-Arctic northern migrants										
Greater Sand Plover *Charadrius leschenaultii*	25	33	22	13	32	24	21	9.5	21	*22.3*
Terek Sandpiper *Xenus cinereus*	12	(0)	8.5	12	11	19	14	13	11	*12.7*
Grey-tailed Tattler *Heteroscelus brevipes*	26	(44)	17	17	9.0	14	11	15	*28*	*17.1*
Little Curlew *Numenius minutus*	57	33	-	36	30	-	(40)	-	-	*39.0*

All birds cannon-netted in the period 1 November to mid-March. Averages (for last nine years) exclude figures in brackets (small samples)

Table 5. Percentage of juvenile/first year waders in mist-net catches in North-West Australia in 2006/2007

Species	No. of catches*	Total caught	Juv./1st year	% Juv./1st year
Sharp-tailed Sandpiper – *Calidris acuminata*	4	122	39	32.0
Marsh Sandpiper – *Tringa stagnatilis*	2	11	6	54.5
Wood Sandpiper – *T. glareola*	4	29	8	27.6
Long-toed Stint – *C. subminuta*	3	27	20	74.1
Swinhoe's Snipe – *Gallinago megala*	2	2	2	-
Common Greenshank – *T. nebularia*	2	5	2	-

* – All catches were small (<50 birds). All birds mist-netted on Roebuck Plains near Broome 27 October 2006 to 29 December 2006

MAP COLLECTION

Four maps below are provided to illustrate various aspects of bird breeding conditions in the Arctic in 2006.

Figures 1 and 2 represent an overlay of the map layers reflecting two different types of information. The first one is the deviation of the mean June/July temperature in 2006 from the mean June/July temperature averaged for the period 1994-2003. This deviation indicates whether the respective month in 2006 was warmer (positive value) or colder (negative value) than average. The colour of the points at different study sites reflects a subjective evaluation by respondents of the spring as being early, average/moderate, or late (Fig. 1), and the summer as warm, average/moderate or cold (Fig. 2). Please note that, also referring to roughly the same period during the summer, the two types of information reflect essentially different phenomena that should not necessarily agree – for example spring could be early and cold. Temperature data were obtained from the National Climatic Data Center (USA, http://www. ncdc.noaa.gov/ol/climate/climateresources.html). Only stations with 26 or more daily records for a month were used for interpolation. The grid map was constructed using inverse distance interpolation in MapInfo Professional GIS software, with the following settings: cell size 50 km, search radius 500 km, exponent 1. The area covered by the grid includes the territory obtained from an overlay of Arctic boundaries, as defined by CAFF and AMAP, plus an additional 100-km buffer.

Figures 3 and 4 illustrate rodent abundance and bird breeding success, basically as these were reported by respondents. In some cases when respondents did not explicitly qualify breeding success or rodent abundance, but these were fairly obvious from other information supplied, the site was assigned to a respective category based on the judgement of the compilers.

Base maps were downloaded from GRID-Arendal's WEB site (http://www.grida.no/db/gis/prod/html/arctic.htm), projection – Lambert Azimuthal Equal-Area.

