# ARCTIC BIRDS

**Newsletter of International Breeding Conditions Survey**

supported by 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

The current issue of the newsletter of the Arctic Birds Breeding Conditions Survey (ABBCS) is the 5th in a series of the survey's annual publications. In accordance with established tradition, the breeding performance of birds in the Arctic and Subarctic, together with the factors affecting it during the past summer of 2002 are the focus of this issue. Survey coverage did not change considerably among Arctic regions in that none of the vast regions that were previously well covered became "*terra incognita*" in 2002, and *vice versa*. Certain shifts naturally occurred, e.g., northern Alaska and northern Chukotka were better covered in 2002, while western Alaska and south-eastern Chukotka were better covered in 2001. Fortunately, long-term research is being conducted in a number of localities scattered over the Arctic which enables a comparison to be made of conclusions drawn from data collected in different years at various sites with data originating from fixed control sites.

The validation of conclusions about the breeding success of tundra birds, using data on the proportion of juveniles on the wintering grounds, provided by Australian ornithologists for the East Asian-Australasian flyway, was particularly important in the case of the 2002 summer, because no reports explicitly characterizing breeding success became available from mainland Eastern Siberia between the Lena Delta and the eastern Chukotsky Peninsula.

A series of reviews of the dynamics of rodent numbers has been expanded by 2 papers analysing rodent cyclicity on the Kola Peninsula, and a paper by V.G.Shtro in which the author made an attempt to link the dynamics of rodent numbers on the Yamal Peninsula with the population dynamics of the Arctic Fox. Given that complex rodent-predator interactions can compromise straightforward application of the prey-switching hypothesis (e.g., see paper by B.Sittler & T. Berg in the 4th issue of the newsletter), specific reactions of the predator component of the system deserve thorough investigation.

Apart from regular collection of information on breeding conditions and the website updates, our efforts during the last year were focused on two specific objectives within the project scope. One of them was aimed at providing public access to the data on individual bird species accumulated in the ABBCS database. The web-based system has operated since February 2003 and allows queries to be made of the database, containing about 88 hundred records on distribution, breeding status and numbers of 310 species across 356 localities in the Arctic and Subarctic. Query results are reported in a tabular form and as a map showing species distribution for requested period of time. The website can be accessed at http://arctic.ss.msu.ru/birdspec/, and is currently working in a test regime which means that the system functionality is subject to further development (also based on comments from users and, hopefully, before the end of 2003).

We hope that eventually this gateway to data will become a sound source of public information on changes in distribution and numbers of arctic birds. Also, people wanting to publish their most recent findings electronically now have an opportunity to do it quickly and with minimal effort on their part. It is noteworthy that after launching the website for the first time with a view of testing it, we immediately discovered a previously unknown source of information on the distribution of a wader species! We hope that potential contributors will evaluate the importance of this data source, and their feedback in the form of submitted questionnaires will be greater than previously, when access to information provided through Part 2 was limited.

Another activity implemented recently was more evolutionary: we entered in the database Russian data for the seasons 1992-1994 and made them accessible through the project website. This was done as part of a framework for preparing a review of trends in bird breeding conditions in the Arctic for the period 1989-2003. Given that considerable time has passed since the early 1990s when that information was collected, much of it was already published, and we had an opportunity to rely on publications along with personal reports of researchers in those past years. However, our knowledge of the published data sources is far from being complete and more efforts will be put into expanding the existing knowledgebase during the next year. In this undertaking, co-operation from researchers in providing their published material is much anticipated, with a positive side effect for contributors in increasing public awareness about their developments.

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*For last-breaking information about the survey visit the website*

**http://www.arcticbirds.ru**

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*Newsletter is distributed among contributors to the database. Others may request it from project coordinators. Free of charge.*

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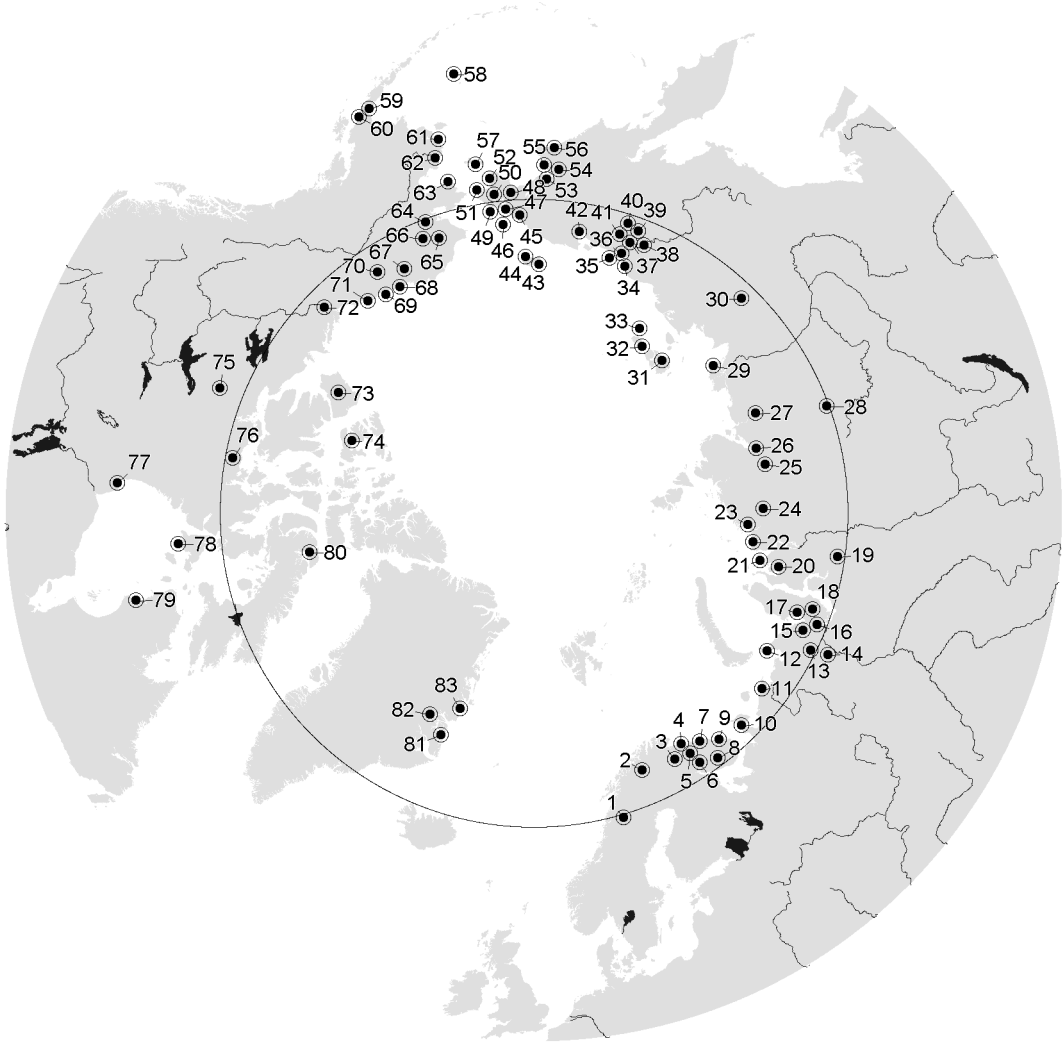


Figure. Arctic localities from which reports about bird breeding conditions became available

## LOCALITY REPORTS

1. Swedish Lapland (66°20'N, 16°20'E)

From our investigation of the area for reintroduced Lesser White-fronted Geese *Anser erythropus*, I can tell that the lemmings crashed during late winter-early spring 2002. We saw more Red Foxes *Vulpes vulpes* and Minks *Mustela lutreola* than usual and my impression is that birds suffered under a high predation pressure. However we left our investigation area by early July before most ducks and waders had hatched. Our Lesser White-fronted Geese had a good season (8 fledged broods observed on staging localities), but brood size was around average (small sample).

Å.Andersson

2. Finnish Lapland (69°54'N, 27°00'E)

The spring was fairly early and dry. The weather was also suitable for breeding birds during the summer. Due to dryness and low water level, the amount of mosquitoes was exceptionally low. This seemed not to have any general effect on passerines and other insectivorous birds. There are no detailed data on the breeding success of passerines, but usual numbers of pairs were present. The same holds true for waders and other land birds.

There were several observations of the Norwegian Lemmings *Lemmus lemmus* during the summer in various parts of Northern Lapland, but the long-awaited population increase did not take place due to low snow level and the warm and wet late winter (snow melted early). The last population peak of the Norwegian Lemmings took place in mid 1970s and late 1980s in some localities in north-western and northern Lapland, respectively. The number of breeding Rough-legged Buzzards *Buteo lagopus* increased somewhat especially in Utsjoki, northern Lapland. They have totally disappeared from large areas due to low vole populations for several years in large parts of Finnish Lapland, and also Hawk Owls *Surnia ulula*, Long-tailed Skuas *Stercorarius longicaudus* and other vole specialists have bred in extremely low numbers in recent years. Although some Snowy Owls *Nyctea scandiaca* have been seen in Lapland every summer, the last confirmed breeding of some tens of pairs took place in Utsjoki in 1986 and 1987. Breeding of the Arctic Fox *Alopex lagopus* has not been verified since the mid-1990s in Finland, and the total number of wandering individuals must be under ten at present.

The Willow Grouse *Lagopus lagopus* population was fairly high in many parts of Lapland, but in spite of this,

the number of breeding Gyrfalcon *Falco rusticolus* pairs as well as their nesting success was below average.

P.Koskimies

3. Lower Tana River, northeastern Norway (70°N, 27°30'E)

According to reports of local people snow melt and start of plant vegetation were approximately 15-20 days earlier than average. June was slightly warmer than usual.

Rodent numbers were very high in August both in river valleys and on forested slopes, while in mountain tundra abundance was about average. I observed a similarly high number in the area only in 1996. In autumn a large density of Willow Grouse was recorded: 3-5 birds per 1 km along a road.

A.Rybkin

4. Gorodetsky Cape, Rybachi Peninsula, Murman coast, Russia (69°35'N, 32°57'E)

It seams the season was early and warm. During the study period, 22-28 June, weather was rainy.

Signs of undersnow activities of voles were often seen on patches of sedge meadows. Lemmings were not recorded.

Nesting numbers and success of birds were assessed for colonies of seabirds on the Gorodetsky Cape cliffs, by counting Kittiwakes *Rissa trydactyla* and murres on survey plots and complete counts of incubating birds in a Great Cormorant *Phalacrocorax carbo* colony. Numbers of Common *Uria aalge* and Thick-billed *U. lomvia* murres did not change in 2002 compared with 2000, while numbers of Great Cormorant nests halved. Mean clutch size of Kittiwakes was low – 1.1 eggs, while mean number of chicks in the cormorant colony was 3.0 eggs (n=100). Seabird diet in late June consisted of capelin *Mallotus sp.* (95%) and herring *Clupea sp.* (5%).

Y.I.Goryaev

5. Laplandsky State Nature Reserve, west-central Kola Peninsula, Russia (67°40'-68°15'N, 31°07'-32°45'E)

Snow cover reached 50% on 7 May and had gone completely on 9 May in forested valleys, but in mountains above tree-line 50% snow cover was reached on 14 May. Flowing of major streams occurred on 2 May. The season was early and cold. Monthly mean temperatures and precipitation were below the long-term average in August-December, but exceeded the long-term average by 0.3-3.5°C in January-July. Weather conditions were favourable in the beginning of the season, but from 14-29 June cold rainy weather prevailed and air temperature dropped to +2°C (daily average to +6°C) causing death of chicks in 4 of 16 nests of Pied Flycatcher *Ficedula hypoleuca*.

Ermines *Mustela erminea* and Least Weasels *M. nivalis* were rare, while Common Marten *Martes martes* and other mammalian predators occurred in usual numbers. Osprey *Pandion haliaeetus*, Rough-legged Buzzard, Northern Goshawk *Accipiter gentilis*, Gyrfalcon and Merlin *Falco columbarius* bred, while owls were rare and did not nest. White-winged *Loxia leucoptera* and Red *L. curvirostra* crossbills started nesting from early March. Waterfowl occurred in usual numbers, but Black *Lirurus tetrix* and Hazel *Bonasa bonasia* grouse numbers, probably, increased. Density of Eurasian Golden Plovers *Pluvialis apricaria* was approximately 1 pair per 1 km of transect in alpine zone in June, but they were not recorded at all on 11 August.

The heavy crop of birch seeds (the highest 5th rank) enables wintering of redpolls, while crop of spruce, pine and cloudberry was low. Crop of crowberry deserved rank 4 of 5, while crop of bilberry and cowberry was approximately 3-4.

A.S.Gilyazov

6. Khibiny Mountains, Russia (67°42'N, 33°40'E)

Vole numbers were rather high.

Rough-legged Buzzards bred, and were feeding young in August. A brood of Eurasian Kestrels *Falco tinnunculus* was also observed after many years of not breeding. The observation of a young Common Buzzard *Buteo buteo* hunting along a marshy lake coast is the northernmost record of the species for the area.

V.D.Kokhanov

7. Eastern Murman coast, Russia (69°00'N, 36°00'E)

The summer season was warm and rainy. Half of the normal monthly precipitation fell during a storm on 19 June. In late July rains were common, with storms in the open sea and near islands. The air temperature then was +9-13°C.

There were two field trips: from 18-28 June and from 25 July to 1 August for inspection of seabird breeding. Hatching was early in Kittiwakes and Herring Gulls *Larus argentatus*. Mean clutch size in Kittiwakes was 1.3 egg compared with 1.56 in 1999 and 1.6 in 2000. Fledging was early in Kittiwakes and Herring Gulls. The number of broods of Common Eiders *Somateria mollissima* (22 in total) decreased notably compared with other years, as did the number of moulting males. Mean brood size (2.6 chick) was larger compared with other years.

A.Ezhov, D.V.Yanina

8. Upper and middle Ponoi River, Kola Peninsula, Russia (67°30'N, 36°02'E)

Spring came early and snow melted rapidly during the first 10 days of May. However, cold weather returned in the second half of May and the temperature dropped to about freezing point. June was moderately warm, and the amount of precipitation was slightly above the average. Thunderstorms with pelting rain occurred on several occasions, which generally is not typical for the area. The temperature dropped below freezing point only at nights in early June. Cold weather did not return in June, and other extreme weather events were not observed. In general the season was warm and rainy.

Lemmings, Arctic Foxes and owls were not recorded, voles were rare, Rough-legged Buzzards were breeding in small number and hatched chicks.

Nesting densities of waders at the eastern end of the study area (where surveys were conducted in 2001) remained at the same level. However, numbers of breeding waterbirds in similar habitats in the upper reaches of the Ponoi River were considerably lower. This area was not surveyed in 2001, and the reasons for low numbers there are not clear. Breeding phenology of waterbirds did not differ from the average. Predation pressure and impact of abiotic factors on bird reproduction were considered to be quite low. Breeding conditions were favourable.

S.A.Dyluk

9. Kharlov Island, Sem' Ostrovov archipelago, Russia (68°49'N, 37°20'E)

Norwegian Lemmings were not recorded on the island in 2002, unlike the previous year.

Ermine was seen several times during the summer. Predation of this species possibly was a reason for the considerable decline of Black Guillemots *Cepphus grylle* on the southern coast of the island. Numbers of nesting Gannets *Sula bassana* increased by a factor of two compared with 2001. Arctic Skuas *Stercorarius parasiticus* became slightly more abundant. Many Kittiwakes were not breeding, and breeding success was generally not high in this species. Breeding waders were represented by Oystercatchers *Haematopus ostralegus*, Red-necked Phalaropes *Phalaropus lobatus* and Turnstones *Arenaria interpres*. Predation of wader nests was not recorded.

M.V.Melnikov

10. Lower Shoina River, Kanin Peninsula, Russia (67°55'N, 44°21'E)

Early May was warm, but in mid May the temperature dropped below freezing point and became positive again on 24 May. The last snowstorm occurred on 22 May. Snow cover reached 50% on 27 May and had gone completely on 5 June. Ice broke on major rivers on 27 May. The period from 1-20 June was cold, and rains were frequent in late June – early July. While spring was slightly later than normal and the summer season was cold and rainy, no sudden return of cold weather occurred, and breeding conditions were favourable.

The number of Barnacle Geese *Branta leucopsis* staging on marshes of 50 km$^2$ during 21 May to 5 June reached 20,000. Several hundred thousand Dunlins *Calidris alpina* passed northward between 26 May and 5 June.

Numbers of lemmings, voles and predators were low on the seaside marshes. In particular, no lemmings, voles or Snowy Owls were seen. Only 3 records of Arctic Foxes were made in early June. Rough-legged Buzzard, Short-eared Owl *Asio flammeus*, Carrion Crow *Corvus cornix*, and Raven *Corvus corax* were rare with no signs of breeding. Nesting success of Barnacle Geese was 83% at the hatching peak. Poaching, wide-scale egging and disturbance are the principal factors negatively affecting waterfowl reproduction in the area.

K.E.Litvin, R.Drent, G.Eichhorn, E.N.Gurtovaya, J.Prop

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

According to reports of local people spring was very late, with snowfalls in late May, early and mid June. From 10 to 19 July maximum air temperatures did not exceed +6°C and from 24-28 July +15°C. Sea ice fragments drifted to the coast from the north on 14 July and covered beaches until 21 July.

Lemmings and other rodents were not observed on the coast during the study period between 10 and 28 July, and the state of the inland populations remained unknown.

Arctic Foxes, Snowy Owls and Rough-legged Buzzards were not seen, while Pomarine Skuas *Stercorarius pomarinus* did not breed. From 13 territorial pairs of Arctic Skuas 3 nested, with hatching in two of the latter on 22 and 24 July. Up to 3 White-tailed Sea-eagles *Haliaeetus albicilla* were seen simultaneously in the area of a Barnacle Geese colony during hatching, attacking small chicks.

Nesting was very late in Barnacle Goose, and the hatching peak occurred on 13 July. Clutch size was very small (2.77 eggs, SE = 0.10, n = 252). In total 1,324 nests of Barnacle Geese were found on the marshes to the south of Tobseda and on Chayachy Islands to the north among nests of Glaucous *Larus hyperboreus* and Herring gulls. Nesting success of Barnacle Geese did not exceed 40%, while hatching was successful in 4 of 5 nests of White-fronted Geese *Anser albifrons*. Nests in a colony of Arctic Terns *Sterna paradisaea* (at least 100 birds on 13 July) were deserted on 15 July.

K.Litvin, M.R.van Eerden, G.Eichhorn, E.N.Gurtovaya, K.Janssen, H.van der Jeugd, O.Y.Mineev

12. Vaigach Island, western coast, Russia (69°52'N, 59°20'E)

Lemmings and Arctic Foxes were rare in the surveyed area, however, the latter species was breeding. Observations in mid August brought us to the conclusion that hatching of Common Eiders in vicinity of Dyrovataya and Laymchina bays started in the third week of July, and peaked from 1-10 August. A single clutch of eggs was found as late as on 13 August.

Reproductive success of Glaucous Gulls was very low, and they occasionally destroyed clutches of Common Eiders. In general, breeding success of eiders and Barnacle Geese was high. Breeding performance of geese and swans was, probably, affected to the largest extent by traditional hunting by native people (Nenets). A pair of White-tailed sea eagles nested in the vicinity of Dyrovataya Bay, hunted on adult eiders, and thus substantially affected the distribution of their broods. Rough-legged Buzzards and skuas were rare, but the former managed to fledge young. Snowy Owls were absent.

Y.V.Krasnov

13. East of Bolshezemelskaya Tundra and Polar Urals, Russia (67°15'N, 64°35'E)

According to reports of local people snow depth in winter 2001/2002 was within the normal range for the

region, or slightly less than the average. Weather was very changeable in May, when short-term thaws with rains often alternated with short-term coolings. The temperature reached +12°C in the beginning of May causing thawing of snow. Snow cover was basically washed away by rains during May, and remnant snow patches could be found from 1-10 June only in deep cloughs and in vast stands of high willow shrubs on the northern slopes of watersheds and on sedge-willow marshes. June was cloudy, rainy and cool, but plant phenology was close to the average. Wet snow was abundant on 3 days in mid June.

Early and gradual snow melt during May resulted in low flood on rivers, and even low floodplain areas were not covered by water. Ice broke up on rivers mainly from 27-30 May, while large lakes became free from ice only in early July.

Summer was cold and wet. Warm sunny weather prevailed only during the first 10 days of July, then cool weather with abundant rains and drizzle set-in and lasted to the end of August. Precipitation was not recorded on only 5 days between 10 July and 15 August. Day-time temperature rarely exceeded +16°C, ranging normally from +10-14°C at day and from 0° to +7°C at night. Prevailing winds from west and north-west turned into storms on some days, and were often combined with heavy rain for 8-25 hours. Snowfalls were frequent above the altitude of 350 m a.s.l. in the mountains, and above 600 m a.s.l. snow cover remained for several days. Abundant precipitation in summer caused significant rise of water level in rivers, in mountains having nearly the same magnitude as during the spring flood.

Numbers of small rodents were high from spring to autumn. Frequent observations of adult Narrow-skulled Voles *Microtus gregalis*, Siberian Lemmings *Lemmus sibiricus* and Ruddy Voles *Clethrionomys rutilus*, along with abundant winter nests and damaged shrubs, indicated successful over-wintering of the former species (already abundant in autumn 2001) and efficient under-snow reproduction of the two latter species in March. Collared Lemmings *Dicrostonyx torquatus* were less abundant, but were occasionally observed in dwarf-shrub watershed tundra and on peat bogs. Ground *Arvicola terrestris* and Tundra *Microtus oeconomus* voles were also common, and they were regularly taken by avian predators. Young lemmings and voles could be seen during the whole summer, which indicated successful reproduction of rodents.

Arctic Foxes were not seen, but Red Foxes were abundant, in particular at mountain foothills and low mountains, and bred. Brown Bears *Ursus arctos*, Ermines, Least Weasels and Wolverines *Gulo gulo* were not recorded. Fresh tracks of Wolves *Canis lupus* were observed.