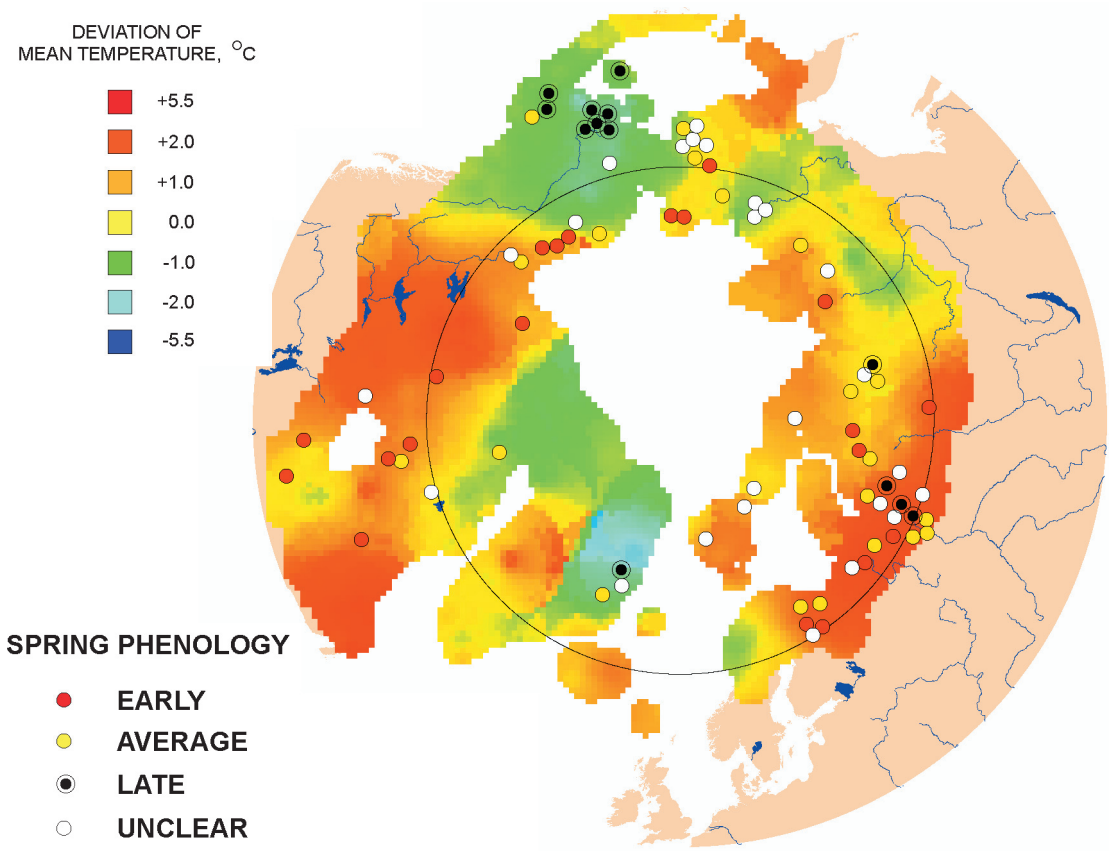

Figure 1. June temperature and phenological characteristics of spring in the Arctic in 2006. See text above for legend