Numbers of Northern Harriers *Circus cyaneus* and Rough-legged Buzzards were generally high, although nesting density was high only locally. Most buzzard clutches had 5-6 eggs, but poor weather caused high mortality of chicks and low reproductive success. Adult birds could not hunt effectively during permanent cold rains, and even grown-up chicks died from cold and hunger. Normally, 1-2 chicks survived to fledging in buzzards, and some pairs lost all chicks. In Northern Harriers 2-3 chicks fledged. Snowy Owls were not seen, while Short-eared Owls were abundant and bred with high success; some pairs raised 5-7 chicks. Long-tailed Skuas were common in spring, but only solitary pairs started nesting, resulting generally in 1 chick per pair.

Spatial distribution and density of most wader species was very variable. Some species had locally high numbers (Wood Sandpiper *Tringa glareola*, Ruff *Philomachus pugnax*, Common Snipe *Gallinago gallinago*). Low numbers compared with previous seasons were characteristic for Eurasian Golden and Ringed *Charadrius hiaticula* plovers, Great Snipe *Gallinago media,* while numbers of Terek Sandpiper *Xenus cinereus*, Temminck's Stint *Calidris temminckii*, Red-necked Phalarope and Whimbrel *Numenius phaeopus* were close to the average.

Nest success was high in all wader species typical for the southern tundra sub-zone. Northern Harriers destroyed 2 nests and reindeers trampled another 2 among 16 found nests of Wood Sandpiper, which gives nest success of about 75%. Chicks hatched in 88% of monitored nests of Ruffs and 100% of nests of Common Snipes. However, reproductive success was low, or average at best (in Wood and Terek sandpipers). Some clutches in Wood Sandpiper, Ruff, Red-throated Pipit *Anthus cervinus*, Bluethroat *Luscinia svecica* and Little Bunting *Emberiza pusilla* were reduced to 2-3 eggs, which was not observed in favourable years. Many clutches of waders, ducks and passerines were replacements, judging by the late dates of clutch completion. Death of chicks from cold was observed in Wood Sandpiper, Red-necked Phalaropes, redpolls, Bluethroats and Little Buntings. Broods of Wood and Terek sandpipers consisted of 1-2 juveniles, while juvenile Ruffs were not seen at all. Despite low pressure of terrestrial and avian predators breeding conditions were unfavourable for waders and other birds due to poor weather.

V.V.Morozov

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

A small amount of snow was accumulated, and snow melted quickly after warming up in late April. However, spring was cold afterwards. Night frosts were frequent in May, and slush and ice were forming on river surface in mid May. Ice broke early, on 4 May on the Voikar River, and on 17 May on the Ob River. Rain or snow occurred regularly. Despite early snow melt and the appearance of buds stimulated by warming in April, further development of vegetation was retarded by cold weather until 10 June (birch greening). Summer was also cold and wet. Ice on tundra lakes remained for a long time due to slow ice-melt.

Ground Voles appeared in floodplain areas in outstanding numbers. Voles were numerous on the shores of lakes and channels, in grass and on forested patches. They destroyed all seedlings in greenhouses in the settlements, visited buildings and were common on the streets. In the beginning of summer, Ground Voles

started to swim across the Ob River and other large waterbodies in a lemming-like manner, perishing in mass. Numerous bodies were observed on river banks and floating in the water. Many voles demonstrated signs of megrim disease. *Microtus sp*. and *Clethrionomys sp*. voles were abundant outside the floodplain.

Abundant Ground Voles attracted many predators: Red Foxes, crows and gulls. Even Greater Spotted Eagles *Aquila clanga* were recorded, which do not breed in the area. Overfed predators, including dogs in the settlements, stopped reacting to each vole, taking only rodents in close proximity. Many dead voles were consumed partially, or had just damaged head or thorax. The abundance of other vole species outside the floodplain attracted mustellids and owls. Short-eared Owls nested in the tundra at a very high density (about 1 pair/km$^2$).

Numbers of nesting Arctic Terns decreased noticeably, but numbers of breeding Common Gulls *Larus canus* and of most other birds were about average. Willow Ptarmigans were somewhat more abundant than usual.

M.G.Golovatin

15. Polar Urals, Russia (67°56'N, 66°34'E)

The timing of spring was average, and summer was moderately cold and rainy (in particular August). The weather was unstable with alternating warming and cooling. The temperature dropped to freezing on 12 July, and snow fell on the ground above 600 m a.s.l. in the mountains. However, extreme weather events capable of causing chick and juvenile mortality were not observed. Mean air temperatures in May, June and July were +0.7-2.7°C higher than in the cold year 2001, while in August the temperature was +1°C lower than in 2001.

Numbers of rodents (voles in mountains and lemmings near foothills) peaked and reached 15-20 animals/100 trap-nights in July-August. Active reproduction of rodents occurred in July, and their populations presumably crashed in autumn after early snowfalls, rains and icing in September-October. The following densities of rodents were recorded in the mountains and foothills, respectively, animals/100 trap-nights: Narrow-skulled Vole 10.9/2.5, Shot-tailed Vole *Microtus agrestis* 0.2/0.4, Ruddy Vole 3.5/0, Grey-sided Vole *Clethrionomys rufocannus* 0.8/0, Siberian Lemming 0.1/6.2, Collared Lemming 0/0.4. Rodent populations presumably crashed in autumn also on the Yamal Peninsula, judging by the mass migration of young Arctic Foxes to the south early in winter. They became abundant in the lower Ob River in November, feeding near human habitations and starving.

Rough-legged Buzzards bred at high density (0.4 pair/km$^2$ locally, or 0.8-6 pairs/km of transect in different areas). We also observed breeding of Northern Harriers and Short-eared Owls.

Successful nesting was observed in Common Gull, ducks (European Wigeon *Anas penelope*, Teal *Anas crecca* and Red-breasted Merganser *Mergus serrator*), Willow Grouse, Rock Ptarmigan *Lagopus mutus* and passerines. Unsuitable habitats were responsible for the low density of waders in the study area, but nests, broods or alarming adults were observed in almost all recorded species. Among common waders for the area successful nesting was proved for Dotterel *Eudromius morinellus*, Eurasian Golden Plover, Common and Pintail *Gallinago stenura* snipes and Wood Sandpiper. Alarming adults were recorded in Ringed Plover, Common *Actitis hypoleucos* and Terek sandpipers, Temminck's Stint.

S.P.Paskhalny, M.G.Golovatin, V.V.Pavlinin

16. Southern Yamal, Russia (67°25'N, 68°00'E)

In August no lemmings or voles were seen. Arctic Foxes were rare, while Rough-legged Buzzards were numerous.

D.Nowak

17. Erkatayakha River mouth, Kanary settlement, Russia (68°12'N, 69°11'E)

June was cold and windy, but the weather improved slightly at the end of the month. The period from 1-10 July was dry and warm, afterwards short periods of dry and rainy weather alternated. Fog from the sea was common, in particular in the second half of August.

Lemmings were rare in July and August. Vole numbers increased at the end of summer. In particular, Narrow-skulled Voles became abundant, and their juveniles were found in pit-fall traps for insects.

Numbers of common breeding waders (Ringed Plover, Red-necked Phalarope, Wood Sandpiper and Temminck's Stint) did not differ from 2001. Eurasian Golden Plovers were notably more abundant in 2002, and spread across tundra-like habitats in the upper parts of the floodplain along with their regular watershed habitats. A Jacksnipe *Lymnocryptes minimus* chick was found on 8 August on the edge of a marsh in the river floodplain.

Start of nesting and incubation, probably, developed favourably in waders, as most territorial birds remained in their territories in early July, and few migrants were seen. Inclement weather with several occasions of 3-day rainy periods from mid July onwards resulted in the disappearance of some adult birds from territories, and we found dead chicks. However, counts of invertebrates showed that sufficient food resources were present for waders until early August. Good weather in late June – early July led to an outstanding yield of cloudberry, crowberry and bog blueberry. Notable migration of waders and passerines started from 10 August when fogs became frequent and the activity of terrestrial invertebrates declined steeply. Numbers of aquatic invertebrates remained high until late August. Predators were scarce, they had low reproductive success and could not strongly affect bird breeding success. In particular Arctic Fox, Rough-legged Buzzard and owls were rare, Long-tailed Skuas common; no breeding of owls and Arctic Fox was recorded, however, both other species fledged some young.

T.R.Andreeva

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

Ice broke on 26 May on the Erkatayakha River, and on 1 June on the Payutayakha River. Snow melted on flat areas on 5-7 June. Despite relatively early snowmelt and ice-break, the summer was cold and rainy. During the arrival of most birds from 20 May onwards we did not witness extreme weather events, which could have resulted in reverse migration. However, steady north winds, frequently with wet snow and rain, and low temperatures (+1-3°C) were common in early and mid June, which contributed to prolongation of the nesting period in many birds, in particular passerines. The absence of strong winds and the low precipitation in late June created favourable weather conditions. July and August were rainy and relatively cold, with some rains lasting for 3 days in a row. Given the relatively low abundance of lemmings, poor weather negatively affected broods of birds, in particular birds of prey. Loss of clutches by passerines and ducks, as well as chicks by passerines after continuous adverse weather was not uncommon. September was rainy and cold with frequent snowfalls and strong winds. Geese migrated during a short time interval, on 19-25 September.

Under-snow reproduction of lemmings and voles was successful, judging by the high numbers of nests, droppings and burrows. However, numerous dead animals, both juvenile and adult, were discovered after snowmelt, and numbers of lemmings in summer were relatively low, while numbers of Middendorff's *Microtus middendorffi* and Narrow-skulled voles were moderate.

Numbers of Arctic Foxes were relatively high, and pressure of predators on birds was substantial. Observations of skuas, Arctic Foxes and, occasionally, Rough-legged Buzzards destroying nests of passerines and ducks were not uncommon, likewise records of egg-shells on excursions. One nest of White-fronted Geese was destroyed by a White-tailed Sea-eagle. Snowy and Short-eared owls were found in small numbers without signs of breeding. We did not record Pomarine Skuas, while Long-tailed and Arctic skuas were present and bred.

Prolonged flood on rivers hindered nesting of many bird species. We often found nests presumably with replacement clutches, of passerines, ducks and waders in late June, as well as deserted clutches.

V.A.Sokolov, A.A.Sokolov

19. Lower Russkaya River, West Siberia, Russia (67°11'N, 81°47'E)

As reported by locals, ice broke on the Taz River in average time, or slightly later. Floodwaters were very high. Warm periods occurred in June, but during almost the whole of July temperatures were low, accompanied by strong wind and rains. There were only 3 warm and dry days with light southerly winds during the period of studies from 25 June to 27 July. There were at least 2-3 hours of rain every day, sometimes the whole day.

Lemmings were not recorded. Short-tailed Voles occurred in the floodplain in considerable numbers. Red Fox, Wolverine and Ermine were common, likewise Short-eared and Hawk owls. We observed Hawk Owl which managed to take 5 Short-tailed Voles on a sandy river beach during 2 hours on 17 July. Skuas were present only on small tundra-like marshes in wide valleys of streams, and Herring Gulls were also rare. Merlin, Gyrfalcon and Northern Harrier occurred in typical numbers for the forest tundra: 8, 3 and 6 pairs respectively per 110 km of the river length. Peregrine Falcon *Falco peregrinus*, Northern Goshawk and Sparrowhawk *Accipiter nisus* were seen only once each, and Hobby *Falco subbuteo* twice. Crows are absent in the Russkaya River valley, and Ravens very rare. Pressure of predators on birds was probably low.

Reproductive success was low due to very cold and rainy weather. Wandering passerines and waders were seen during all July, and their replacement clutches were found: for example, fresh eggs of Dusky Thrush *Turdus eunomus* on 14 July and Wood Sandpiper on 18 July (given first observation of chicks on 12 July). Common and Wood sandpipers and Reeves started to gather into flocks by 20 July.

V.G.Vinogradov

20. Gydansky Peninsula, Tazovsky District, Russia (71°22'N, 77°27'E)

Spring started early according to reports of locals, but then cold weather returned with frost and snow. Accordingly, geese that had already arrived *en masse* had to go back southwards. Afterwards, when warm weather established, only small wandering groups of geese were observed. Most of them did not nest, and presumably passed north-eastward towards Taimyr. Gydanskaya Gulf cleared from ice near Gyda settlement around 25 June.

Numbers of both lemmings and Arctic Foxes were probably above the average. Snowy Owls being rather common bred successfully across the whole area, Short-eared Owls were rare. Skuas were also common, but breeding was not confirmed. Rough-legged Buzzards nested at high density and had high reproductive success. Reproductive success of geese was low.

P.M.Glazov, A.E.Dmitriev

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

Snow cover was nearly complete upon our arrival on 6 June and snow melt occurred 1-2 weeks later than in the two previous years, with 50% snow cover and flowing of major streams on 20 June. Rapid snow melt was initiated not by high temperatures, but by heavy rain. The summer of 2002 was on average a bit colder than that of 2001, though not as cold as 2000. Apart from a colder start (average June temperature +1.2°C in 2000, +4.0°C in 2001, and +2.0°C in 2002), the general pattern in air temperature was similar to that in 2001, although peak temperatures were reached a few days later. However, 2002 was distinctly less sunny. The most remarkable feature of summer 2002 was its wetness: between 6 June and 9 August no less than 132 mm of precipitation was recorded, compared to 59 mm in 2001 and 7 mm in

2000. Nearly all of this fell in the form of rain; the only significant snowfall occurred on 6 July, but the tundra stayed white for a few hours only. Both the number of days with rain and the amount of rain falling on rainy days were larger than in previous years.

After two years of very low abundance, lemming numbers had increased (season average 1.4 animals seen / 10 h in field) but not reached a real peak. None were seen until 15 June, but shortly after the snow melt, lemmings seemed abundant (between 20 and 30 June up to 10 lemmings seen /10h), but this declined rapidly as they moved into summer burrows and/or were taken by predators, to less than 1 seen /10h after 5 July. Overall season lemming density was 10-12 individuals /hectare, from live-trap censuses. Siberian Lemmings were 10 times more abundant than Collared.

Pomarine Skuas (c. 2 pairs/km$^2$), Rough-Legged Buzzards (15 of 20 active nests in 275 km$^2$ contained eggs, 1 of them was deserted, 2 destroyed, others hatched and, probably fledged), and Snowy Owls (3 nests in c. 30 km$^2$, 9 nests in 275 km$^2$) bred. Clutches of Snowy Owls were small, 4-6 eggs, and these predators suffered lack of food later in the season, as many Snowy Owl young died. Arctic Foxes were scarce but some reproduced. Geese and ducks bred in larger numbers than in the two previous years, with several Brent Goose *Branta bernicla* colonies around Snowy Owl nests (64 nests in 4 colonies and 2 single nests near owls), as well as scattered solitary pairs (21 nests). A total of 85 nests of Brent Goose were found in the inland tundra (searched area of 275 km$^2$), plus 35 nests on the offshore islands.

Wader arrival was retarded due to cold weather and persisting snow cover, with flocks of further northbound species (Knot *Calidris canutus*, Purple Sandpiper *Calidris maritima*, Dunlin) staging in the few snow-free patches for a few days. Nesting commenced 7-10 days later than in 2000 and 2001, around 20-25 June in the early species, and 2-5 days after the sites had become exposed. Laying periods were markedly compressed, with 50% of clutches completed within 3 days in Dunlin, and within 5 days even in Little Stint *Calidris minuta*. Despite the late spring, breeding numbers of most wader species were similar to the previous years, with lower numbers only in Pacific Golden Plover *Pluvialis fulva* and Curlew Sandpiper *Calidris ferruginea*. Surprisingly, the influx of breeding Pectoral Sandpiper *Calidris melanotos* and Grey Phalarope *Phalaropus fulicarius* in the warm spring of 2001 was repeated in 2002, though Pectorals were less numerous this year (2 nests).

Nest success varied between bird groups: probability of surviving the nesting period was 65% for passerines, 59% for waders (21-73% depending on species), 61% for skuas. White-fronted Geese were quite successful: 8 of 9 found nests hatched (89% hatching success). In inland Brent Geese nests, 25 of total 85 hatched (29.4%). On islands no Brent predation was recorded at all, probably most clutches hatched and fledged. In spite of the presence of at least 12 prospecting Red-breasted Goose *Branta ruficollis* pairs, probably, only 1 nest was initiated and 1 brood hatched. Large bird eggs seemed to be especially sought after by foxes, while small eggs were taken more occasionally by both skuas and foxes. Even some Brent Goose colonies near Snowy Owls were raided by foxes, perhaps because none of the owls was very aggressive towards (human) intruders. Predation of wader eggs started when lemming abundance on the tundra surface dropped as summer burrows thawed out, in early July. Hatching of wader chicks coincided with several days of warm weather and high insect abundance, but throughout much of the pre-fledging period sunshine was scarce and insect numbers low. Chicks showed somewhat retarded growth but many did survive to fledging. Our eventual impression was of moderate breeding success for waders, low success in Red-breasted and moderate in Brent geese, and low success for raptors.

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22. Uboynaya River mouth, Taimyr, Russia (73°37'N, 82°23'E)

During the period of studies between 27 June and 18 July, the abundance of Siberian and Collared lemming was determined by trapping them using 25 traps placed near lemming burrows or at lemming tracks for three successive days. Two habitat types (grassy tundra as found in valleys and patchy tundra as found on hills) were sampled twice. In total 9 lemmings were caught during 300 trap nights. Lemmings clearly were most abundant in wet, grassy tundra. Both lemmings caught in the patchy-tundra habitat were Collared lemmings, all other lemmings caught were Siberian lemmings. Contrary to our expectations, 2002 was not a lemming peak year, but a typical intermediate year at the Uboynaya study site.

We found in total 3 active Arctic Fox dens in an area of about 60 km$^2$. Foxes were seen in the study area, but not regularly. Roughly, every 3 field days 1 fox was observed. One Arctic Fox was observed carrying a dead Ptarmigan female towards a den. In one of the pipes of a den 3 dead Siberian lemmings were found.

Rough-legged Buzzards bred, but only had small clutch sizes (2.8 eggs, SD = 1.1, n = 5). In our study area of about 80 km$^2$ 4 Snowy Owl nests with eggs were found. Three nests contained 5 eggs, one nest had only 3 eggs. Hatching started on 10 July.

After a week of frequently displaying, Pomarine Skuas started to breed. In a plot of 8 km$^2$ 18 Pomarine Skua nests were found (2.25 nests/km$^2$). From a total of 50 individuals only 14% were of the dark morph. Almost all pairs had two eggs. Only 2 of 30 nests contained 1 egg. Long-tailed Skuas also bred in the area, but at much lower densities. For comparison, only three nests of Long-tailed Skua were found in the 'skua plot'.

Brent Geese were rather scarce (29 nests were found) and clutch sizes were small (3.6 eggs, SD = 1.2, n = 20). Brent Geese nests were found mainly in the vicinity of Snowy Owl nests. Only 5 of 29 nests were not directly related to a Snowy Owl nest. Around four different Snowy Owl nests 13, 7, 4 and 0 Brent Geese nests were found. The Snowy Owl nest without Brent Geese nests

in the vicinity was surprisingly predated by an Arctic Fox.

All Brent Geese nests unrelated to Snowy Owl nest were predated by Pomarine Skuas or Arctic Foxes. Brent Geese nests near Snowy Owl nests were heavily predated, although 46% of all nests around Snowy Owls were not predated at the time we left (after about 2 weeks of incubation). Most of these nests were predated by Pomarine Skuas (72% of all depredated nests).

In total 15 nests of Little Stint and 3 nests of Curlew Sandpiper were found within a small 0.33 $km^2$ plot where wader nests were searched for. Nest success of Little Stint nests was calculated using the Mayfield method (23 nests, 235 nest days). The probability that a nest hatched was 78%, which is high compared to other years. Only one nest was predated by a skua. Two other nests were deserted before the eggs hatched. At the time we left the area the first eggs hatched.

It is hypothesized that wader nests escaped from predation because lemming densities were (just) high enough to make searching for wader nests less profitable than searching for lemmings. However, because Brent Goose nests attain a higher reward to the predator, Brent Geese nests did not escape from predation, because searching for Brent Goose nests was favourable over searching for lemmings.

R.Klaassen, F.Cottaar, V.Grabovski, P.Saurola, A.E.Volkov

http://www.alterra.dlo.nl/english/aboutalterra/ fs-aboutalterra.asp?keus=60

23. Cape Wostochny, Pyasina River delta, Taimyr, Russia (74°06'N, 86°44'E)

The temperature exceeded +6°C for only a few hours in the period from arrival until 11 July. After 14 July, midday temperatures ranged between +15°C and +22°C, remarkably warm for the tundra at 74°N, and were accompanied by swarms of hostile and mean mosquitoes. Snow cover was estimated visually from the air at 60% on our arrival on 27 June, and decreased rapidly. Much of the snow disappeared as a result of wind and rain, rather than melting with increasing temperatures.

On arrival, there were many Siberian Lemmings at camp, but there were very few in the tundra (estimated probably less than 0.2 lemmings per hour).

During the first visit to a fox den on 29 June, 28 Siberian Lemmings were accessible from the outside and were examined briefly before being replaced. Two were too badly mauled to be aged. Of the 28 lemmings, 11 were males (9 adults, 1 sub-adult, 1 unknown) and 17 females (8 adults, 8 sub-adults, 1 unknown).

The first set of traps (set 28 June, checked 29 June – 1 July) near camp caught no lemmings over three days. The second set (set 1 July, checked 2-4 July), caught three the first day, three the second day, and one on the third day. So 2002 was not the "lemming peak year" it was anticipated to be.

Among checked dens of Arctic Foxes in the area one had been recently used, and one was occupied by a pair of foxes with a litter.

Rough-legged Buzzards and Snowy Owls were rare and did not breed. On a ridge on 30 June and again on 4 July 5 nests of Rough-legged Buzzards were found; there were no eggs in any of these. Non-breeding Pomarine Skuas were seen frequently, mostly single birds, but occasionally in pairs. Six nests of White-fronted Geese were found before 18 July. One of these and presumably the female were depredated. A Brent Geese colony of ~70 nests was checked in Bird Island, while on the mainland careful search was made in areas where nests had been found in 1990-1995 and everywhere else, but none was found.

L.Underhill, G.Muskens

http://www.uct.ac.za/depts/stats/adu/travel/piasinabirdrep.htm

24. Pyasina River basin, Taimyr, Russia (73°00'N, 91°00'E)

Break-up on rivers and development of vegetation were generally in line with the pattern of an average year, at least in the tundra zone. From 4 July to 16 August the weather was cool. Heavy rains occurred from 10-30 July, which could have affected the reproductive performance of waders and passerines.

Many chicks were found in nests of Herring Gulls on 4 July on Chayachy Island at the south of the area (approximately 70°N, 88°E). Fishermen reported laying of the first egg by a pair of White-fronted Geese on 9 June and hatching of 5 chicks from 6 eggs at the upper reaches of Pyasina. White-fronted Geese were rare on tributaries of the middle reaches of the Pyasina River, while Bean *Anser fabalis* and Red-breasted geese were common. 22 Bewick's Swans *Cygnus bewickii* were seen on 13 July per 120 km of the Yangoda River.

Numbers of Siberian and Collared lemmings were, probably, average, given that Arctic Foxes occupied 20% of available dens on the Yangoda River in the centre of the area. Nesting Snowy Owls were not observed, but nesting Rough-legged Buzzards and Herring Gulls were common, and their clutches were large.

Density of nesting Peregrine Falcons increased in the southern and central parts of the Pyasina River basin, but not on the northernmost part of the surveyed tributaries (Toreya River).

Chicks hatched successfully in 4 of 5 monitored nests of Temminck's Stints, while in one 3 chicks died during heavy rain in the third week of July. Among 16 surveyed nests of Peregrine Falcons most contained complete clutches, which indicates average or high numbers and successful reproduction of waders.

Y.I.Kokorev

25. Ary-Mas, Taimyr, Russia (72°29'N, 101°50'E)

Spring developed rapidly in 2002. Ice broke on 9-12 June on the Khatanga and Novaya rivers, which is somewhat later than average. The water table during flood was lower than average on the Novaya River (approximately 3.5 m above low-water period level), but the water table remained 0.5-1 m above low-water period level during the whole period of observations. By

our arrival on 19 June snow cover had disappeared, except for solitary snow patches in valleys and dense forest stands. Air temperatures were extremely high in the last 10 days of June, rising above +30°C twice (+33.4°C on 22 June and +33.8°C on 28 June). Air temperatures in July and August were close to average, +13.9°C and +11.6°C, respectively. The summer was wet with August being slightly less rainy, and maximum precipitation (9.2 mm) was recorded on 10 July. Strong wind was rare, with a single record of velocity reaching 25 m/s on 13 August. Dense fog during 19-23 August reduced visibility to 1 km, and was, probably, caused by forest fires in Yakutia.

A single Siberian Lemming was seen during the period of studies, but approximately 30 animals were trapped in different habitats (mostly forest) by M.P.Telesnin. In mid summer lemmings were found in nests of Rough-legged Buzzards on each inspection. A vole (presumably, Middendorff's Vole) was seen in the tent on 23 June.

Arctic Foxes were seen only twice, but they bred. Occupation of dens was low, but this is typical for the area. The last groups of reindeers were seen on 20-23 June on their northward migration, while the first ones migrating south were recorded on 2 August, and became numerous from 6 August. Mountain Hares *Lepus timidus* were numerous during the whole summer, and their remains were found near nests of buzzards along with lemming bodies. Rough-legged Buzzards occupied 90% of known nests on trees, while all nests outside forest were empty. Hatching in buzzards started on 8 July, and among 3-6 chicks per nest most survived and fledged by 20 August. Two nests of Merlin were found with 3 and 4 chicks, respectively. Gyrfalcon was seen as non-breeder. Snowy Owl was not recorded, while Short-eared Owls were represented by two territorial pairs, and became relatively common on post-breeding movements in August. Long-tailed Skua, Herring Gull and Arctic Tern were common, although nesting pairs were dispersed. Pomarine Skua nested, and a flying juvenile was seen on 11 August along with juveniles Herring Gulls.

Willow Grouse and Rock Ptarmigans were both common having up to 10 chicks in broods which fledged by 10 August. All 3 species of divers bred, but only Black-throated Diver *Gavia arctica* was relatively common. Nesting of White-billed Diver *Gavia adamsii* was confirmed for the first time on a lake at the southwest of the area. Observations of geese were rare, and their frequency increased only during autumn migration. Long-tailed Duck *Clangula hyemalis* and King Eider *Somateria spectabilis* were the only common nesting duck species.

Bar-tailed Godwit *Limosa lapponica* and Spotted Redshank *Tringa erythropus* were the most common waders, along with Pacific Golden Plover in tundra areas and Grey Phalarope on marshes. Ringed Plover was common on gravel river banks. Pectoral Sandpiper and Temminck's Stint nested sporadically. Ruff was numerous on migration, but nested in low numbers. The first wader chicks were found on 8 July.

Red-throated Pipit and Willow Warbler *Phylloscopus trochilus* were the most common passerines in the forest; Bluethroat, Redpoll and Little Bunting in shrubs, and Lapland Bunting *Calcarius lapponicus* in tundra. Pallas' Bunting *Emberiza pallasi* was relatively common. Nesting of all these species was successful, and their fledglings were seen in large numbers from 11 July. A few nesting pairs of Dusky Thrush were recorded. Flocks of Ravens of 10-20 birds became common in August. Breeding was successful in all bird species.

I.N.Pospelov

26. Bludnaya River mouth, Taimyr, Russia (72°51'N, 106°02'E)

Snow cover reached 50% on 9 June which is at the early end for an average season, as is complete melting of snow on 14 June. Since the start of recording on 5 June air temperatures rose steeply comparable only with records in 2001. Accordingly, temperatures became very high in the second half of June when on some days daily mean air temperature exceeded +20°C. Low precipitation in combination with hot weather resulted for the second year in a row in severe drying of tundra and marshes. July was moderately wet, and habitats accumulated some water in the second half of the month. Dates of plant and insect development were the earliest on record since the start of observations in 1994.

After complete melting of snow on 16 June, lemming under-snow nests were counted on a transect 4.6 km long and 10 m wide, located principally within flat-hillock marsh - the dominant habitat in the study area. On this transect, 6 winter nests were recorded which is very close to 7 nests in 2001 and considerably less than 33 nests on the same transect in 2000. Numbers of lemmings recorded visually in June-July 2002 were also very close to 2001 (25 and 22, respectively), which exceeds only the numbers recorded in 1995 and 1998 (9 and 10, respectively), and represents an apparent population low continuing for the second year after the outbreak in 2000 (587 records) and growth stage in 1999 (94 records). Estimated density of Siberian Lemmings varied from 1.8-6.3 ind./hectare in June-July based on counts using live-traps, and the population, probably, continued to increase through the summer.

A pair of Arctic Foxes inhabited a den on the southern border of the main study plot and the floodplain, and had 9 cubs in the litter. Adult foxes were regularly seen going to the den with a mouth full of lemmings. Among skuas, Pomarine did not breed, while Long-tailed and Arctic nested in their usual low numbers, and one nest of Arctic Skuas survived to hatching. Two nests of Rough-legged Buzzards were found on the Khatanga River bank, having 2 and 3 chicks on 31 July.

Most species started nesting earlier than in other years since 1994 except for 1999 and 2001. Estimated densities (in nests/km$^2$) for common species were: Little Stints – 9.5, Grey Phalarope – 4.7, Ruff – 7.1, Dunlin – 8.7, Pectoral Sandpiper – 14.2 and Lapland Bunting – 18.9. These densities were low compared with the long-term average for all species except for Little Stint, for which the density was close to average. The total bird

density 80.5 nest/km$^2$ slightly exceeded the previous minimum record of 74.6 nest/km$^2$ in 2001, but was still considerably below the range 93.9-151.1 nest/km$^2$ in other years. Thus, the adverse impact of hot and dry weather in June on breeding bird numbers apparently outweighed the negative impact of late springs or cold weather observed in other seasons.

Despite the close proximity of an Arctic Fox den predation pressure was not high, and nest success of common birds was moderate to high: 58.3% in Dunlin (n=12), 47.6% in Pectoral Sandpiper (n=21), 45.5% in Ruff (n=11), 44.4% in Grey Phalarope (n=9), 83.3% in Little Stint (n=12), 84.0% in Lapland Bunting (n=25). Still nest success was apparently lower than in 2001 when lemming numbers were very close to 2002.

M.Y.Soloviev, V.V.Golovnyuk, E.N.Rakhimberdiev, I.V.Travina

27. Lower Anabar River Saskylakh settlement, Yakutia, Russia (71°58'N, 114°10'E)

Ice broke on the Anabar River on 5 June, and floodwaters were high. The tundra became 60% free from snow by 7 June, but snow cover re-established on 9 June, and reduced to 10-20% by 15 June. Larch greening started by 20 June. Ice on large lakes melted in early July, and snow patches remained until 5 July. The summer was dry and warm, and areas to the south were affected by fires for 2-3 weeks.

A heavy crop of bog bilberry and crowberry stimulated increases in lemming and vole populations. Rodents and signs of their activities were frequently seen. Numbers of Mountain Hare were increasing.

Arctic Foxes bred. Wolves and wolverines were not rare. Rough-legged Buzzards and Peregrine Falcons successfully nested every 3-5 km. Among skuas only Long-tailed was common. A pair of Gyrfalcons and pair of White-tailed Sea Eagle bred near the village.

Ringed Plover, Temminck's Stint and Common Snipe were common in the floodplain, while Wood Sandpiper and Ruff were common locally. Pacific Golden Plover and Grey Plover *Pluvialis squatarola* nested in dry tundra, while Grey Phalarope, Ruff and Bar-tailed Godwit occurred in lowlands. Swans were rare. Bean Goose was common among geese, and migrated on 24-30 May. Red-breasted Goose was rare. Common Scoter *Melanitta nigra*, Pintail *Anas acuta* and Long-tailed Duck migrated to the south in small flocks before 20 June. Common and Herring gulls and Arctic Tern were common breeders on lakes. Willow Grouse were common and bred. Pied *Motacilla alba* and Yellow *M. flava* wagtails, Red-throated Pipit, Snow *Plectrophenax nivalis* and Little buntings, Redpoll *Acanthis flammea* were the most common passerines.

The area was visited during summer by 4-5 large flocks of migrating wild reindeers, which followed waterbodies and trampled bird nests and chicks. Wader numbers did not differ considerably compared with the previous year, while reproductive success was below the average.

N.V.Keremyasov

28. Alakit River, Yakutia, Russia (66°50'N, 110°00'E)

The water table on the Alakit and Olenyok rivers was very low during the whole of July, and bars on rivers were difficult to pass by boat. The weather was generally hot, with alternating cloud. Strong winds were not recorded, and rains were mostly short-term. A single thunderstorm occurred on 16 July. Air temperature reached +26°C in the shade on 13 July, but in late July temperatures dropped to +2°C at night.

The weather was favourable for birds in July. Among rodents Ruddy Voles were the most abundant, while *Microtus sp*. voles were rare, and Wood Lemmings *Myopus schisticolor* solitary. Vole numbers were sufficient to support the needs of birds of prey, judging by the large number of chicks in nests in mid summer. Rough-legged Buzzards were numerous and nested successfully. Breeding was also recorded in White-tailed Sea Eagle and Short-eared Owl. Hatching was probably successful in most groups of birds.

N.N.Egorov

29. Bolshaya Trofimovskaya Channel mouth, Lena Delta, Yakutia, Russia (72°48'N, 129°19'E)

Spring was average in timing. Air temperatures rose above freezing point from 31 May, and never dropped below it after 7 June at the south of the delta. Snowfalls were minor, and snow melted quickly afterwards. The snow completely melted on flat surfaces by 11 June. Ice broke earlier than usual, and the water table was average. The middle reaches of the Bykovskaya Channel (southeast delta) became ice-free on 8 June, while the mouth of the Bolshaya Trofomovskaya Channel (east delta) and mouth of the Bolshaya Tumatskaya Channel (north of delta) cleared up on 10 and 11 June, respectively. The summer was warm and dry, and monthly mean temperatures exceeded the long-term average by 3.5°C in June, 1.8°C in July and 3.6°C in August. The last 10 days in June and July were particularly warm with mean temperature +13°C. The passage of a cyclone on 15-17 July was accompanied by rapid drop of air temperature, fitful wind and abundant precipitation, including snow spells. This period of inclement weather coincided with hatching in waders and fledging in Snow Buntings.

The low stage in lemming populations continued for the second year, but juvenile animals appeared in the second half of summer. On the mainland in the southern part of delta the stage of the lemming cycle resembled that in 1999 preceding a peak in numbers.

Arctic Foxes were seen regularly including young animals in the second half of July. Breeding of foxes was not observed in the coastal areas. Adult and young wolves were seen. Ermines were rare, but bred. Among skuas only Arctic Skua bred, while Long-tailed Skuas were observed in early July in wandering flocks up to 100 birds. Snowy Owls were very rare as solitary non-breeders. Rough-legged Buzzards were common, but nested in small numbers mostly in the southern parts of the delta, while numbers of breeding Peregrine Falcons did not change in comparison with 2000-2001. Remains of a Brent Goose were found near one of the Peregine

Falcons' nests. Broods of Raven were seen on the south of the delta.

Weather conditions were favourable for birds. Numbers of Ross's *Rhodostethia rosea* and Sabine's *Xema sabini* gulls, Grey Plovers, Grey Phalaropes, Little and Temminck's stints and Ruffs increased compared with 2001 on the same islands. Nesting of Ringed Plover was observed on the north of delta. However, known colonies of Brent Geese decreased in size and became more dispersed, lacking cores of high nest density. Nesting density of Steller's Eiders *Polysticta stelleri* did not exceed 0.7-1.0 pair/km$^2$, locally reaching 2-3 pairs/km$^2$. High density of King Eiders was observed only in colonies of Brent Geese and large gulls. A nest of Baikal Teal *Anas formosa* was destroyed by Arctic Fox in the presence of observers. Numbers of Willow Grouse and Rock Ptarmigan decreased compared with 2000 and 2001. Grey Plovers nested at an average density 0.7-1.1 pair/km$^2$. Grey Phalarope and Pectoral Sandpiper had relatively low densities approximating 10-11 and 3.5 pairs/km$^2$, respectively. Little Stint occurred in usual numbers (8.2-8.8 pairs/km$^2$), while high numbers were recorded in Temminck's Stint (12 pairs/km$^2$) and Turnstone (6.5-7 pairs/km$^2$).

Nesting success of birds was primarily affected by predation. Most nests of Steller's and King eiders, Long-tailed Duck and Pintail on the surveyed elevated islands were destroyed by Arctic Foxes, often before clutch completion. Nests of divers, Ross's and Sabine's gulls and waders were depredated there by Arctic Foxes, Arctic Skuas, Herring and Glaucous gulls. Low-profile seaside islands were free from Arctic Foxes, and bird clutches there suffered only from large gulls which resulted in high density of broods of Grey Phalaropes, Pectoral Sandpipers and Temminck's Stints. Nest success was above the average (85%) in a Brent Geese colony, and about the average in Bewick's Swan, Herring and Glaucous gulls. Nest success was low in King Eider and Pintail, while Steller's Eider failed completely. Number of Bewick's Swan on a large island (40 by 20 km) in the central delta inhabited also by a family of wolves was considerably lower on 10 August compared with adjacent areas. Overall nest success of waders was low (on average 10-15%) in the delta. Main observations on density and nesting success of waders were carried out on a study plot of about 7 km$^2$ at the east of delta. Nest success there was low in most species: 16.7% in Grey Plover (n=6), 15.4% in Grey Phalarope (n=12), 21.4% in Little Stint (n=28), 47.6% in Temminck's Stint (n=21), 78.6% in Turnstone (n=14) and 0% in Pectoral Sandpiper (n=3) and Ruff (n=2). Values for the two latter species with small samples are likely to be conservative, as broods of Pectoral Sandpiper were observed later in the season. Nest success was low in Red-throated *Gavia stellata* (33.3%, n=6) and Black-throated (40%, n=5) divers and in Ross's and Sabine's gulls. Better performance of Turnstones is, probably, due to their semi-colonial nesting and aggressive nest defence by birds from several pairs in emergency.

V.I.Pozdnyakov, Y.N.Sofronov, S.V.Volkov

30. Lower Adycha River, Yakutia, Russia (67°50'N, 135°50'E)

While bird migration started earlier than usual, spring was very cold, with returns of cold weather. Snow-cover was much thicker than usual, and was covered with an ice-film after sudden cooling in mid May. Almost no melting occurred in the forest in May, and the first flowers appeared on 24 May while normally this happens before 10 May.

Rise of water on the Tuostakh River from 3 to 7 June resulted in complete flooding of the valley, and all colonies of Common Gulls and Common Terns *Sterna hirundo* were destroyed there. Only about a half of Common Terns and 20% of Common Gulls started laying replacement clutches by 17 June. According to reports of local hunters broods of geese and ducks were substantially less common in August compared with previous years. Thus, breeding conditions were unfavourable for geese, ducks, gulls and terns which nest colonially on river islands.

S.M.Sleptsov

31. Kotelny Island, New Siberian Islands, Russia (75°17'N, 139°56'E)

Many Snowy Owls (approximately one every 5-6 km) were seen on the tundra during a helicopter flight along Faddeevsky and Kotelny islands on 27 July. Numerous flocks of waterfowl (several hundred) were seen on lakes at the north of Zemlya Bunge between Faddeevsky and Kotelny islands.

M.Anisimov

32. Northwest of Novaya Sibir Island, Russia (75°20'N, 146°50'E)

During the survey period between 28 June and 28 July the weather was slightly warmer and drier than normal in the first half of the period, while it was colder and wetter in the second half.

Lemmings and Willow Grouse were not seen. Arctic Foxes, Snowy Owls, Geese and ducks were rare and their breeding not recorded with certainty.

M.Anisimov

33. Novaya Sibir Island, southern coast, Russia (74°45'N, 149°00'E)

Snow melt was late: 50% of cover was reported on about 10 July and complete clearance at the end of July. The season was unusually cold with exceptionally abundant precipitation and very strong winds. Snowfalls with wet snow were frequent, and pelting rains were accompanied by thunderstorms which is very unusual for the area. Soil accumulated water quickly and remained wet the whole season even on watersheds. Ice remained near the southern coast for a long time, until mid August, and afterwards ice fields occasionally appeared there.

Lemmings, waders, skuas and Snowy Owls were numerous; ducks and Willow Grouse common. We saw 19 owls at a time in mid August in an area not exceeding 4 km$^2$, and also we saw two broods with 3 and 4 chicks. In contrast to 2001 no wolves or Polar Bears *Ursus*

*maritimus* were seen. Numbers of skuas, waders and Long-tailed Ducks did not appear to be affected by relatively low temperatures and unusually abundant precipitation.

P.A.Nikolsky

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

The summer was warm and relatively dry. September was very windy. Heavy snowfall took place in mid September.

Lemmings, voles, Arctic Fox were common. White-tailed Sea Eagles were regularly seen. The presence of young of most bird species indicated a successful breeding season.

D.G.Fedorov-Davydov

35. Medvezhy Cape, north-western Chukotka, Russia (69°40'N, 162°22'E)

Rains were common during the whole season, not just the period of our visit in late August. Windy weather and storms on the sea were frequent. Westerly and north-westerly winds prevailed.

Lemmings were common. No Arctic Fox, Rough-legged Buzzard or an owl was seen. Only gulls were abundant, all other birds were common including their young.

D.G.Fedorov-Davydov

36. Kolyma River mouth, Kuropatoch'ya River, Russia (69°30'N, 162°00'E)

August was warm and dry. Lemmings, voles, Arctic Foxes, Rough-legged Buzzards and owls were common. Three nests of Peregrine Falcons were found in mid August at 3 km rocky shore of the Kolyma River near the Kuropatoch'ya River mouth. Each family had 2 fledglings and one pair an extra downy chick. An unusually high number of nests and chicks was, probably, related to warm weather and high density of waders. Apart from waders Tundra Swans were numerous, all other birds were common, and most species raised chicks.

S.V.Gubin

37. Akhmelo Lake vicinity, Kolyma lowland, Russia (68°50'N, 161°02'E)

The summer was hot and very dry; more precipitation occurred in September. Snow blanketed the ground and stayed for several days in mid September, but melted soon. In general September was also warm, with rain and snow more frequent than in summer. Snow-cover established on 1 October.

In the second half of the summer only few lemmings were found, while voles were common. No geese or birds of prey were recorded, while most other birds were common and fledged young.

D.G.Fedorov-Davydov

38. Duvanny Yar, Lower Kolyma River, Russia (68°40'N, 159°00'E)

The summer was warm and relatively dry, without frosts and snowfalls. Ice floated along the Kolyma River on 6-10 June.

Lemmings and Arctic Fox were not seen; voles were common. Rough-legged Buzzard, owls, Willow Grouse were common and raised young.

S.V.Gubin

39. Anyuy River mouth, lower Kolyma, Russia (68°20'N, 161°00'E)

The water table rose rapidly in the Anyuy River in the beginning of August. No lemmings or foxes were seen.

Breeding conditions were favourable for geese and ducks due to the warm summer and absence of high floods. High numbers of Willow Grouse and their broods were related to good weather and a heavy crop of berries. Rough-legged Buzzards (successfully bred), ducks, owls and passerines were common, waders and geese rare.

S.V.Gubin

40. Maly Anyuy River mouth, Lower Kolyma, Russia (68°20'N, 161°30'E)

The weather was warm and dry in mid summer, the water table in rivers was fairly stable.