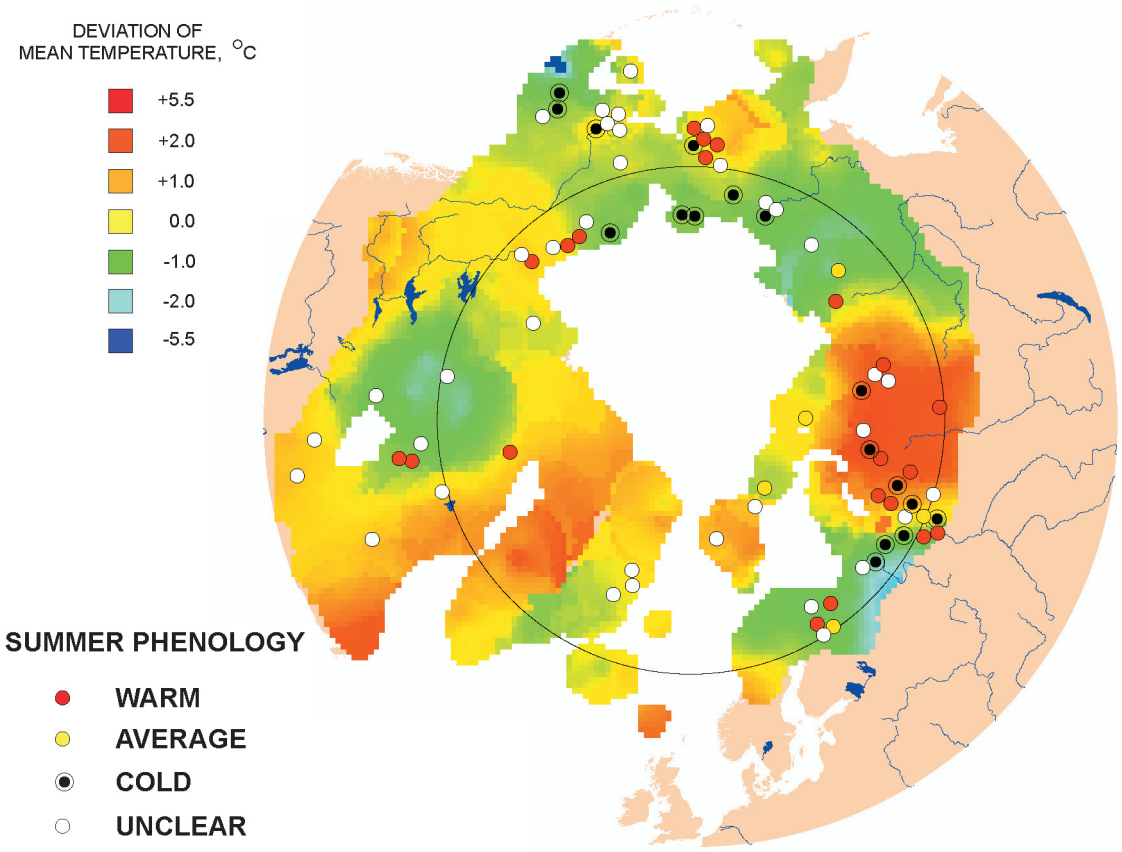

Figure 2. July temperature and phenological characteristics of summer in the Arctic in 2006