Neither microtine rodents, nor Arctic Foxes were seen. High numbers of Willow Grouse were observed for two years in a row, which in the current summer was due to good weather, abundant berries and decrease of Sable *Martes zibellina* numbers. Ducks were abundant, Rough-legged Buzzard, waders, gulls, owls, passerines common. Most bird species fledged young.

S.V.Gubin

41. Cherskiy settl., Yakutia, Russia (68°46'N, 161°21'E)

Locals reported ice break on the Kolyma River on 6 June and disappearance of snow by late May. June and July were very warm.

Lemmings and Arctic Foxes were not seen, but voles were common. Among birds, waders, Willow Grouse, gulls, owls and passerines were common and successfully bred. Rough-legged Buzzards were rare, but raised young.

S.V.Gubin

42. Chaun-Palyavaam River delta, Russia (68°53'N, 170°44'E)

Snow melted completely by the start of observations on 6 June, and all waterbodies were ice-free. Spring was very early and unusually warm. Cold weather returned on a single occasion between 30 June-1 July, and was accompanied by snowfall.

Lemmings were at a low after peak in 2001. Arctic Foxes did not bred, but they were numerous everywhere on the islands of the delta. Rough-legged Buzzards and Snowy Owls were not observed from 6 June to 12 July.

Waterfowl started nesting earlier than normal, but reproductive success was not high in geese and ducks due to predation by Arctic Foxes. Reproduction was very successful in Bewick's Swan. Nesting density and species diversity of waders were unexpectedly low. Nesting was confirmed only for Grey and Pacific Golden plovers, Pectoral Sandpiper, Dunlin, Ruff, Red-necked Phalarope and Bar-tailed Godwit. Nesting of Turnstone was not confirmed, while Spotted Redshank and Grey Phalarope were rarely observed, and their breeding in the area was unlikely.

D.V.Solovieva

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

Lemming numbers in 2002 were higher than in 2001, and deserved a rank of 4 along a scale of 5. Siberian Lemmings were clearly more abundant than Vinogradov's Lemmings *Dicrostonyx vinogradovi*. High lemming numbers were observed both in mountains and on the plains. Given that the last peak lemming numbers occurred in 1994, and the duration of previous cycles varied from 5 to 7 years, 2002 could have been a peak year and will be followed by a decline in 2003. There is a chance, however, that a super-peak with very high lemming numbers spreading across the whole island will happen in 2003, as it was previously in 1970 and 1981.

Numbers of Arctic Foxes in the area of the main geese colony were below average. Breeding foxes were principal visitors to the colony, including animals from 4 dens with litters at the colony, and at least 4-5 pairs having dens outside the colony territory. Pomarine Skuas bred. Snowy Owls bred everywhere including flat areas of the island, where reproduction of owls is rare compared with the mountains and occurs only when there is a high density of lemmings.

Early spring and rapid snow melt resulted in extremely early dates of reproduction in Snow Geese *Anser caerulescens*. Spring migration in North America was also early, and, unlike the 2001 season, arrival of geese to the island followed the local pattern of air temperature change and the appearance of snow-free patches in the colony. The total spring population was estimated at 107,500 geese, slightly higher than last year. First nests appeared in the colony on 22-23 May. Colony formation was not affected by a shortage of suitable nesting habitat, which resulted in the absence of cuckoldry and egg-laying outside nests. The average clutch size was 4.00 eggs (SE = 0.05, n = 462), and the fraction of nests with 4 eggs was 52.2% which reflects very good conditions for colony formation. There were an estimated 30,300 nests, and nest success was nearly 81%. Good production was also observed at a smaller colony on Wrangel Island. The first chicks hatched on the island on 21 June. However, the weather deteriorated during peak hatching with a snowstorm on 23 June and low air temperatures (below freezing point at night) until 10 July. The second half of July was warmer. August and September were also relatively warm.

Generally, nesting of Snow Geese on Wrangel Island was successful, and the percentage of juveniles on wintering grounds was 26.7% (S.Boyd, pers. com.).

V.V.Baranyuk

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

Snow melted completely by the time nesting started in most bird species. Summer was warm, and mean air temperatures ranged from +5.5-9.9°C in the first half of June. Prolonged cooling in the second half of June and the first week of July was associated with almost daily precipitation (mainly snow) and frost at nights, and mean daily temperatures ranged from –0.5-+4.8°C. A snowstorm on 22-23 June resulted in complete snow cover, but it melted by 24 June. Day-time temperatures exceeded zero during this cold period, and most bird species (geese, passerines, waders and owls) managed not to loose chicks, although chicks of Turnstones from the two earliest broods had to feed in snow-covered tundra on 3 July. Mass movement of Snow Geese with broods to their moulting grounds occurred during the period of adverse weather as well, but there was no considerable decrease in brood size recorded. Warm weather, with mean day temperatures from +3.7-17.7°C, prevailed by the time of mass hatching in waders and fledging in passerines. During August, hot weather gradually gave place to cool weather with positive day-time temperatures and frosts at night.

Numbers of Siberian Lemmings were high, while Vinogradov's Lemming occurred at average or low density in different areas. Undersnow nests of lemmings occurred at a density of 19 per 1 km. Peak lemming numbers can be reached in 2003, if Siberian Lemmings retain their density and Vinogradov's Lemmings further increase in numbers.

In the permanent study plot, Arctic Foxes bred at a density of 0.2 pairs/km$^2$, Snowy Owls 0.27 nest/km$^2$, Pomarine Skuas 0.29 nest/km$^2$ and Long-tailed Skuas 0.36 nest/km$^2$. The plot was also inhabited by a single male Short-eared Owl during the whole season, and was regularly visited by 2-4 Ravens which, however, were promptly chased away by all local skuas and owls. Waders and passerines were not found as prey of Arctic Foxes and owls. The diet of Snowy Owls comprised mainly lemmings (94.8%, n=79), with female Common Eiders being a negligible supplement (5.2%). Remains of juvenile geese were found near a few dens of Arctic Foxes in geese moulting grounds in the Tundra of Academia Lowland. Arctic Foxes were present in all regions of the island in average numbers. Among inspected dens 76.5% (n=51) contained broods. Snowy Owl numbers ranged from 0.025-0.4 nest/km$^2$ in different habitats. Only 59% of owls bred (n=233), and 69 nests were found in total. Long-tailed Skuas were present in high numbers in all habitats suitable for breeding. The distribution of Pomarine Skua was extremely uneven. Apart from the plot in the mountains, this species was rare. Skua numbers were high on the northern plain, but only 49.6% (n=119) of birds bred. Reproductive success of skuas, owls and Arctic Foxes was high. Nest success of

Pomarine Skua on the permanent plot was 84.6% (n=13), mean brood size was 1.55, and chicks started to fledge on 7 August. Chicks hatched in all nests of Long-tailed Skua (n=16), mean brood size 1.75. Arctic Foxes raised large broods (mean brood size 10.33, n=9). Snowy Owl clutches averaged 6.27 eggs (n=41), and the mean size of broods at fledging was 5.07 (n=28, range 0-8).

Snow Geese successfully nested outside the main colony, near Snowy Owl nests. Geese colonies of at least 6 nests were found near 54.6% (n=27) of owls' nests. About 400 pairs of geese bred on the plot of 46 $km^2$. They started egg-laying on 24-25 May, and broods started to move on 21 June. Mean clutch size was 4.41 (n=94), mean brood size after hatching 3.74 (n=156), and mean brood size at fledging in August was 3.67 (n=18). Predation of geese nests in colonies near owls was insignificant, and mass death from diseases was not observed.

A single nest of Brent Goose was found near an owl nest, and this goose nest was successful. Common Eider nested in the inland areas of the island in high numbers, although large colonies were not found. Eiders started egg-laying before 10 June, and hatching occurred from early July to early August. Mean clutch size was 4.88 (n=17), and mean brood size after hatching was 4.83 (n=12).

Geese, waders and passerines started breeding earlier than normal. Mass fledging of Snow and Lapland buntings occurred at the end of June. The breeding season for waders was longer than usual, their broods were numerous in July and August. Dunlins were less common than usual. Predation pressure was low, and reproduction of birds was successful.

I.E.Menyushina

45. Belyaka Spit, Chukotsky Peninsula, Russia (67°04'N, 174°37'W)

Spring and summer were very early, warm and dry which is unusual for the north of the Chukotsky Peninsula, and affected plant, invertebrate and bird breeding phenology. Snow cover was reduced to 50% before late May, and had gone completely from level areas by 7 June. Waterfowl were able to utilize clear water on small lakes as early as late May. Mean day air temperature rose above freezing point on 1 June, and did not drop below it during the period of surveys. Maximum air temperatures generally were above +10°C, while minimum dropped below freezing only twice after 3 June. Most lakes completely cleared of ice by mid June, except for the largest where ice remained until late June. Ice broke on 15 June in the mouth of the Kolyuchinskaya Gulf channel which is considerably earlier than in 1986-1988 (1-9 July). The first flowering dwarf willows *Salix chamissonis* were found on the southern slopes of coastal dunes on 28 May, the first day of studies, while mass flowering occurred from 3 June. Greening of willow buds and leaves of sedges started from 7 June, caddis flies (Trichoptera) appeared *en masse* on 3 June, Chironomidae and craneflies (Tipulidae) on 14 June. The first mosquitoes and moths were seen on 14 June, while from 16 June the first butterflies were recorded. These events indicate the development of phenological events approximately 2 weeks earlier compared with previous observations. Snowfalls occurred only twice during summer (23-24 June and 2/3 July), but snow cover existed for less than half a day on both occasions and did not seriously affect bird reproduction.

Lemming numbers were low: a single Brown Lemming *Lemmus trimucronatus* was seen in spring. Presumably, numbers decreased during winter, as under-snow nests, burrows in snow and other signs of activity were found. Peak numbers probably occurred in 2001, as last year nests of Rough-legged Buzzards were found on onshore navigation constructions both on the Belyaka Spit and Yuzhny Island. Numbers of Arctic Ground Squirrels *Citellus parryi* also were very low, and they were spotted only 4 times during the whole summer. Tundra Voles were locally abundant near the hut.

Arctic Foxes were numerous, and were seen almost daily up to 3 times a day in June. Differences in coloration after the start of moult permitted the individual distinction of at least 5 animals at the northern portion of the spit. Interestingly, fox abundance decreased from 47 visual records in June to 11 in July. Despite the low abundance of lemmings, one pair of foxes bred and had 2 cubs in a den on Yuzhny Island in July. None of the avian predators bred. Observations of Snowy and Short-eared owls were solitary.

Early spring development led to the early arrival and start of reproduction by birds. The shift in timing of breeding was more pronounced in waterfowl than in waders. The first White-billed Divers arrived in late May, Red-throated Divers on 1 June. Divers had complete clutches before 20 June, while the first incubating Emperor Goose *Anser canagicus* was found on 10 June. Among waders, Turnstones were the earliest breeders with the first complete clutch on 6 June. Spoon-billed Sandpipers *Eurynorhynchus pygmeus* arrived on 2 June, only 1 day earlier than previously recorded dates, and started egg-laying on 8 June. Average clutch size and brood size after hatching were higher in this species compared with previously collected data.

Predation pressure on bird clutches was high. Clutches of many species were destroyed completely: divers (except White-billed Diver), Emperor Geese, Pintail, gulls, Grey Plover. Solitary broods of Common Eider and Long-tailed Duck were seen in July. Large birds (White-billed Diver, Tundra Swan *Cygnus columbianus* and Sandhill Crane *Grus canadensis*), probably, suffered less from predation, because broods of these species were observed. Ducks and waders were able to gain some reproductive success with replacement clutches, following the decrease in Arctic Fox abundance in July. Mayfield nest success in Spoon-billed Sandpiper was 40.2±3.3% (n=16); in Temminck's Stint 25.4±4.1% (n=11); in Turnstone 19.9±6.3% (n=7), and in 11 wader species combined 31.4±2.1% (n=42). Chick survival was, probably, high.

Numbers of Red-throated Diver, Long-tailed Duck, Grey Plover, Spoon-billed Sandpiper, Dunlin, Arctic

Tern, and, probably, of Grey Phalarope and Herring Gull decreased compared with their numbers in the 1970s and 1980s. In contrast, numbers of Black-throated and White-billed divers, Emperor Goose, Tundra Swan, Ringed Plover, Temminck's Stint, Rock Sandpiper *Calidris ptilocnemis* and Glaucous Gull increased.

P.S.Tomkovich, V.A.Buzun, M.Kashiwagi, W.Liu, J.McCallum, I.A.Taldenkov

46. Atchavyvrer River basin, Chukotsky Peninsula, Russia (66°55'N, 173°00'W)

Weather was changeable during the 4 days of surveys (29 June – 2 July), but clear sky prevailed.

Lemmings were seen on 3 occasions in the lower reaches of Teninveem River, and one vole was seen in the lower reaches of Aanraveem River.

Two Arctic Fox dens surveyed in the Atchavyvrer River basin were uninhabited, but one fox was seen as well as their fresh tracks in three places. A Brown Bear female with 2 yearlings was seen there as well. Long-tailed Skuas were common, and they were seen attacking a Snowy Owl to the south of Kynetlyun Ridge. Several colonies of Herring Gulls were found on lake islands in the Teninveem River delta. Breeding of birds of prey was not recorded.

Bird numbers were relatively high. We found nests or broods of Sandhill Crane, Western Sandpiper, Dunlin, Grey Phalarope, four nests of Common Eider with clutches and two more depredated nests. Some eggs were damaged by skuas in one of two inspected nests of Long-tailed Duck. Clutches were destroyed by predators in 4 found nests of Emperor Goose. Local pairs of the latter species and Sandhill Crane were numerous in late May when we passed through the Achavyvrer River basin on an all-terrain vehicle, but neither pairs, nor nests were found in July. An Emperor Goose egg buried by an Arctic Fox was discovered.

Generally, reproductive success was, probably, average, but low in some species.

E.E.Syroechkovski, Jr., H.Karhu, M.Kashiwagi, C.Kelly, E.G.Lappo, W.Liu, C.Zöckler

47. Kolyuchinskaya Gulf eastern coast, Chukotsky Peninsula, Russia (66°46'N, 173°55'W)

Warm and dry weather prevailed during surveys from 5-8 July. Lemmings and voles were not seen.

Arctic Foxes were seen several times, including one record on a lake island where it was searching for food in the deserted colony of large gulls. Owls were not seen, and birds of prey did not nest. We saw Gyrfalcon, Peregrine Falcon, Herring and Glaucous gulls and numerous wandering Long-tailed Skuas at the north of the area. A pair of Arctic Skuas was observed catching and eating an adult wader, presumably Dunlin. Numbers of breeding birds were low, possibly, due to heavy predation pressure. According to reports from local reindeer herders numbers of at least large birds were higher in other years. Ringed Plovers alarming on the gulf coast were most common, while Sandhill Cranes, Dunlins, Yellow Wagtails and Lapland Buntings were relatively rare. Only few Grey Phalaropes, Turnstones, Reeves, Temminck's Stints, Rock and Pectoral sandpipers were alarming near broods. Fledged young Lapland Buntings were seen. Waterfowl (divers, geese, swans and ducks) were common and locally numerous, but no signs of reproduction were recorded.

According to general impression, reproductive success of birds varied from zero to average, being low overall particularly in geese and swans.

E.E.Syroechkovski, Jr., C.Kelly, E.G.Lappo, P.S.Tomkovich, C.Zöckler

48. Rekokavrer Cape, Kolyuchinskaya Gulf, Chukotsky Peninsula, Russia (66°41'N, 173°55'W)

Summer apparently was dry judging by dry marshes and low water table in lakes.

Lemmings, Arctic Foxes and owls were not seen during the two-day visit on 8-9 July. Birds of prey did not nest, but we saw Peregrine Falcon, White-tailed Sea-eagle, Herring and Glaucous gulls. Nests of Ringed Plover, Spoon-billed Sandpiper and Temminck's Stint were found with hatching chicks. Broods of Dunlin were common, while alarming Red-necked Phalarope, Red-necked Stint *Calidris ruficollis*, Reeve and Pectoral Sandpiper occurred in small numbers. Emperor Geese were moulting on the lagoon in considerable numbers. Nests of waterfowl were not found, but nest predation pressure was not high based on the relatively high abundance of wader broods in the area.

E.E.Syroechkovski, Jr., C.Kelly, E.G.Lappo, P.S.Tomkovich, C.Zöckler

49. Neshkan settlement, Chukotsky Peninsula, Russia (67°02'N, 172°55'W)

Snow cover reduced to 50% (20% near settlement) on 21 May which is very early. The Chukchi Sea was ice-free in late May, and wide fast ice along the coast was afterwards broken 2-3 weeks earlier than normal. Mass flowering of cotton-grass was observed on 24 May along with activity of various invertebrates: spiders, bumble-bees, flies and caddis-flies.

*Microtus sp*. voles were common on the dumping places around the village. Rodents were rare in the tundra of the Neshkan Spit: we saw burrows during snow-melt, and 3 Brown Lemmings were seen in June and July on the coast and in the tundra. Under-snow nests, tracks and droppings were relatively numerous in the hilly area on the southern coast of the lagoon, but animals were not seen. Local residents reported a high abundance of lemmings in 2000.

Pintails, Common Eiders, Sandhill Cranes, Herring and Glaucous gulls arrived in the beginning of the last 10-day period of May, while Willow Ptarmigans, Snow Buntings, Pectoral, Western *Calidris mauri*, Semipalmated *Calidris pusilla* and Rock sandpipers were actively displaying at this time. Snow and Brant geese and Rough-legged Buzzards were migrating westwards. Lapland Bunting carrying nest material and a female Western Sandpiper ready to lay an egg were seen on 23-24 May.

Arctic Foxes were not seen near Neshkan, probably due to abundant dogs near the settlement. Arctic Foxes were seen twice and wolverine once on the southern coast of the lagoon. Two wandering Snowy Owls were recorded on 24 May and 3 June, and one Short-eared Owl on 4 June. Rodent-specialist avian predators did not breed. A pair of Peregrine Falcons was found on off-shore Idlidlya Island, and several pairs were seen near Enurmino settlement. Colonies of Herring and Glaucous gulls were found on rocky Idlidlya Island and on the flat islands of the lagoon.

Judging by the commonness of birds with broods, reproductive success of waders and passerines was not below the average in the close vicinity of Neshkan. Fledged juveniles of Semipalmated Sandpiper were observed on 10 July. Waterfowl numbers near the settlement and on nearby lagoons were low, presumably due to hunting by local people continuing during the whole summer.

E.E.Syroechkovski, Jr., V.A.Buzun, H.Karhu, C.Kelly

50. Chukotsky Peninsula inland uplands east of the Koluchinskaya Gulf, Russia (66°20'N, 172°50'W)

Quick surveys of the area were carried out from 9-10 July and from 13-17 July in the course of the trip on an all-terrain vehicle and foot-excursions during stops. Summer was dry judging by the low water table in rivers and lakes. The snow must have melted early in spring, because Chegitun River valley was observed to be 80% free of snow on 21 May during the helicopter overflight.

Lemmings and voles were not seen, but a few under-snow nests were found. Hares were seen rather often, while Arctic Ground Squirrel rarely.

Arctic Foxes were not seen, but a solitary Wolverine was recorded and tracks of wolf were seen. We saw also 4 Brown Bears, including one female with cubs. Three records of non-breeding Snowy Owl were made. Northern Pikas occurred everywhere on stony patches at moderate density, and their remains were also found in nests of Rough-legged Buzzards. The latter species had low numbers: only 3 nests were found, each with 3 chicks. The bodies of 2 Arctic Ground Squirrels and a juvenile Collared Lemming were inspected in one of the buzzard nests. Peregrine Falcons, Arctic and Long-tailed skuas, Herring Gulls and Ravens were recorded.

Willow stands along the rivers had a relatively high density of passerines, while bird populations in the tundra were low with Sandhill Cranes, Pacific Golden Plovers, Red-necked Stints, Yellow Wagtails and Lapland Buntings being the most common. Broods of Willow Grouse, Ringed Plovers, Temminck's Stints and Baird's Sandpipers *Calidris bairdii*, Wheatears *Oenanthe oenanthe* and Snow Buntings were found in suitable habitats. Solitary broods of Black-throated Diver, White-fronted Goose, Mongolian Plover *Charadrius mongolus*, Turnstone, Western and Pectoral sandpipers, Knot, Dunlin and Common Snipe were recorded. We saw fledglings of Red-necked Stint, Temminck's Stint and Baird's Sandpiper, Common Snipe, Pied and Yellow wagtails, Wheatear, Lapland and Snow buntings. A nest of White-billed Diver, in which the eggs had been depredated, was found on Kuuskyn Lake. Reproductive success of birds was not below the average based on the overall abundance of broods.

E.E.Syroechkovski, Jr., C.Kelly, E.G.Lappo, P.S.Tomkovich, C.Zöckler

51. Lavrentia settlement, Chukotski Peninsula, Russia (65°35'N, 171°00'W)

The area was visited twice in 2002: from 15-21 May and from 18-31 July. Spring was early and snow-free patches occupied 5% of the area on 15 May, expanding to 50% near the settlement. Clear water of the Bering Strait adjoined the ice-covered Lavrentia Bay. Sandhill Cranes were actively migrating to the west on 15 May. Pintails, Teals and Western Sandpipers were recorded, and some Snow Buntings were already in pairs. Cotton-grass flowers and active spiders were seen on 19 May, and Western Sandpipers initiated territorial displays and pair formation. Summer was warm and dry. The first berries of bog bilberry had ripened by 25 July.

Lemmings were not seen, but their burrows appeared from melting snow on hill slopes. A fledgling Long-tailed Skua regurgitated a vole in late July. Arctic Ground Squirrels were regularly seen on the settlement outskirts.

Arctic Foxes and owls were not recorded, but dogs were common in the settlement and its vicinity. Peregrine Falcon, Rough-legged Buzzard and Arctic Skua were rarely seen, while records of Ravens and, particularly, Herring and Glaucous gulls were common. Pomarine Skuas were common spring migrants. Among birds of prey a single pair of Peregrine Falcons presumably nested on an island in the bay. A single juvenile Long-tailed Skua was barely flying in late July, thus providing evidence of skuas breeding in the area.

Ringed and Semipalmated *Charadrius semipalmatus* plovers alarming near broods, having at least 2-3 chicks at fledging, were not rare in late July on the wide gravel cape where the settlement, airport and deserted part of the village are placed. Broods of Red-necked Phalaropes, Turnstones, Red-necked and Temminck's stints and Ruffs were rare. Locally fledged Western Sandpipers, Pied and Yellow wagtails, Lapland and Snow buntings were common by the second half of July, while migrating juvenile waders started to gather in flocks in the last week of July. Tundra on hills was populated at low density. Pacific Golden Plovers were most common there, although Sandhill Cranes with broods, Red-necked Stints, Rock Sandpipers, Dunlins, Red-throated Pipits, Wheatears and Lapland Buntings were seen in small numbers. A nest of Pintail was also found. Common Eiders were still incubating on the islands of Lavrentia Bay, but one brood was seen.

Judging by the frequency of brood records, reproductive success was probably low in waterfowl and from average to high in waders and passerines in the vicinity of the settlement.

P.S.Tomkovich, J.Bunting, E.E.Syroechkovski, Jr., C.Zöckler

52. Lavrentia settlement, Chukotsky Peninsula, Russia (65°35'N, 171°02'W)

Long-term, whole-year studies of carbon and water cycles and energy flows in typical tundra were carried out by Department of Ecology of Biological Faculty of the Moscow State University and the Russian Academy of Sciences, which included measuring of climatic parameters and phenological observation.

The spring was the earliest and warmest on record during the last 5 years of observations. Snow melt and phenological events in plants and insects occurred approximately two weeks earlier than normal. Snowfalls or storms were not recorded during the summer. The summer was one of the warmest, sunniest and driest during the last 5 years, which resulted in melting of all snow patches in the area. Southerly winds prevailed during summer, and the Lavrentia Bay was ice-free during almost the whole summer and autumn. The average air temperature in autumn (September-mid November) was twice the value in 2001. Average humidity of the upper soil layer dropped below 50% in summer indicating an unusual drought. Wind strength from June to October was below the average. With a general warming tendency during last 30 years, 2002 season was the warmest since 1995 as determined from the sum of ambient temperatures (mean monthly air temperatures were –0.9°C in May, +7.3°C in June, +8.0°C in July, +8.2°C in August, +3.8°C in September, –0.4°C in October).

Lemmings were practically absent in summer, as in 2001. Owls and Arctic Foxes were not seen, while skuas were present in usual numbers. Most waders and passerines arrived earlier than normal in spring. Sandhill Cranes migrated at the usual time in autumn. Generally conditions were favourable for most breeding birds in 2002.

D.G.Zamolodchikov, D.V.Karelin

53. Anadyr Estuary, northern coast, Volch'ya River, Russia (64°48'N, 177°33'E)

In total 153 animals (90 rodents and 63 shrews) were captured per 2700 trap-days (1600 snap-trap-days and 1100 cone-days) in the first half of August. Relative numbers of rodents were 3 animals/100 trap-days. In the catches, rodents were represented primarily by Tundra, Ruddy and Grey-sided voles, 2 Siberian and 2 Collared lemmings, few Arctic Ground Squirrels and Northern Pikas *Pica pica*.

Owls, skuas, Red and Arctic foxes were not seen.

N.Dokuchaev

54. Area between Velikaya River mouth and Vtoraya Rechka River, Chukotka, Russia (64°30'N, 176°50'E)

The summer was rainless, and tundra fires spread over vast areas. Numbers of spawning salmons were low, and brown bears failed to accumulate enough fat.

Lemmings were practically absent in summer after their peak number in spring 2001. Willow Grouse has occurred in low numbers for several years in a row. According to general impression, Arctic Foxes have become less common in recent years; whilst the situation for Red Foxes and Ermines is the opposite.

O.D.Tregubov

55. Anadyr Estuary, southern coast and Dionisiya Mountain, Russia (64°34'N, 177°19'E)

The study period (27 July-1 August) was warm with very few rains. The tundra was dry and many springs dried out. The yield of bog blueberry and cloudberry was good, but berries of the latter were small due to drought.

In total 29 animals (25 rodents and 4 shrews) were captured per 1200 trap-days (700 snap-trap-days and 500 cone-days). Lemmings were not recorded. Tundra and Ruddy voles, as well as 2 Arctic Ground Squirrel were captured. Relative numbers of rodents 1.9 an./100 trap-days are especially low given that traps were put in places with fresh signs of rodent activities. According to reports of local people numbers of rodents peaked in 2001.

Owls, skuas, Red and Arctic foxes were not seen.

N.E.Dokuchaev

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

The low precipitation during the study period (27 June-9 September) did not result in drought in 2002. This is because the study area is situated in the coastal belt, separated from the Anadyr Lowlands by Koryaksky and Meinypylginsky ridges, and has a seaside monsoon climate. This area is characterized by high relative humidity, high fraction of overcast days, frequent fogs and drizzle in summer. The weather conditions in 2002 did not differ from the average and were relatively cool in contrast with adjacent areas exposed to drought and fires in August. Insufficient moistening in the area could be noted only on meadows and resulted in low and sparse vegetation. After the last snow patches melted in the mountains in August water levels in rivers dropped considerably below the norm.

No lemmings, voles, Arctic Foxes were recorded.

Unlike the two previous years, channels connecting lakes Vaamochka and Pekulneiskoe with the sea were blocked after storms in autumn 2001. The channels were cleared by local people only on 21 June 2002 which is approximately 1 week later than normal. Intensive snow melt and absence of drainage resulted in the highest rise of water in the lakes for the last 8 years. The water table exceeded the August level at 2.6 m, and nesting habitats in river deltas, low shores, islands and spits of lakes were flooded until early July. This resulted in delay of nesting by some of birds by 8-10 days and cancellation of breeding by a fraction of geese. Clutches of Common Eider on low parts of spits contained 1-3 eggs during the first week of July, while birds at elevated areas had 4-6 eggs. Eider pairs were still recorded until 20 July, while in previous year most males departed before 10 July. A pair of Red-throated Divers, which has bred annually on a lake island, started nesting only on 7 July.

Geese numbers increased considerably after fledging in the second half of August in Meynypilgynskaya system compared with previous years. Birds presumably migrated to the system from regions with adverse conditions. Birds consumed almost completely the heavy crop of bog bilberry, cloudberry and crowberry, feeding even in normally avoided localities with poor visibility.

E.V.Golub, A.P.Golub

57. Savonga vicinity, Saint Lawrence Island, USA (63°41'N, 170°28'W)

The amount of snow accumulated by spring was low. Spring was unusually early, and summer very dry, sunny and relatively warm. By 20 June snow was absent on coastal lowland tundra and the settlement, and plant growth started there, resulting in a clear greenish aspect, in contrast with the yellow aspect of the same places in late June in 2000-2001. Mosquitoes appeared on 25 June which is 3 weeks earlier than in 2001 and almost 2 weeks (12 days) earlier than in 2000.

Root Voles were very abundant in the tundra – considerably more so than in 2001, and similar to 2000. Numbers of *Cletrionomys* voles in stony talus and on the coast remained high for the second year in a row.

As in 2000-2001, Snowy Owls were never seen during the period of studies between 20 June and 28 August. Rough-legged Buzzard was seen only once, on 17 July, in the lowland of the island centre. Long-tailed and Pomarine skuas were always common in the tundra, while Arctic Skuas were considerably less common. Skua nesting was not observed in the vicinity of Savonga, but Long-tailed Skua, probably, bred somewhere on the island because two flying juveniles led by an adult bird were seen on 5 August. Juveniles were not observed in other species of skuas. The coastal area of the island (shore, stony talus and sea-side tundra) was inhabited by numerous Arctic Foxes, Ravens, Herring and Glaucous gulls.

The first chicks of Thick-billed and Common murres hatched on 22 and 26 July, respectively, which are 3 days earlier than in 2001. Hatching in Crested *Aethia cristatella* and Least *A. pusilla* auklets was recorded on 24 and approximately 16 July, 4 and at least 10 days respectively earlier than in 2001. Chicks of Kittiwakes hatched on 12-14 July. Reproduction in Thick-billed and Common murres, in Crested and Least auklets and in Kittiwakes was successful.

V.A.Zubakin

58. Saint George Island, Pribilof Islands, USA (56°35'N, 169°40'W)

The island experienced a mild winter and most of the area was snow free upon our arrival on 2 May. However, large snowfields persisted on steep, northwest-facing slopes and ridgelines. Before 20 May daytime temperatures ranged from 2-9°C and winds were predominantly from the southwest or southeast, usually at 5-15 knots but some days (e.g., 5-7 May) steady at 30-40 knots. Low clouds, fog, snow squalls, and/or rain were experienced most days.

A lemming was seen in the mouth of a fox on 8 May; no other signs of overwinter survival.

Paired Rock Sandpipers were noted on 3 May, as were numerous other males in flight display. A 3-egg clutch was found on 13 May (4th egg laid 15 May); a single egg nest was found on 16 May; and 2, 4-egg clutches were found 14-15 May indicating birds on St. George were on a similar schedule as birds on adjacent St. Paul Island in spring 2001 (see Arctic Birds # 4). The nesting density of Rock Sandpipers on St. George in 2002 appeared to be about twice that on St. Paul in 2001. Density is likely to be a function of the different landcover composition between the two islands with St. George having more heath and shrub tundra than St. Paul and less forb tundra and sand dunes than St. Paul. St. George also appeared to have fewer Arctic Foxes and about half the number of caribou as found on St. Paul. Fox populations on St. George are likely constrained by the limited intertidal areas accessible to them as compared to that available on St. Paul.

R.E.Gill, Jr., M.N.Dementiev, D.R.Ruthrauff, L.Tibbitts

59-60. Bristol Bay Lowlands, USA (57°20'N, 157°50'W) and Becharof Alpine Area / Ruth Lake, USA (57°36'N, 156°08'W)

The spring seemed to be late with waders delayed in the lower 48 states. The spring was cool, but in May the weather became exceptionally warm without much rain.

S.Savage

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

Spring break-up was among the earliest on record on the Yukon Delta.

Brant nest density varied among 5 Yukon Delta colonies, from approximately 50% of the average level (Kokechik) to slightly above the average (Kigigak and Tutakoke). Emperor Goose nest densities increased in 2002. The 2002 spring estimates of total Tundra Swans, breeding pairs, and nests on the Yukon Delta were all at record high levels (since estimation started in 1985). Ideal weather during nesting, low levels of fox predation, and the lack of flooding contributed to good production.

U.S. Fish and Wildlife Service. 2002. Waterfowl population status, 2002. U.S. Department of the Interior, Washington, D.C. 51pp.

62. Kanaryarmiut Field Station, Yukon Delta National Wildlife Refuge, Alaska, USA (62°13'N, 164°47'W)

Spring ice break-up was early compared to both 2001 and the long-term (15-year) average. The weather was cool, wet, and windy in the first half of May, but then generally drier and warmer through mid-June.

In 2002, we completed the fifth consecutive year of shorebird studies at our long-term study site on the central Yukon-Kuskokwim Delta.

Since at least 1984, arvicoline rodents, primarily voles (*Microtus spp.*), on the Yukon-Kuskokwim Delta have exhibited a 4-year population cycle. The last peak oc-

curred in 2000; the next is expected in 2004. Unlike other shorebird species in other areas of the arctic, nest success of Western Sandpipers is not obviously correlated with rodent cycles at our study site. The years of highest and lowest nest success, 1998 (0.55) and 2002 (0.11), occurred at the same stage of the rodent cycle (i.e., 2 years after peak rodent numbers). Nest success during the rodent population high in 2000 was intermediate (0.37) and was not statistically different from the 5-year mean at our site. We hypothesize that this lack of correlation is due to 1) the lower amplitude of rodent population highs in our region compared to other regions in the arctic, and/or 2) the high annual abundance of alternate prey species for predators which may buffer them against dramatic fluctuations in rodent populations. In addition to mink, both Red and Arctic Foxes were observed on our study site in 2002. Between the first Western Sandpiper clutch initiation and the final fledging (~60 days), Red and Arctic Foxes were detected on 5 and 17 days, respectively. Among avian predators, both Long-tailed and Arctic Skuas were seen almost daily throughout the breeding season.

As in past years, Western Sandpipers were the focus of our investigation. The first Western Sandpiper clutches were initiated on 17 May, which was 8 days earlier than in 2001, and 2 days earlier than the previous early date at our site (19 May in 1999). In 2002, 50% of first nests were initiated as of 23 May. By comparison, in 2001, it was 5 June before 50% of first nests had been initiated. In past years, nest density has been calculated as simply the number of nests found divided by the study area size (= 16 ha). By this measure, nest density in 2002 was the lowest recorded to date, 2.63 nests/ha versus a mean of 3.01 nests/ha (range 2.95-3.06) for 1999-2001. The number of nests found, however, is at least partially a function of nest predation (i.e., fewer nests found when predation rates are high). Nest predation in 2002, probably primarily by mink *Mustela vison*, was very high; Mayfield nest success was only 0.11, compared to a mean of 0.34 (range 0.21-0.55) for 1998-2001. When rates of nest loss are considered, nest density in 2002 may have been as high as 4.56/ha.

High rates of nest loss led to high rates of re-nesting; 35% of pairs that lost nests re-nested. The mean interval between the loss of a first nest and the initiation of a pair's second nest was 6.4 days. There was no correlation between the age of the nest lost, and the interval required to initiate the second clutch. By eliminating second nests from consideration, we estimated the density of breeding pairs on the study area (i.e., number of pairs that initiated at least 1 clutch) to be 3.56 pairs/ha.

Among clutches which hatched, fledging success (defined as a clutch fledging one or more young) was only 39%, compared with 58% in 2001. Overall in 2002, only 4% of clutches initiated resulted in fledged young.

B.J.McCaffery, D.R.Ruthrauff, M.K.Spies

63. Nome area, Alaska, USA (64°32'N, 165°25'W)

Snowmelt was normal compared to the unusual situation in 2001 when most of the region was snow-covered until mid-June. When I arrived on 13 June, all of our usual study sites were snow-free.

As in the 2001 season, lemmings were not evident. The only rodents observed were Arctic Ground Squirrels. We recorded numerous Long-tailed Skuas (several nests found), and a few Arctic Skuas (no nests found). No Pomarine Skuas, owls, or foxes were seen.

Furthermore, vegetative development and flowering indicated that nesting conditions were favourable when birds returned in early spring. Nesting Golden Plovers (both *Pluvialis fulva* and *P. dominica*) were relatively abundant with densities in suitable habitats on the order of 3-4 pairs/km$^2$ for *dominica* and 1-2 pairs/km$^2$ for *fulva*. Our field work involved only these two species, and we had the following objectives: 1) continued assessment of site- and mate-fidelity, 2) collection of eggs for contaminant analyses, 3) obtaining additional measurements in both taxa. During our stay, we recorded almost no predation – only one clutch of *dominica* (out of eight being monitored) was lost. We departed on 25 June before hatching began so have no knowledge of subsequent reproductive success.

O.W.Johnson

64. Kobuk National Park & Preserve, USA (66°58'N, 159°35'W)

Major snow (estimated 2-10 cm) at higher elevation with wind and freezing temperatures occurred for 12-18 h on 31 May.

All evidence points to 2002 as being a low in microtine rodent cycles. At 14 of the 22 sites we recorded no evidence of voles or lemmings, while single Red-backed and Tundra voles were noted at only 2 and 3 sites, respectively.

No owls were observed during the study period (30 May - 12 June). Observers were present on this plot between 30 May and 1 June with actual census work conducted 30-31 May. The plot is in the Waring Mountains and contains mostly patchy boreal forest (which is at its northern limit in this portion of Alaska) and alpine tundra. The north end of the plot rises abruptly from the broad floodplain of the Kobuk River. The plot was mostly snow free except for forested portions and north-facing exposures where <15% snow cover was usually found. Daytime temperatures reached +12°C but dropped to –2°C at night. The avifauna recorded on the plot reflected the predominantly forested landscape with species like Gray Jay *Perisoreus canadensis*, Gray-cheeked Thrush *Catharus minimus*, Varied Thrush *Ixoreus naevius*, Yellow-rumped Warbler *Dendroica coronata*, Fox Sparrow *Passerella iliaca*, and Pine Grosbeak *Pinicola enucleator* occurring regularly. A single species of wader, Wilson's Snipe *Gallinago delecata*, was recorded on the plot, while the only mammal observed was the Porcupine *Erethizon dorsatum*. Most species were actively singing and chasing suggesting that birds were still establishing territories and acquiring mates.

Only Common Ravens were repeatedly seen making direct flight to and from areas suggesting they may have already been feeding young.

R.E.Gill, Jr, M.N.Dementiev

65. DeLong Mountains, USA Noatak National Park & Preserve, Alaska, USA (68°24'N, 160°55'W)

During our 2 days (3-4 June) on the site at elevations 460-1,300 m a.s.l., we experienced clear skies and no precipitation. Cold evenings and mornings, and very warm days with daytime temperatures of approximately +15°C and night-time temperatures of approximately –2°C. No wind.

We spent about 46 hours at this montane site located on the northern border of Noatak National Preserve. The landscape held snow only on northern exposures, but despite the large amount of available habitat, we encountered very few individuals of sixteen bird species. We encountered only two wader species during our stay, Wandering Tattler *Heteroscelus incanus* (2 individuals detected, calling) and Surfbird *Aphriza virgata* (one individual detected, calling); neither species were confirmed breeding. It is our impression, however, that our visit was timed during the peak period of display and territory establishment as most passerine detections were of singing or displaying males. We detected no sign of microtine rodents, but sighted Caribou *Rangifer tarandus*, Dall Sheep *Ovis dalli*, and Arctic Ground Squirrels throughout the area.

R.E.Gill, Jr., T. van Pelt, D.R.Ruthrauff

66. Noatak National Park & Preserve, USA (68°04'N, 157°57'W)

A prolonged warm spell in mid-May over most of the Brooks Range resulted in rapid melt of snow and ice leaving mostly snow-free habitat upon arrival of birds. Conditions were well advanced at the study site (330-460 m a.s.l.) on 6-8 June 2002. The ground was nearly snow-free and creeks were running and had very little shore ice. Small ponds were mostly ice-free while large ponds and lakes were still mostly ice-covered. Cottongrass *Eriophorum vaginatum* and Bog Blue-berry *Vaccinium uligonosum* were in full bloom. No extreme weather was recorded during the period save for snow that fell on 31 May and blanketed mostly higher (>500 m) elevations throughout the area.

No signs of presence of lemmings, voles or foxes were found.

Pacific Loons *Gavia pacifica*, Long-tailed Ducks, and Greater Scaup *Aythya marila* were feeding in pairs indicating that females had not yet started incubating. Long-tailed Skuas and Whimbrels mobbed predators in apparent attempts to direct them away from nests. A pair of Northern Harriers engaged in courtship flights; likewise, American Golden-Plovers, Semipalmated Plovers, and Wilson's Snipe performed flight displays. Most detections of passerines were of males singing from prominent perches, indicating that territory set up and egg-laying were underway; an exception was the American Robin *Turdus migratorius* (an early migrant), most individuals of this species were alarm-calling, suggesting that egg-laying was complete. At an adjacent site during the same time period, we found many Lapland Buntings incubating complete clutches of eggs. Willow Grouse were present but quite inconspicuous suggesting that their breeding display period was over and that females were incubating.

R.E.Gill, Jr., J.Morse, L.Tibbitts

67. Kuparuk Oilfield, USA (70°17'N, 149°45'E)

I think the Kuparuk River broke during the last week of May or first couple days of June. Upon arrival on 31 May, most snow (~90%) in the flat areas was melted. June was more overcast and rainy than normal. July was sunnier than June. We experienced one major storm (on July 2-3) and associated high winds (~50 km/h). The storm resulted in minor snow accumulation (< 5 cm) that melted within 1.5 days. In general it was an early and rainy season.

All 4 observers over 2 months in the field observed lemmings only 3 times. No trend in lemming abundance was apparent during the course of the season. We did not capture lemmings.

We searched for and monitored all nests on study plots every 3-6 days until nesting fate was determined. In total we discovered 231 nests of 18 species from 7 June to 22 July; of these 70 nests were discovered off-plot. 47.6% of nests successfully hatched, 37.2% failed, and we were unable to reliably assess the fate of 35 nests. Most nests failed due to predation (72 of 86 nests, 84%). Other causes of nest failure included: weather (n=4), caribou trampling (n=4), human-induced (n=4), and infertile eggs (n=2). Mayfield estimates of nesting success for the three most common species were 0.382 for Lapland Bunting (n=65), 0.587 for Pectoral Sandpiper (n=44), and 0.647 for Semipalmated Sandpiper (n=39).

We conducted three 10-minute point count surveys for potential nest predators on all plots with a total of 4 replicates of this survey on all plots during the course of the season. Eight potential predator species were recorded: Arctic Ground Squirrel (n=1 detection), Snowy Owl (n=1), Common Raven (n=4), Arctic Fox (n=5), Pomarine (n=1), Arctic (n=74), and Long-tailed skuas (n=61), Glaucous Gull (n>100 detections). The most common potential predators were Glaucous Gull, Arctic and Long-tailed skuas. Arctic Foxes were common and bred.

Nesting success for the three most common species appeared to be higher than the average (based on the results of previous studies carried out in this area).

J.R.Liebezeit

68. Simpson Lagoon, Prudhoe Bay, Alaska, USA (70°32'N, 149°16'W)

Both 2000 and 2001 were considered years of late ice break-ups, yet ice break-up in 2002 was even later. Consequently, median initiation date was delayed in 2002 and fewer eiders nested. Among nesting Common Eiders clutch size did not vary from previous years.