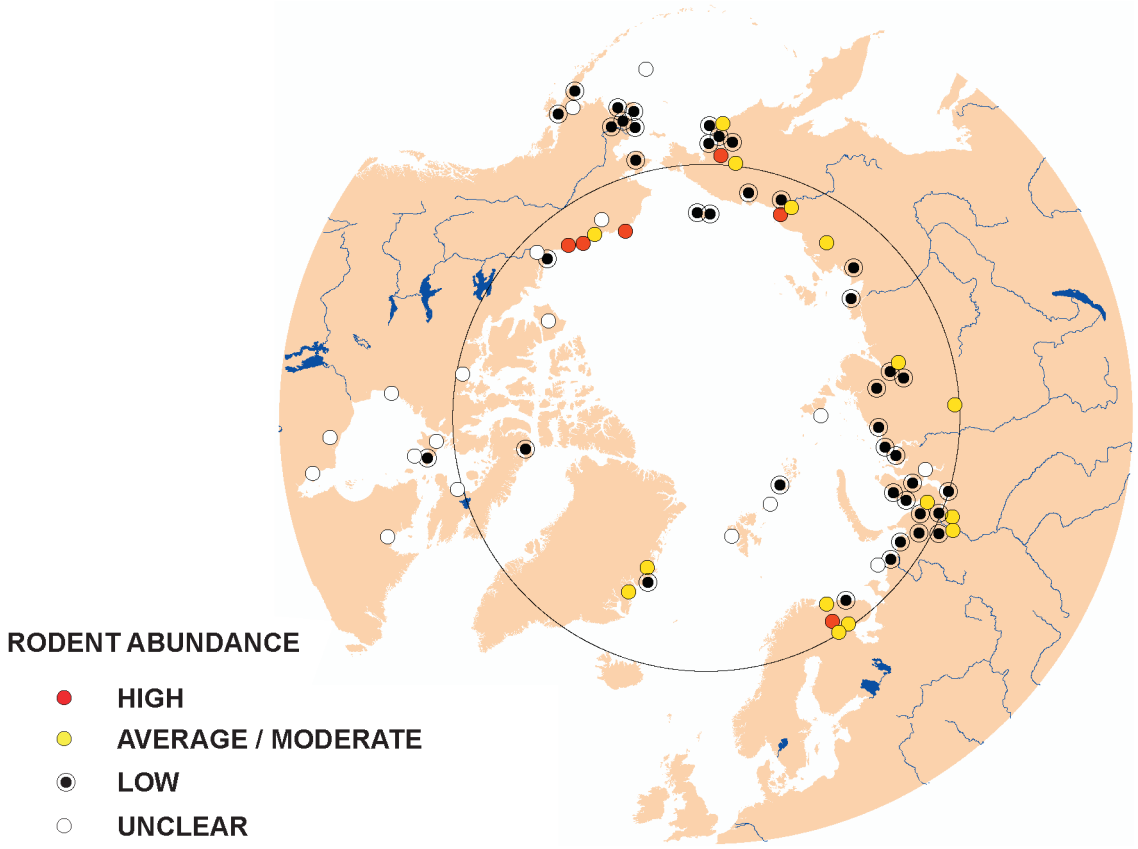

Figure 3. Rodent abundance in the Arctic in 2006

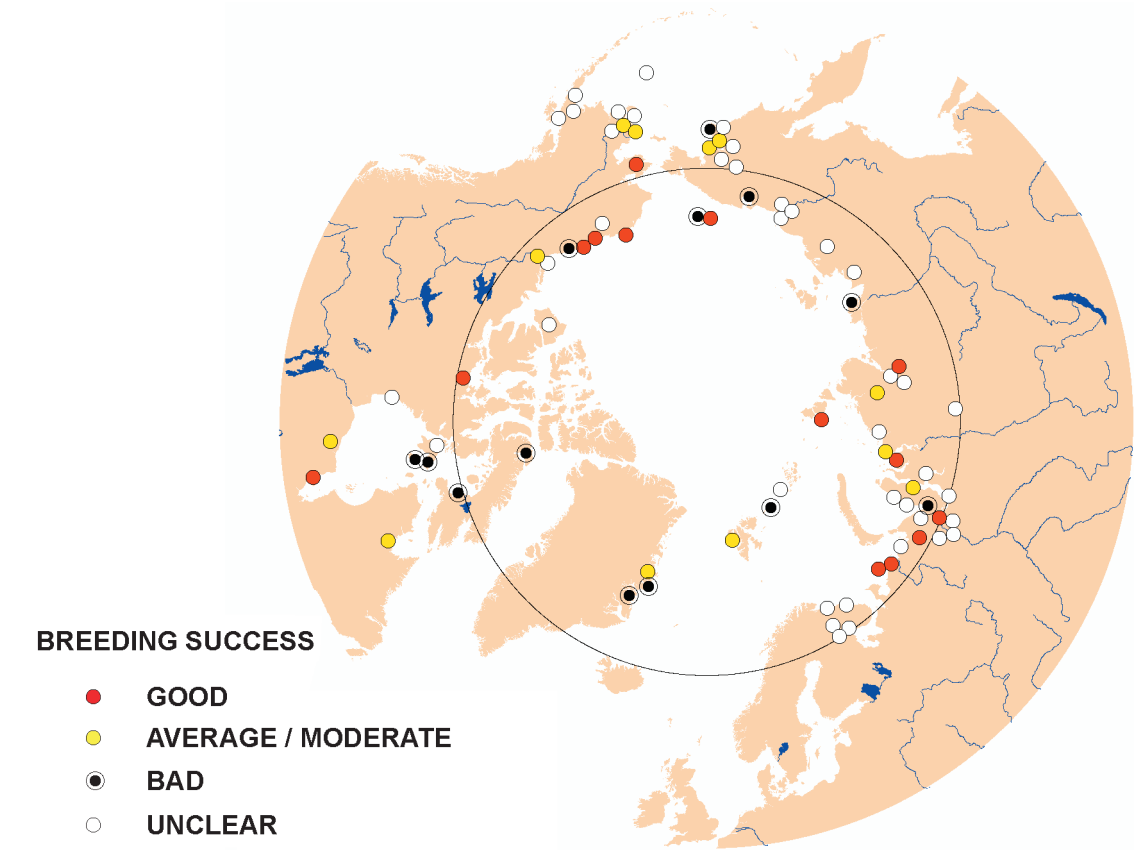

Figure 4. Bird breeding success in the Arctic in 2006