Arctic Foxes and Glaucous Gulls were the principal nest predators on the study area. On 3 July a fox was ob-

served on West Egg Island. The single fox, followed closely by many gulls, destroyed every active eider (n=29) and gull (n=6) nest on the island in less than four hours. When we examine only the areas searched in all three years, we see a steady decrease in the total number of eider nests found in each year of the study (2000: 470, 2001: 301, 2002: 194). Similarly, the number of Glaucous gull nests has decreased since 2000 (2000: 66, 2001: 43, 2002: 12). Hatching success was extremely low (3.8%) in Common Eiders, due to predation by Arctic Foxes and Glaucous Gulls.

Flint, P., J. Reed, D. Lacroix, J. C. Franson, T. Hollmen, S. Sonsthagen. 2002. Monitoring Beaufort Sea waterfowl and marine birds, 2002 Annual Progress Report. Report for Minerals Management Service by U. S. Geological Survey, Anchorage, Alaska, USA. 57

69. Point Thomson, Alaska, USA (70°10'N, 146°10'W)

Early season with most of snow gone by our arrival on 7 June. One snow storm accompanied by strong winds, sleet, etc. occurred during field season (lasted till 14 July) with accumulation of a few cm that disappeared by mid-day.

We occasionally saw a lemming here and there. Lemmings were likely more common than they appeared to be from our casual observations. We did not try to trap any lemmings. We saw many more lemmings in 2001 than in 2002 and Pomarine Skuas were also more common in 2001.

A breeding Arctic Fox den was found in northwest portion of study area, and second (breeding?) fox den in the eastern portion of study area. Arctic Fox signs were recorded at many depredated nests in 2002. Pomarine Skua was abundant during the first half of the season in 2001 but much less common in 2002, while Arctic Skua was common during both years, and one Arctic Skua nest was found off-plot in 2002.

The study was conducted for 2 years (2001, 2002) but methodologies differed between years, with more intensive effort during the second year. Nest densities were similar for both years although search effort was much reduced during the first year and so densities not really comparable. Nest density on 24 10-ha study plots was 59.2 nests/km$^2$. The most common nesting species were Lapland Bunting (23.3 nests/km$^2$), Semipalmated Sandpiper and Pectoral Sandpiper (10.8 nests/km$^2$), and Grey Phalarope (5.4 nests/km$^2$). Nest success were relatively low: 24% in Lapland Bunting, 31% in Semipalmated Sandpiper, 36% in Pectoral Sandpiper, 59% in Grey Phalarope (although nest sample size for Grey Phalarope was small, n = 13).

B.Rodrigues

70. Middle Canning River, Alaska, USA (69°54'N, 146°21'W)

Snow melt on the Canning River Delta was relatively early this year, with birds found on 4-egg clutches by 10 June. We had several snowy, cold days over the next 12 days but these conditions did not appear to result in higher than usual rates of nest loss.

There was evidence that lemmings were active during the prior winter but relatively few were seen during the study. We did find one pair of nesting Long-tailed Skuas and saw several Short-eared Owls flying over the area, which suggests lemmings were at least present but in low numbers. This was our first and only field season at the middle Canning River site. We found relatively few nests on our plots (typically less than 4 nests for each 16-ha plot). The largest number of nests was found on an upland site that had many small ponds interspersed throughout the plot. Other wetter and drier plots had lower numbers of birds, although the habitat appeared equally suitable. The field season ended prior to when nests would have hatched, although most nests were depredated already. There was no evidence that extreme weather negatively effected shorebird nesting.

R.B.Lanctot

71. Canning River delta, Arctic National Wildlife Refuge, Alaska, USA (70°10'N, 145°50'W)

Snow cover was less than 50% on 6 June indicating an early spring. During the study period between 6 June and 22 July a strong wind and rain storm occurred on 1-2 July.

We rarely observed a few lemmings. Arctic Foxes were rare, and we did not find signs of their breeding. Neither were signs of breeding found for Pomarine Skua and Snowy Owl.

This is the first year of the study, so there are no data for comparison. However another study was conducted at this site in the late 70s and early 80s. There was a considerable annual variation in nest density during those time periods. Densities in 2002 at this site were within the range of variation. Nest initiation dates were earlier than those found in a previous multi-year study at another site on the coastal plain.

Mayfield nest success was low in waders: 9% in Dunlin (n=5); 29% in Semipalmated Sandpiper (n=15); 20% in Pectoral Sandpiper (n=7); 32% in Grey Phalarope (n=19); 23% in Red-necked Phalarope (n=5), and moderate – 43% in Lapland Bunting (n=13).

S.Kendall

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

Spring phenology was about 1 week early.

Indices of nesting Tundra Swans in the Mackenzie Delta Region in 2002 nearly doubled from the late year of 2001, and production is expected to be average to above average.

U.S. Fish and Wildlife Service. 2002. Waterfowl population status, 2002. U.S. Department of the Interior, Washington, D.C. 51pp.

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

Spring phenology on Banks Island was near average and biologists reported a good nesting effort for Snow Geese. Survey crews reported relatively small numbers of geese nesting at the Anderson River and Kendall Island colonies, where spring conditions were favourable.

Production likely will be near average for this population.

U.S. Fish and Wildlife Service. 2002. Waterfowl population status, 2002. U.S. Department of the Interior, Washington, D.C. 51pp.

74. Melville Island, Canada (75°30'N, 111°30'W)

Survey and banding operations were conducted on Melville Island in the summer of 2002. A total of 116 Brant Geese (45 adult females, 45 adult males and 26 goslings) were banded from both breeding and moulting groups. Only 5 family groups of Western High Arctic Brant were observed on Melville Island and breeding success was expected to be low for the second consecutive year.

S.Boyd In: Canadian Wildlife Service Waterfowl Committee. 2002. Population Status of Migratory Game Birds in Canada: November 2002. CWS Migr. Birds Regul. Rep. No. 7.

75. Daring Lake, Canada (64°52'N, 111°35'W)

Rodent abundance was assessed using snap-trapping methods during 1994-2002, following standards for the NWT and Nunavut Small Mammal Survey (see http://www.nwtwildlife.rwed.gov.nt.ca/Publications/ManuscriptReports/Reports/96.htm). During the whole period of monitoring Greenland Lemming *Dicrostonyx groenlandicus* was common only in 2001, but never abundant like voles. Brown Lemming has never been common. Ruddy Vole was abundant in the mid 1990s, and its numbers gradually increased again to high abundance by summer 2002. Meadow Vole *Microtus pensylvanicus* was abundant only in 1995 and common in 1994 and 2002.

S.Carriere, S.Matthews

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

The season was generally average in timing, perhaps a touch late, but cooler than average, with wind and precipitation normal. Snow reduced to 50% cover on flat areas on 8 June and disappeared in the last week of the month. Ice broke up on major rivers on 10 June.

The abundance of small mammals was quite low at Karrak Lake this year. We captured only Ruddy Voles in 2002 and no Brown or Greenland lemmings (Brown Lemmings have been low in all years whereas we generally capture some Greenland Lemmings each year, especially 2000).

Arctic Fox abundance appeared to vary among years and we saw 1.0, 2.3, and 1.5 foxes per 30 km in 2000 to 2002, respectively. Fox abundance appeared to be higher in the geese colony than outside the colony in all years; we saw 0.5, 0.5, and 0.5 foxes per 30 km travelled outside the colony in each year, respectively, compared to 1.5, 4.0, and 2.5 foxes per 30 km travelled inside the colony in each year, respectively. The density of breeding dens varied among years and was 1.5, 0.75, and 0 (no breeding dens in any of the 4 study-areas or the colony as a whole) breeding dens per 25 $km^2$ in 2000 to 2002, respectively.

Lesser Snow and Ross's *Anser rossii* geese arrived on the study area somewhat later than normal, but this did not seem to be due to weather conditions or spring chronology. Herring, Thayer's *Larus thayeri* and Glaucous gulls, Red-throated Divers, and Arctic Terns appeared to experience average nest success. Nest success was average in King Eider (~50%), low in Long-tailed Duck (~10%) and average or slightly below average in Lesser Snow and Ross's geese.

G.Samelius, D.Kellet, R.Alisauskas

77. Churchill, Manitoba, Canada (58°45'N, 94°04'W)

After the cold and snowy final months of the winter 2001/2002 snow persisted relatively long and some drifts were still present in the sheltered areas in the second half of June. The Churchill River started flowing on June 12; this is over 3 weeks later than in the 2001, when it moved in the week of May 17 (M. Goodyear, pers. comm.). Most lakes were still frozen and the meltwater levels were the highest observed in the last 5 years. The spring was colder than average, especially during the 3 first weeks of May – that is just before or during typical arrival time of American Golden Plovers. This was followed by the relatively average summer temperature-wise. Precipitation levels were higher than normal both during the spring and summer (Meteorological Services of Canada). In the last 5 years the spring was later and the pre-nesting season similarly cold only in the 2000. Persistent rains of 30 June – 2 July (26 mm during 3 days, Meteorological Services of Canada) brought surface water back to unusually high levels for this time of the season, again the highest in the last 5 years. It stayed very high until the end of field work on 9 July.

After the unusual decline of all small mammal species (lemmings, voles and shrews) in 2000 and 2001 (J. Dubois, pers. comm.), the numbers of Greenland Lemmings and Meadow Voles were increasing, inferring from the large numbers of under-snow nests and accumulation of faeces. This remains in marked contrast with the previous year, when no winter nests or faeces of small mammals were seen. Only 2 lemmings were seen, 1 alive and 1 being carried by a weasel. Fall trapping of small mammals (August – September) confirmed relatively high numbers of small rodents, chiefly of Meadow Voles (M. Goodyear, pers. comm.). Snow-shoe Hares *Lepus americanus* were also seen more often than in any other year.

Of the typical avian predators, the Bald Eagle *Haliaeetus leucocephalus*, Rough-legged Buzzard and Merlin were seen several times during field-work, and the Northern Harrier nested in the area. Short-eared Owls were seen daily early in the season, sightings declined later in July. Sightings of all these species besides Merlin increased compared with the previous year. The safety of shorebird nests was endangered by Common Ravens, Herring Gulls and Arctic Skuas, especially the latter which were present in relatively high numbers. Red Foxes and Ermines were present in the area and there were 4 and 5 fox pups in 2 dens.

The American Golden Plovers nested in higher numbers than in 2001, but similar numbers to those of 2000, with the average clutch size in original nests 4.0 (n=16), and with nesting success 66.7% (n=15, range observed so far 38.5-100%). Hatching was highly synchronous, with all successful nests (n=10) hatched within 4 days. Whimbrel bred in high numbers, comparable to those of 2001, and hatching success of nests of known fate was very high for this species 83.3% (n=6). No weather-related chick mortality should be expected in these 2 species. The number of nesting Stilt Sandpipers *Micropalama himantopus* was higher than in the last 2 years, with at least 5 pairs nesting in 1 $km^2$ in the best area. Fewer Lesser Yellowlegs *Tringa flavipes* nested than in 1998 and 1999. No nests of the Killdeer *Charadrius vociferus* were found, and only 1 bird was seen, in flight. Many former territories of the Canada Goose *Branta canadensis* were vacant, while some nests were located in the places where they were not seen in the past, due to the long lasting snowdrifts. Geese nests were not purposely sought or checked; several nests from which the incubating birds were accidentally flushed contained 4-6 eggs, and the young broods consisted of 4-7 chicks.

J.Klima

78. Southampton Island (63°22'N, 84°56'W)

The season was late and cold. Snow reduced to 50% cover on flat areas on 18 June and disappeared on 3 July. Ice broke up on major rivers on 12 June.

Lemmings were virtually absent this year after a population high in 2000.

The conditions this year were significantly affected by increased numbers of Arctic Foxes and Long-tailed Skuas, which were both common. Owls, Rough-legged Buzzards and Pomarine Skuas were all rare and did not bred. Nest densities of Red Knots were lower than last year, which were lower than the year before.

Nest success was high for birds overall in 2002, except for the Red Knot which was at an average/moderate range: 80% in American Golden Plover (n=10), 56% in Red Knot (n=9), 100% in Sanderling *Calidris alba* (n=5), 80% or higher in Dunlin (n=4) and Lapland Bunting (n=4).

L.Niles, A.Dey, M.Peck

79. Polemond River, Ungava Peninsula, Canada (59°31'N, 77°36'W)

Winter snow cover across much of the Ungava Peninsula was heavy in 2002 and spring temperatures were exceptionally cold resulting in a slow, late melt and a 2-3 week delay in the timing of nesting.

For the first time since this project began in 1997, there was an abundance of small mammals on the study area. Trapping took place between 23 July and 4 August, during which time 32 small mammals, primarily Ungava Lemming *Dicrostonyx hudsonius*, were caught. This number was four times the previous yearly high of 8 caught in 1998. This phenomenon may help explain the lower than expected nest predation by Arctic Foxes on the study area where we found three active den sites (as compared to one or two dens in other years).

The first nests of Canada Geese were found on 9 June, about 17 days later than normal. A total of 325 nests were eventually found in the 34.5 $km^2$ main study area, resulting in a nest density of 9.4 nests/$km^2$. The highest recorded density since the study began was in 2001, with a density of 18.5 nests/$km^2$. Mean nest initiation and hatching dates in 2002 were 16 June and 9 July (range: 3-20 July), respectively. In addition to the main study area, 7 secondary sites were visited, between 16 and 20 June, along a 200-km north-south stretch of coastal lowlands and centred on Puvirnituq. At these sites, a total of 167 nests were found; nest densities were similar to those observed in previous years, but lower than in 2001. Mean clutch sizes for the main study area (3.0) and at the secondary sites (3.2) were the lowest recorded since the study began in 1997; the 1997-2001 averages were 4.7 and 4.2 for the main and secondary sites, respectively. Nesting success (Mayfield) for the main study area was 55%, below the 1997-2001 average of 67%. Predation (44%) and nest abandonment (1.5%) together accounted for all nest losses. Nesting success varied considerably among the secondary sites, with the highest success recorded on the two northernmost sites. Preliminary analyses of the nesting data show apparent nest success for each site (north to south) as follows: Korak River 83% (n=24 nests), Sorehead River 76% (n = 34), Puvirnituq Lake 61% (n = 19), Small River 54% (n = 25), Kogaluk River 65% (n = 23), and Mariet River 50% (n = 16). Herring and Glaucous gulls, Long-tailed and Arctic skuas were the principal egg-predators.

The wide variation among capture sites in the age of goslings captured as well as in plumage development indicate that hatching occurred over a longer period of time and later than in the main nesting study area.

T.Nichols, R.Cotter, J.Lefebvre. 2002. 2002 Canada Goose Nesting Study and Preseason Banding Report From Hudson and Ungava Bay Regions, Quebec. Http://www.dnr.state.md.us/wildlife/2002apneststudy.html.

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

The spring of 2002 was characterized by an early snowmelt, mostly due to a relatively thin snow-pack. Snow depth on 2 June was 26 cm compared to a long-term average of 35 cm. The temperature in spring was also relatively mild with an average air temperature of –0.94°C between 20 May-20 June compared to a long-term average of –0.32°C. Consequently, the rate of snow-melt was rapid and comparable to years with early spring such as 1997 and 1998. Precipitation was low in June (10 mm), including a few light snowfalls (4 cm). However, summer temperatures were generally cool with little sunshine and frequent precipitations (38 mm in July).

For our small-mammal survey, we accumulated 1400 trap-nights in the Base-camp Valley split between two trapping sites (one lowland and one upland) and 550 trap-nights in the upland habitat at Camp-2. In the Base-camp sites, we captured only one Greenland Lemming,

for an index of abundance of 0.07 lemmings/100 trap-nights, the lowest number since 1995. Lemming abundance at the Camp-2 was also very low (0.19 lemmings/100 trap-nights with only one Greenland Lemming captured). Therefore, lemmings continued the decline started in 2001 at the Base-camp Valley following the peak of 2000, and declined dramatically at Camp-2 following a very high density in 2001. Thus, even though the last peak in lemming abundance was not synchronized at our two study sites, lemming populations had crashed at both sites in 2002.

We found signs of Arctic Fox activity (digging or fresh prey remains) at 6% of known denning sites (n = 48) compared to 47% in 2001 and 46% in 2000. No litters were seen this year compared to 8 in 2001 and 7 in 2000. This suggests that fox breeding activity had declined drastically and was very low in 2002. Again this year, no Snowy Owl nests were found at either study area compared to 13 nests in 2000.

Despite the early snow-melt, the arrival of Greater Snow Geese on Bylot Island was much later than in most years and similar to 2000, a year with a relatively late snow-melt. Our first pair count on 1 June on the hills surrounding the Base-camp Valley was 28 pairs, and up until the complete snowmelt counts remained low (i.e. <200 pairs), which is unusual. Median egg-laying date was 16 June, which is later than normal. This is very surprising given the favourable conditions in early June (i.e. early snow-melt). It is noteworthy that since the instauration of the spring hunt in 1999, nest initiation has been later than the long-term average in three years and near normal in the fourth. Our field observations suggest that the reproductive effort of geese was low at the main breeding colony (Camp-2) and no nests were found at the Base-camp Valley (even though the latter site is mostly a brood-rearing area, a low density of nesting geese is found there in most years). Average clutch size was 3.43, which is below the long-term average. Again, it is noteworthy that since the instauration of the spring hunt, clutch size has been lower than the long-term average in all four years.

Nesting success (proportion of nests hatching at least one egg) was similar to the previous year (53% in 2002 compared to 57% in 2001), which is below the long-term average. Activity of predators, especially Arctic Foxes, at goose nests was moderately high this year possibly because the abundance of lemmings (the main prey of predators) was very low on Bylot Island following the peak of 2000. Peak hatch was on 11 July, slightly later than normal. The low reproductive effort observed this year was confirmed by the density of goose faeces at the end of the summer in wet meadows of the Base-camp Valley, which was among the lowest values recorded (mean 4.4, SE = 1.2 faeces/$m^2$). Accumulation of faeces was also delayed this year and only started at the end of July, which suggests that arrival of broods on the brood-rearing areas was delayed.

This is the first time in 14 years of monitoring that an early spring (e.g. similar to 1993, 1997 and 1998) did not result in a good breeding performance by geese. Nest predation was moderately high, but not as high as in previous years of lemming crashes (e.g. 1995 and 1999), which is also surprising given the low nest density. The combination of low reproductive effort, late nesting, and moderate nest predation lead to a low young : adult ratio during our banding operation. Based on this statistic, we anticipated a proportion of young in the fall flock around 14%, a low value. However, this prediction was only partially upheld as juvenile counts conducted in Quebec this fall indicated an even lower proportion of young (6%, n = 18,930). It should be noted that our young : adult ratio at banding does not take into account non-breeding adults that do not stay on Bylot Island to moult, a number that was likely high this year due to the low reproductive effort. Therefore, with a proportion of young in the fall flock of 6%, the year 2002 can be classified as a year of breeding failure for Greater Snow Geese (defined as years where this proportion is <10%), comparable to 1999 (2%, the worst breeding failure in over 30 years).

G.Gauthier, A.Reed, J.-F.Giroux. 2002. Population Study of Greater Snow Geese on Bylot Island (Nunavut) in 2002: a Progress Report. 31 October 2002

81. Traill Island, Greenland (72°30'N, 24°00'W)

Based on partial information provided by the sledge patrols Sirius, snow depths in winter must have been less than on average. In addition we noticed an advancement of the snowmelt by more than one week, with the area nearly completely free of snow by the end of June. Likewise, pack ice receded earlier than usual, with large parts of the fjord already free of ice around mid-July.

Routine surveys of winter nests have shown that lemming population, while displaying a moderate increase, had not really recovered from the low recorded in 2001, despite several indications of breeding in these nests. This situation was also in line with observations from live trapping, suggesting that densities at snow melt were clearly below one animal per 1 hectare. Such scarcity in lemmings, as usual, was also perceivable in the situation for the predators. While Snowy Owls were absent, there were only very few breeding attempts among Long-tailed Skuas and only two fox dens were occupied (with probably only one young in each still alive by mid August). The fact that 13 of the 403 lemming winter nests were used as winter quarters by Stoats suggests that possibly this unusual high pressure could have prevented a recovery of the lemming population (since such high ratios were always linked to lemming lows). Regarding breeding birds, we failed to record any breeding ptarmigan and for waders, casual observations suggest that despite early snowmelt, numbers of breeding pairs were lower than average. In addition, judging from the very small numbers of fledged waders observed in August, breeding success should be classified as low.

Boat journeys organized at the end of July and in early August suggest that patterns were similar in the region of Mesters Vig (72°15'N, 24°00'W), as well as in the main valleys of Lyells Land (72°30'; 25°00'W)

B.Sittler

82. Ymers Island (Jultsdal), some 70 km north of Karupelv Valley, Greenland (72°45'N, 25°60'W)

Based on direct observations of lemmings, records of active burrows and greater aggregations of winter nests, there was evidence that lemmings had experienced an outbreak. This was also illustrated by patterns displayed by predators, with records of fledged Snowy Owls and Long-tailed Skuas and also reproduction among Arctic Foxes. The non-occurrence of an outbreak on Traill Island and this particular and deviating situation recorded from Ymers Island raise many new questions about lemming cycles in North East Greenland.

O.Gilg

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

The warmest spring and the earliest egg-laying in waders so far at Zackenberg in high arctic Greenland. Late May, June and early July were about the warmest recorded during more than 50 years of records for Northeast Greenland. We recorded egg-laying as early as the earliest recorded in high arctic Greenland since the first expeditions a hundred years ago. The snow-cover was heavy, but not particularly extensive, probably around 80% in early June. Normally, more or less continuous positive daily maximum temperatures do not begin until late May, but the average remains below zero even into June. This year saw for the first time a positive mean for 21-31 May here at Zackenberg, and average was about 3°C higher than during each of the years 1996-2001. Early June was also warmer, but not much more than a number of earlier years. There were no spells of inclement weather in June-July.

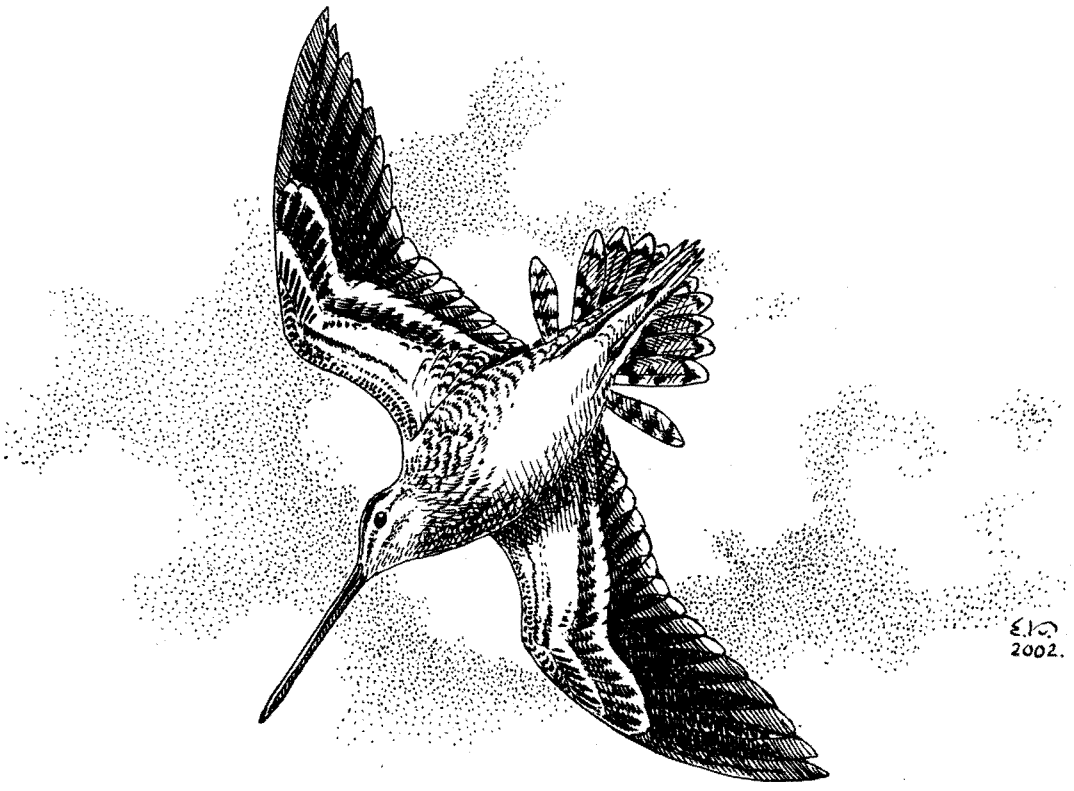
Lemming population did not reach a peak as expected. Four lemmings were seen by one researcher during the season. Lemming numbers were assessed using winter nest counts.

Egg-laying had been initiated around 1 June in Turnstone and Dunlin nests, with median 1st egg dates even earlier than in the very early breeding season of 2000. Only a few records exist of equally early egg-laying in all of high arctic Greenland, the most obvious explanation being extraordinary high temperatures in late May and early June.

The population censuses resulted in somewhat lower populations of Sanderling and Turnstone, possibly as the result of the three consecutive problematic breeding seasons mentioned above. Dunlins, however, seem to contradict this, since they apparently have continued their increase. Regionally the breeding season was very successful. Juvenile waders appeared in good numbers on the mud-flats on the coast by late July, and accumulated totals for Dunlin and Turnstone juveniles from counts every third day until the end of August exceeded what we have recorded in previous years. A very fine breeding season.

H.Meltofte

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



# BIRD BREEDING CONDITIONS IN THE ARCTIC IN 2002

**Pavel S. Tomkovich & Mikhail Y. Soloviev**

As previously in annual reviews, in this paper we make an attempt to assess the breeding conditions of birds in the Arctic and Subarctic in 2002. Information was received from 83 localities (see above), among which less than a half (35) were surveyed also in other year(s) (at least as reflected in the breeding conditions database), and only 26 of these repeated surveys yielded data for two consecutive years: 2001 and 2002. Of 46 reports in which authors explicitly identified the scope of their research in 2002, by completing the appropriate fields in the questionnaire, 30 were from projects in ornithology. This assessment is likely to be biased towards non-ornithological research, because the overwhelming majority of the sources for which there were no questionnaires were represented by publications on birds or originated from personal communication with ornithologists. However, it is clear that people either not involved with birds as a primary research object, or studying issues directly unrelated to breeding performance submitted a notable fraction of the data (see details of research projects in the section with respondents' contact details on pages 35-36).

It is apparent that accurate evaluation of bird breeding performance and related factors is impossible in the course of short-term (10 days or less) visits and can be problematic in the course of medium-term (11 to 30 days) surveys, which together constituted more than 40% of all observations of known duration in 2002 (Fig. 1).

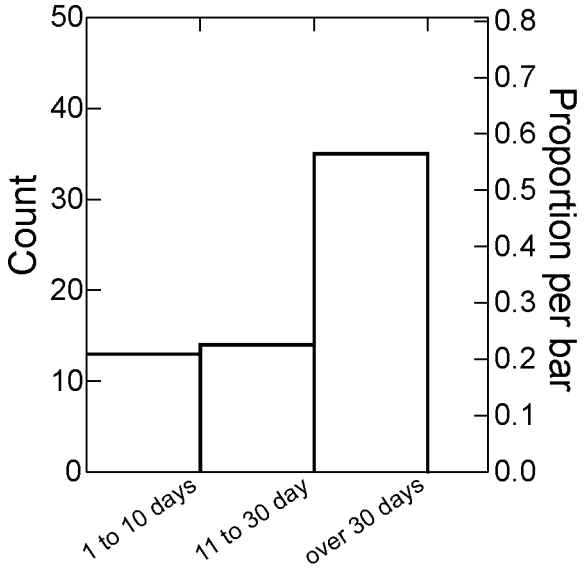



Figure 1. Duration of field studies conducted by the survey participants in 2002. Number of studies is on the left axis, their proportion per duration category on the right axis.

Given the diversity of data sources, outlined above, and their varied ability in providing information pertinent to the issues of interest for the breeding conditions survey, obtaining complementary reports from the same regions becomes imperative to assess key abiotic and biotic factors determining bird breeding performance. In this respect, the continuing increase in the number of surveyed localities gives hope that it will become possible to obtain more sound conclusions in future.

**Weather and other abiotic factors**

Weather and climate-related natural events, such as floods and fires, apparently have strong impacts on the distribution, numbers and reproduction of birds. Mass arrival of birds and the start of breeding occur in June in most regions to the north of the Arctic circle. The map of deviations of monthly mean air temperatures for June 2002 from the average over the last 9 years (Fig. 1 on page 51) gives the general impression of conditions early in the breeding season. June was clearly warmer than normal in the east of Greenland, in the north of Western Europe, in most of the Siberian Arctic and in the west of Alaska. Low June temperatures occurred across northern European Russia and in West Siberia (to western Taimyr), in the east of Alaska, north-west Canada and around the Hudson Bay.

The evaluation of spring phenology by respondents in most cases agreed with the distribution of air temperature deviations in June (Fig. 1 on page 51). A particularly early and unusually warm spring was recorded in north-eastern Greenland, on the Chukotsky Peninsula and in eastern Alaska. The discrepancy between June temperatures and phenological reports from respondents was found in two areas: regions in north-eastern Alaska and the lower Mackenzie River area, and regions to the west and east of the Polar Urals. Indications of early spring referred to May there, while June was actually cold and rainy.

Compared with June, in July air temperatures approached the most recent 9-year average in north-eastern Europe and in West Siberia (Fig. 2 on page 51). However, cold weather with precipitation spread in July from the region of Hudson Bay across almost the whole of the Canadian Arctic. Warm and dry weather remained in Fennoscandia, in north-eastern Siberia and in western Alaska. However, this temperature pattern was not observed by respondents from the regions adjacent to the Polar Urals, who unanimously pointed to cold and rainy summer. This discrepancy can be explained by the fact that the first 10 days of July were characterized by some respondents as being warm and sunny, which given cold the second half of the month would have probably resulted in close to average evaluations. However, judgement about summer weather as a whole in these cases was based on conditions both in July and August, and the latter month was also cold and rainy.

Bird reproduction can be negatively affected by natural factors with contrasting expression in different parts of the Arctic. Cold and rainy summer weather in north-eastern Europe and in West Siberia caused desertion of clutches by some birds and the death of chicks, as reported from Bolshezemelskaya Tundra, Erkatayakha River on Yamal and Pyasina River on Taimyr. Increasing water table in rivers during the summer led to flooding of nests of coastal wader species (plovers and Temminck's Stints) in Bolshezemelskaya Tundra and

near Churchill, Canada. High spring floods destroyed nests of gulls and terns on the Adycha River in Yakutia, while the long-lasting high water levels in rivers on Yamal prevented breeding by floodplain species of birds. The drought on the Chukotsky Peninsula and in Yakutia resulted in the drying out of many marshes and small waterbodies and extensive fires in the Anadyr lowland and in forests of north-western Yakutia.

Summer snowfalls occurred in different areas: in mid or late June in Bolshezemelskaya Tundra, Wrangel Island, northern Alaska and Bylot Island (Canada), in early July on north-western Taimyr and in the Kuparuk Oilfield area in Alaska, and in mid July in the Lena River delta. These snowfalls coincided with the hatching of chicks in some cases, but snow never covered the tundra for long, and so probably, didn't lead to catastrophic consequences for birds anywhere.

**Rodents abundance**

Variations in the numbers of small rodents (primarily lemmings and voles) have both direct and mediated impacts on distribution, numbers and reproductive success of birds in the Arctic. Rodent-specialist birds, in particular owls and the Pomarine Skua, are directly dependent on rodents as a principal food resource. The dependence of other land-nesting birds on rodents takes effect through the supply of alternative food for mammalian and avian predators.

The high-amplitude fluctuations of numbers of lemmings (*Lemmus* spp. and *Dicrostonyx* spp.) are particularly important for Arctic ecosystems. Several areas of high lemming numbers existed in 2002 in the Arctic (Fig. 3 on page 52), but none of these were very widespread. After the peak numbers of Norwegian Lemming *Lemmus lemmus* in 2001, in Norway and Sweden, the populations of these rodents decreased in some localities, reportedly remained high in others (see paper by G.D.Kataev below in this issue), but did not start to increase in Finnish Lapland. High numbers were reached by Siberian Lemmings *L. sibiricus* on Wrangel Island and by the Ungava Lemming *Dicrostonyx hudsonius* on the Ungava Peninsula, Canada. Greenland Lemmings *D. groenlandicus* were abundant at one of the localities in north-eastern Greenland. The situation on Novaya Sibir Island (New Siberian Archipelago) remains controversial, as two respondents respectively reported numerous lemmings and their total absence from sites about 100 km apart.

Lemming numbers increased considerably on western Taimyr, but all observers indicated that peak numbers had not been reached. Numbers of Siberian Lemmings were increasing too in regions to the west: Bolshezemelskaya Tundra, the Polar Urals and Gydan Peninsula. Numbers were not high in most localities of north-eastern Greenland. The population of Greenland Lemmings near Churchill, Canada, showed some increase. Lemming numbers dropped to a low point on Vaigach Island in Eastern Europe, on Chukotka in the northern Far East of Russia, in the Karrak Lake area and on Bylot Island in Canada.

Vole species have a generally more southerly distribution than lemmings, and a high abundance of the former was observed in Bolshezemelskaya Tundra, in several localities of West Siberia where mass mortality of these animals was recorded in summer, on the Alakit River in Yakutia, on St. Laurence Island in the Bering Sea and on Daring Lake in Canada.

The abundance of voles increased in Churchill, Canada, while low populations remained on the Kola (but see paper by G.D.Kataev in the current issue), Kanin and Chukotsky peninsulas, and in Alaska, despite the presence of local sites with increased numbers.

**Predators**

Surprisingly, Arctic Foxes responded to the high abundance of lemmings by breeding in high numbers in a single locality, the Ungava Peninsula in Canada (Fig. 2 on page 30). Other areas with high lemming numbers did not attract numerous Arctic Foxes for breeding, probably because of the low point in fox populations, or information about fox breeding status was not available. Arctic Foxes occurred in low or average numbers and bred on Taimyr and Gydan Peninsula, where lemming numbers started to increase. Indications of high abundance of breeding Arctic Foxes at a single locality (Fig. 2 on page 30), on the Chukotsky Peninsula, where rodent populations were generally low, actually corresponds to breeding of a single pair among numerous non-breeding animals. Solitary breeding attempts by foxes were recorded also in other areas with low rodent numbers: Vaigach Island, south-eastern Taimyr, northern Alaska.

Arctic Foxes were abundant and successful breeders on St. Laurence Island where there was a high density of voles. Vole abundance allowed intensive reproduction of Red Foxes in Bolshezemelskaya Tundra and Subarctic areas of West Siberia.

The distribution of nesting owls (Fig. 3 on page 30) had much in common with the pattern described for the distribution of Arctic and Red foxes. Breeding by Snowy Owls in high numbers was reported from two regions with high lemming numbers: New Siberian Archipelago and Wrangel Island. Snowy Owls had low nesting densities in the regions with increasing rodent populations (western Taimyr, Gydan Peninsula and one locality in north-eastern Greenland). Increasing vole numbers in Subarctic areas attracted considerable numbers of Short-eared Owls (Churchill in Canada and, probably, lower reaches of the Kolyma River in East Siberia), which became common breeders in Bolshezemelskaya Tundra, the Polar Urals, the lower Ob River region, and Russkaya River in West Siberia, Ary-Mas and Alakit localities in north-central Siberia. Owls were rare or not reported from the Kola and Kanin peninsulas, Vaigach Island, Chukotka, Alaska and much of the Canadian Arctic.

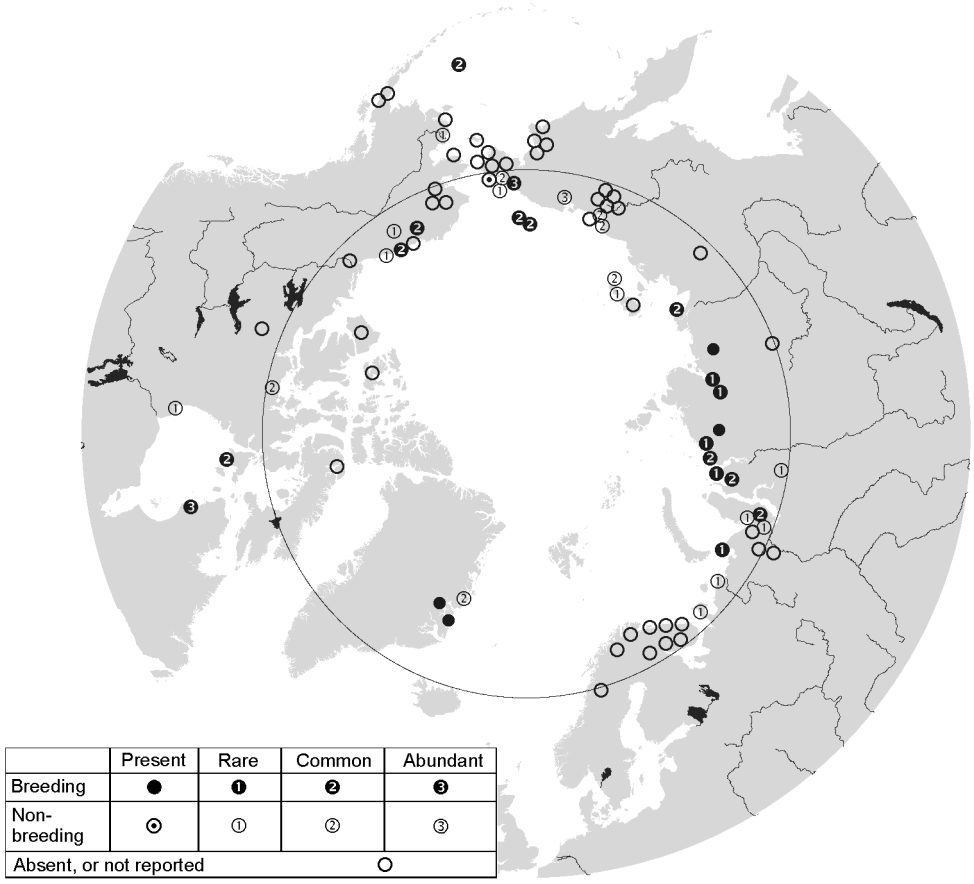



Figure 2. Abundance of Arctic Foxes in the Arctic in 2002

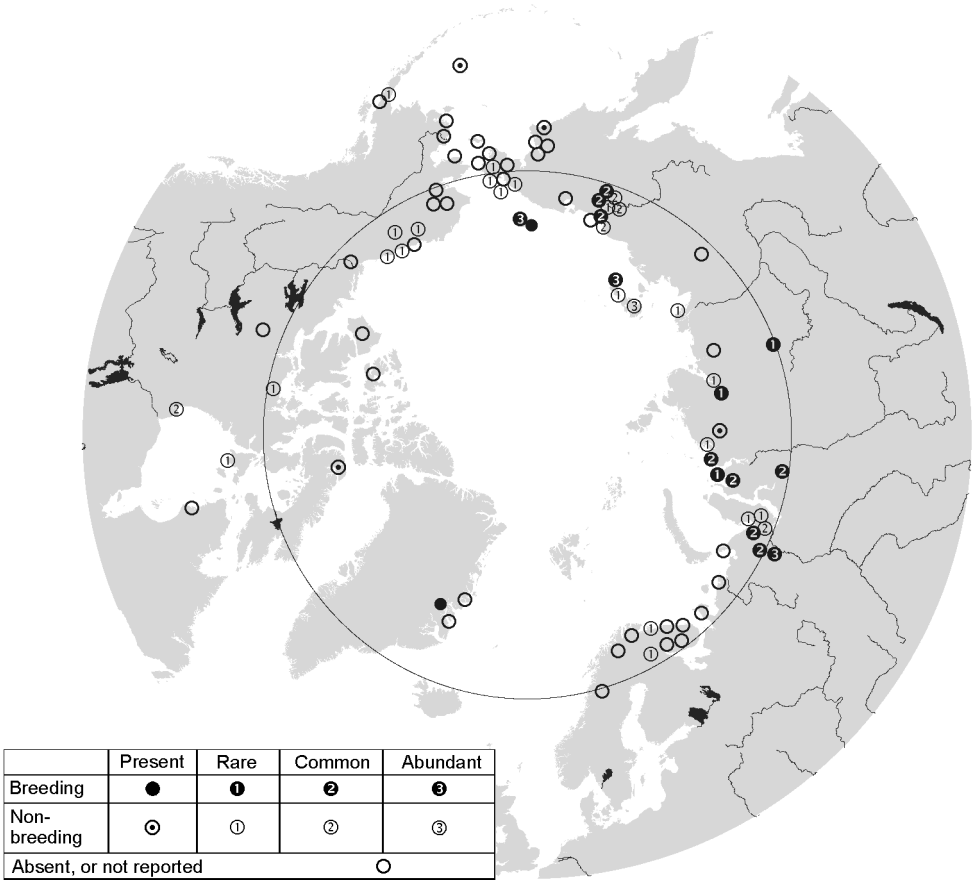



Figure 3. Abundance of owls in the Arctic in 2002

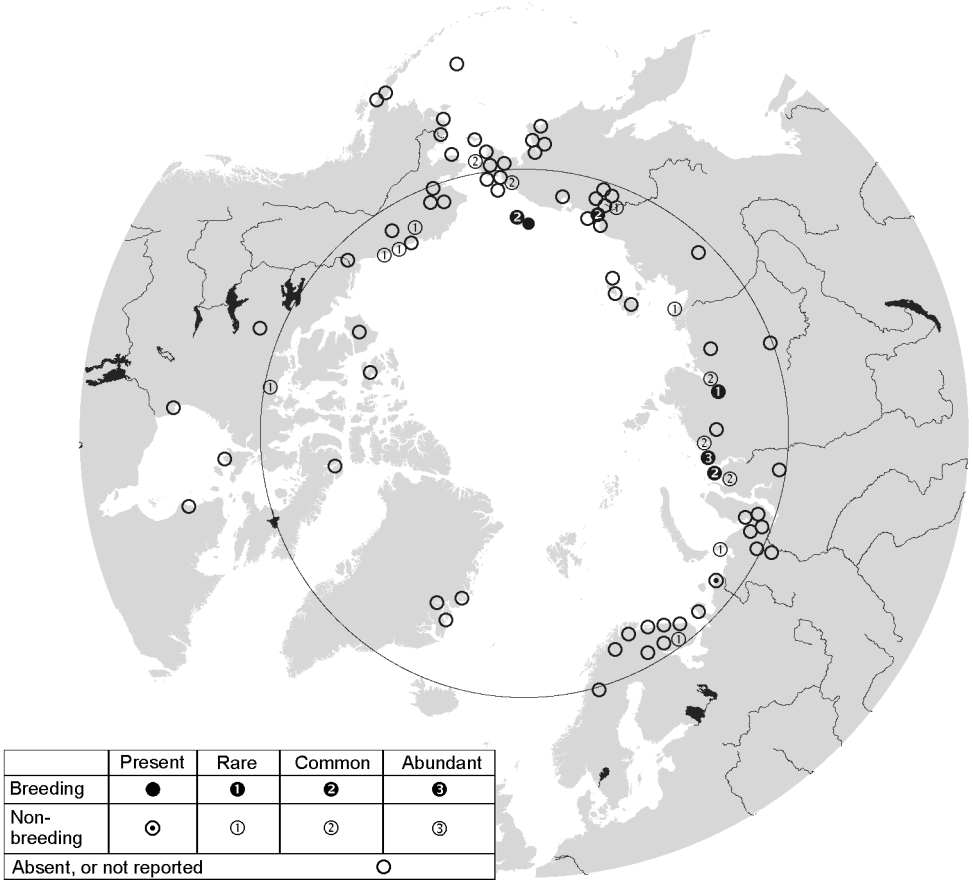



Figure 4. Abundance of Pomarine Skuas in the Arctic in 2002

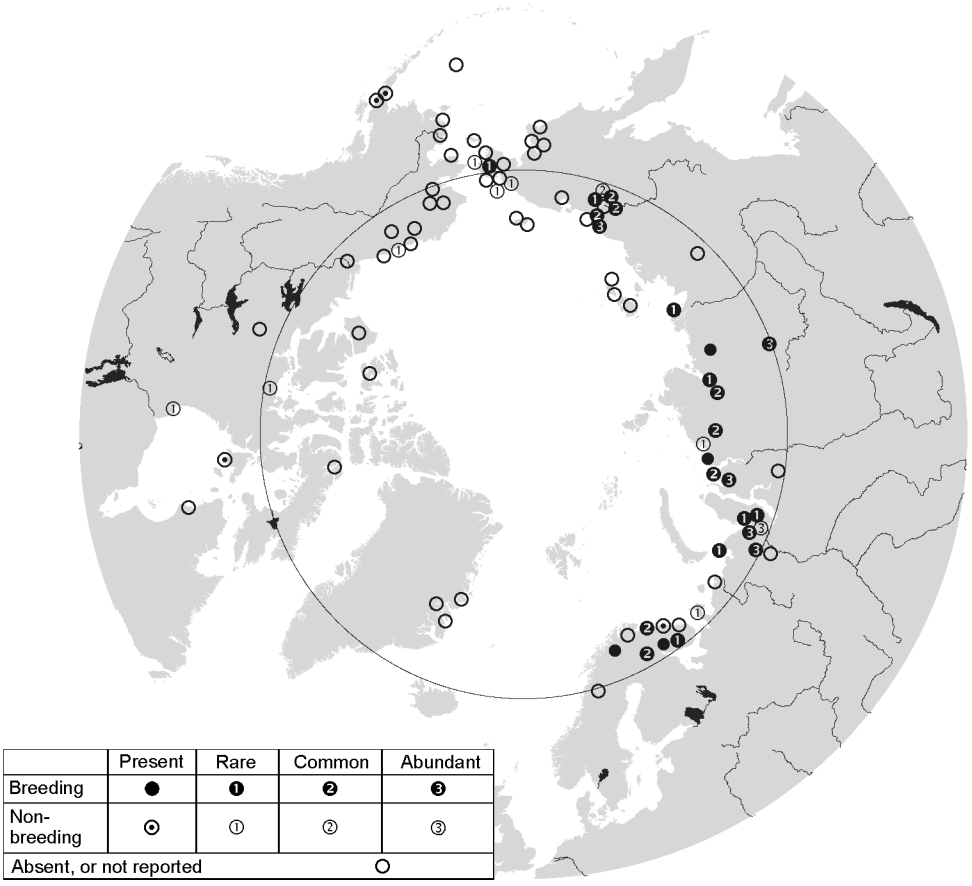



Figure 5. Abundance of Rough-legged Buzzards in the Arctic in 2002

Pomarine Skua, as Snowy Owl, depends heavily on lemmings for breeding and, accordingly, average or high densities of nesting skuas were reported in 2002 from the north of western Taimyr and Wrangel Island (Fig. 4 on page 31), where lemmings were abundant or increasing. A report of the Pomarine Skua breeding in the lower Kolyma River could have been the result of misidentification. Breeding of Pomarine Skuas was not recorded in the Nearctic, and they were generally rare when reported.

Rough-legged Buzzards are less dependent on the abundance of rodents compared with owls and Pomarine Skuas, because they can take alternative prey (eggs and chicks of birds, pikas, young hares, ground squirrels) when rodents are scarce. In the north of Eurasia buzzards nested at high densities on the Polar Urals, Gydan Peninsula in West Siberia, north-west and north-east Yakutia in East Siberia (Fig. 5 on page 31). Breeding in average numbers was reported from the north of Scandinavia, Taimyr and the lower Kolyma, while nesting in low numbers was reported from Scandinavia to Chukotsky Peninsula. According to the available information Rough-legged Buzzards did not nest in the American section of the Arctic and were rarely reported.

A high abundance of voles attracted Northern Harriers to Bolshezemelskaya Tundra, the Polar Urals and the Russkaya River in West Siberia, where they bred and occasionally destroyed birds' nests (reported for Bolshezemelskaya Tundra). The White-tailed Sea Eagle, a less traditional predator in the Arctic, was highlighted in several reports. Sea Eagles attacked chicks of Barnacle Geese in the Pechora River delta, took adult Common Eiders on Vaigach Island and destroyed a nest of White-fronted Geese on southern Yamal.

Ermines were reported in summer 2002 from two localities in the west of Eurasia and the Hudson Bay area in Canada. American Mink was supposedly the principal predator of wader nests in the Yukon delta in Alaska. Polar Bears and Brown Bears were not reported as nest predators in 2002, but the increasing population of Black Bears in the Ungava Bay area in Canada was responsible for poor breeding performance of Canada Geese there. Trampling of nests by wild reindeers (caribou) was recorded in Bolshezemelskaya Tundra, north-western Yakutia and northern Alaska.

Uncontrolled hunting (Kanin and Chukotsky peninsulas and Vaigach Island in Russia) and large-scale egging (Kanin) had an apparently negative impact on numbers and reproduction by birds. Human-induced nest failure was reported from the Kuparuk Oilfield area in Alaska.

**Distribution, numbers and breeding phenology of tundra birds**

Information about the changes in numbers of certain bird species was provided in many locality reports, especially from Russia. Below we have tried to highlight those changes, which are likely to reflect widespread phenomena rather than local and temporary changes.

Wide-scale surveys on the Chukotsky Peninsula in 2002 failed to confirm nesting of the Long-billed Dowitcher. Grey Phalaropes were unusually rare breeders there, which, probably, resulted from early spring and movements of migrants further north-westwards. In contrast, Ruffs nested almost everywhere on the Chukotsky Peninsula, which does not happen in all years.

Numbers of Common Eiders and Glaucous Gulls continued to decrease on the Barrier Islands in the Beaufort Sea. Populations of nesting Tundra Swans in the Mackenzie Delta Region in 2002 recovered after the late year of 2001, and for the first time this species was found breeding in the Ungava Bay area.

Common Buzzard *Buteo buteo* and Greater Spotted Eagle *Aquila clanga* are not typical birds of the Arctic and Subarctic, but both these species were found in 2002 in areas of high vole numbers on the Kola Peninsula and the lower Ob River area, respectively.

Willow Grouse were abundant in 2001 in many regions of Eurasia and in western Alaska, but in 2002 their numbers decreased in most of the regions where they were previously numerous. Willow Grouse were still abundant in the north-east of Norway, Finnish Lapland and two localities in the lower Kolyma River, and common in Siberia in the lower Ob River area, southern Taimyr and Koryak Highlands, and in America on the Northern Slope of Alaska, in the Karrak Lake area and near Churchill. Numbers of Rock Ptarmigan increased compared with 2001 in north-eastern Greenland and decreased in north-western Taimyr.

Timing of arrival and reproduction of tundra birds was affected in some regions by specific weather events. An unusually early spring in areas adjacent to the Bering Strait was responsible for the earliest recorded start of nesting by the Western Sandpiper in the Yukon delta and early nesting of geese and Turnstones on Chukotka and Wrangel Island. Late ice breakup on the Simpson Lagoon, northern Alaska, resulted in delayed nesting of eiders and Glaucous Gulls. Late arrival and delayed start of breeding were noted in geese across most of Canada: Snow Geese on Karrak Lake and Bylot Island, Brent Geese on Banks Island and Canada Geese on the Ungava Peninsula. Geese on Bylot Island also had reduced mean clutch size.

**Breeding success**

Estimates of nesting success for birds based on an assessment of nest fate, at least for some species, are available from 13 localities. Breeding success evaluation from most other sites was based on indirect indications, which in some cases were interpreted by the compilers of the newsletter. Breeding success was reported as low from 17, average from 14 and high from 11 sites across the Arctic. The distribution of these sites did not show a clear, systematic pattern (Fig. 4 on page 52), and localities with contrasting values could be found in close proximity (e.g., on the Polar Urals, in the Yukon delta and northern Alaska). This picture is likely to reflect the changeable pattern of breeding conditions in 2002, when

high or increasing lemming numbers did not spread over vast areas, and predators in moderate numbers could have occurred almost everywhere, sometimes having abundant rodent food, otherwise destroying the nests of birds. Average values of bird reproduction prevailed in the areas of increasing lemming numbers on western Taimyr and presumably on the Gydan Peninsula. Non-breeding Arctic Foxes concentrated along the northern coast of the Chukotsky Peninsula, which provided favourable conditions for birds nesting further inland. Low rodent populations and a cold summer resulted in mostly low breeding performance of birds in northern Alaska. Unfavourable summer weather in the north of European Russia and in the Canadian Arctic probably did not have a pronounced effect on the reproduction of most birds, with the exception of birds of prey which could not obtain enough food in rainy weather and exhibited high chick mortality.

**Comparison with predictions for 2002**

Expectations of bird breeding performance in the Arctic (see "Arctic Birds" No. 4, p.22) were generally met, but not in the details. We anticipated the appearance of a vast region from north-eastern Europe to western Taimyr where increasing abundance of lemmings and a spreading area peak numbers of voles would have led to low predation pressure and, accordingly, favourable conditions for reproduction of tundra birds. The situation approximated to the above scenario, but nowhere did lemming numbers reach peak levels, and their summer reproduction was probably low or absent, judging by the low survival of chicks in Snowy Owl broods and small clutches of Rough-legged Buzzards. Furthermore, mass mortality of voles started early, in the beginning of summer in the lower Ob River area. This together with adverse summer weather led to variable bird breeding success across the region. As a result the success can be evaluated as average in general, but not high as predicted.

Low lemming populations and low breeding success of birds were expected in Yakutia, East Siberia. Unfortunately the available data were incomplete for this region. Numbers of lemmings and voles were considerable in the west and east mainland in this region, and were low in the Lena River delta. Low values of breeding success prevailed among several available assessments, although better conditions and results of reproduction may have occurred in the lower reaches of the Kolyma River and on the New Siberian Archipelago.

A protracted, but subdued, peak of lemming numbers on Wrangel Island during the last 3 years was expected to give way to a decrease with the associated increase in bird predation by Arctic Foxes and impairment of nesting success. Contrary to expectations, lemming populations showed marked increases which together with an early spring and warm summer provided for almost ideal breeding conditions and high reproductive performance.

Continuation of the low stage in rodent populations in Alaska and associated low abundance of Arctic Foxes were supposed to result in increased bird breeding success in western Alaska, compared with the previous season of almost complete failure. Scarce reports from this region actually indicated low numbers of rodents and foxes. However, predation by American Mink on nests at Kanaryarmiut resulted in considerable decreases in wader reproductive performance there. Fairly successful reproduction was reported in line with expectations from two other sites in the west of Alaska.

Increased lemming abundance and possible local peak numbers, along with high breeding success of birds, were predicted for north-eastern Greenland. In fact, while lemming abundance increased in general, locally it varied from low to high. Given the ideal weather conditions, reproductive performance by birds was generally good in the region.

**Predictions for summer 2003**

Predictions about any natural phenomenon should be based on a model describing the behaviour of the studied system. In the case of bird breeding success in the Arctic such a theoretical framework is provided by the Roselaar-Summers prey-switching hypothesis, which links the nesting success of birds to abundance of rodents as alternative prey for predators. We tried to check the theoretical performance using empirical data on rodent abundance and bird breeding success accumulated for all years in the database of the Arctic Birds Breeding Conditions Survey. Both factors were summarised to a 3-rank categorical scale with ordered levels ("low", "average", "high"), and cross-tabulation of the data revealed a significant correspondence of bird breeding success and rodent abundance (Spearman Rho=0.333, $P<0.05$).

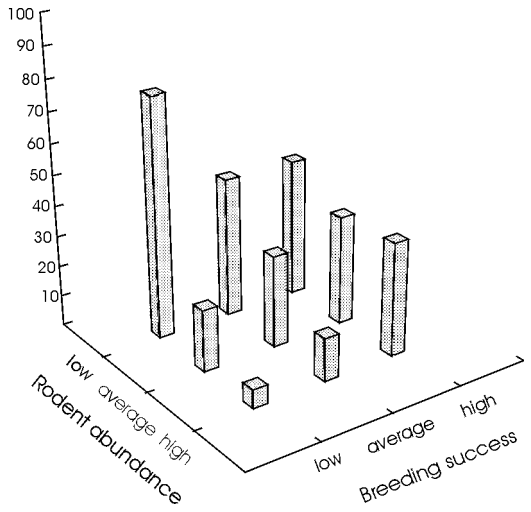



Figure 6. Relation of bird breeding success to rodent abundance

The relationship of the factors is visualized in Fig. 6, which shows that a combination of low breeding success and high abundance of rodents is the most unlikely situation to occur, with average success being the close second. Low breeding success in the majority of cases resulted from low abundance of rodents. However, there was also a high likelihood of average and even high

nesting success coinciding with low rodent abundance. Interestingly, high reproductive performance by birds occurs slightly more often at low abundance of rodents than at average or high, which, probably, reflects the scenario arising when predators leave a region with insufficient small mammals resources. Thus, the rodent-bird system seems to be most predictable at high stages of rodent populations, i.e. every 3-4 years given the generally recognized pattern of rodent cyclicity. The low stage of rodent populations occurs more often, and the response by breeding birds is less unambiguous then. Bearing in mind the possible additive and unpredictable effects of weather on bird breeding performance we proceed with the prognosis for 2003.

G.D.Kataev (this issue) does not exclude the possibility of Norwegian Lemming and voles reaching peak numbers on the Kola Peninsula in 2003, with the associated lowering of predation pressure on birds.

The situation is complicated in the region from Bolshezemelskaya Tundra in north-eastern Europe to western Taimyr in Siberia. Lemming numbers did not peak anywhere in this area in 2002, but voles were apparently numerous in the Polar Urals and the lower Ob River area. In the latter region, vole populations had crashed in summer, resulting in the starvation of Arctic Foxes. Not knowing these facts, we would have expected further growth of lemming populations and attainment of peak numbers in summer 2003, followed by successful reproduction of birds in the north of West Siberia. However, starving predators can suppress intensive lemming reproduction and prevent their populations from rising to high numbers. A different scenario can develop on western Taimyr, where the chances are higher for active under-snow reproduction by lemmings leading to peak numbers. However, the considerable abundance of lemmings in 2002 may mean that peak numbers will be reached in winter, so that numbers decrease by summer 2003. An assumption of 3-year cyclicity in populations of lemmings indicates that the likelihood of peak numbers occurring on western Taimyr in summer 2003 is not high. Arctic Foxes are likely to benefit from average numbers of rodents remaining in West Siberia and/or on western Taimyr and overwinter successfully. This leads us to predict at best average reproductive performance of birds in this region in summer 2003.

A tendency towards increasing lemming populations was observed in summer 2002 on eastern Taimyr and in north-western Yakutia. Peak lemming numbers may spread from western Taimyr to the eastern part of the peninsula and further eastward in summer 2003, and according to the expectations of respondents, may extend to parts of the Lena River delta. However, given that a 4-year lemming cycle was recently observed in this region, average numbers of lemmings are more likely. In either case, conditions for bird reproduction should be favourable in north-central Siberia.

High lemming numbers in 2002 on Wrangel Island led to active and successful reproduction by predators. Normally, further development should result in decreased lemming abundance and increased pressure of predators, primarily Arctic Foxes, on birds in summer 2003. The researchers, however, do not exclude a possibility that a super-peak with very high lemming numbers may happen in 2003 due to the growth of the Vinogradov's Lemming population, thus allowing for another year of favourable conditions for breeding birds.

It is expected that a low stage of rodent populations will continue or deepen on the Chukotsky Peninsula, while vole numbers may start increasing in the west of Alaska. The scarcity of predators will permit the successful reproduction of birds in these regions where St. Laurence Island may become the only known source of emigration of Arctic Foxes after successful reproduction.

Growth of lemming populations should start in 2003 at North Slope of Alaska, with associated average or even high breeding success of birds.

According to the available data, the state of rodent populations differed considerably between northern and southern localities in Canada. Rodent populations crashed in the Karrak Lake area and on Bylot Island, and numbers (in particular of lemmings) dropped to low. Lemmings were virtually absent on Southampton Island after a population high in 2000. Reproduction of Arctic Foxes did not occur in the two former localities, but they were common and bred in the latter. Given low rodent numbers, overwinter survival of Arctic Foxes may be problematic, although they are known to make heavy use of marine foods during lemming lows. Anyway, further increase of predation pressure is not likely in the above localities, and average breeding success of birds can be expected there in 2003. Growth of the rodent populations started in 2002 in some southern localities in Canada, the Daring Lake area and near Churchill, which resulted in high breeding success in the latter locality. Further increases in rodent numbers can be expected there in 2003, along with good bird reproduction for the second year. Peak rodent numbers are unlikely to remain for the second year on the Ungava Peninsula to the east, and predators will, probably, cause low reproductive performance by birds there.

The tendency towards increased populations of the Greenland Lemming in 2002 should result in peak numbers across large areas of north-eastern Greenland, which will contribute to successful reproduction by birds.

Validation of the above predictions for various Arctic regions will be possible if we get sufficient information on bird breeding conditions in summer 2003 from respondents.

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# LONG-TERM FLUCTUATIONS OF NORWEGIAN LEMMING NUMBERS ON KHARLOV ISLAND, SEM' OSTROVOV ARCHIPELAGO, EASTERN MURMAN COAST

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Kharlov Island is one of the largest islands in the eastern Murman region of the Barents Sea, permanently populated by a single rodent species – the Norwegian Lemming *Lemmus lemmus*. The island is 3.5 by 1.5 km large, and looks like an elevated tundra plateau with the maximum altitude 120 m a.s.l. At the north side the island has cliffs of 20-30 m high, and at the south it is separated from the mainland by a channel 2.5 km wide which does not usually freeze in winter. Only twice in recent decades (in April 1966 and April 1979) has the channel filled completely with drift ice, so that terrestrial animals could reach the island. Lemmings were recorded annually in the period from May through to August from 1978 to 1999 in the course of field ornithological studies on the island.

The following criteria of lemming abundance were used during observations (in ranks):

0 – complete absence of visual records (very low numbers);
1 – 1-5 records of animals by one observer for a season (low numbers);
2 – 5-10 records (average numbers);
3 – 10-50 records (high numbers);
4 – >50 records (very high numbers).

The impact of predators on the local population of lemmings on Kharlov Island is not great. These rodents were rarely taken by such birds as Arctic Skua *Stercorarius parasiticus*, Herring Gull *Larus argentatus*, Gyrfalcon *Falco rusticolus*, Snowy Owl *Nyctea scandiaca*, Raven *Corvus corax*, and mammals like Red Fox *Vulpes vulpes*, dog *Canis familiaris*, cat *Felis catus* and Ermine *Mustela erminea*. These predators were not making special efforts to catch lemmings, probably, due to the availability of alternative and easily obtainable food in colonies of seabirds. I am sure that fluctuations of lemming numbers on the island are determined by internal population factors.

Figure shows that the local population of Norwegian Lemming was characterized by the absence of a regular cycle. Lemming numbers were high (ranks 3-4) only in 4 summer seasons over the 22-year period, while in most years (n = 15) the population was at a low. Peak numbers occurred at intervals of 3, 6 and 7 years. It is noteworthy that lemming numbers remained at a low point during the period of 6 years from 1988 to 1993.

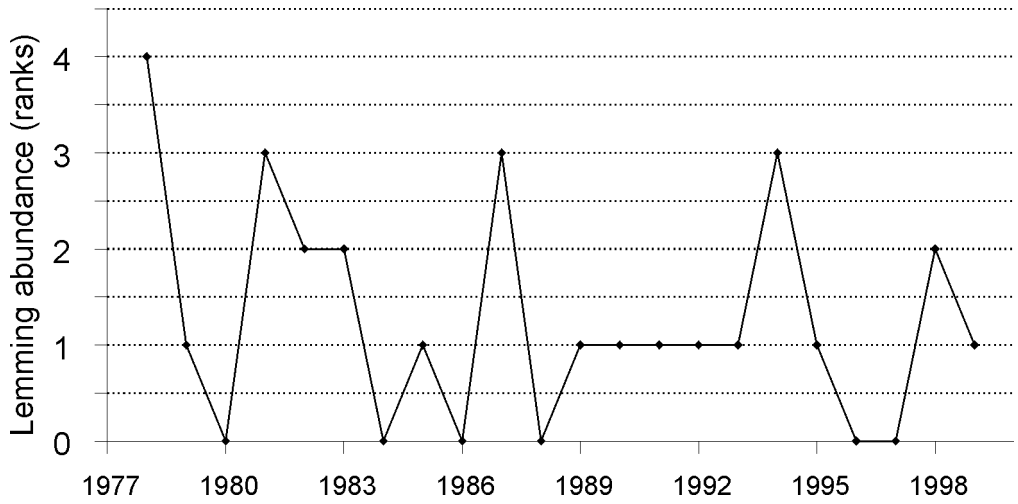


Figure. Dynamics of abundance of Norwegian Lemmings on Kharlov Island, Barents Sea, in 1978-1999.

Unfortunately comparable data are not available for the adjacent mainland coast of the Kola Peninsula where regular observations were not carried out. It is known, however, that very high lemming numbers were observed in 1978 across the whole Kola Peninsula, including Kharlov Island. In contrast, high lemming numbers in 1987 were observed only on the island, while coastal mainland areas in this year were populated at a high density with voles. Thus, the dynamics of the Norwegian Lemming, probably, differs between Kharlov Island and the adjacent coast of the Kola Peninsula, which is likely to be due to the isolation of the island population. Dynamics of lemming numbers even on nearshore islands can be peculiar enough to prohibit reliable conclusions about the stage of the lemming numbers on the nearby mainland coast.

# CYCLICITY IN LEMMING AND VOLE NUMBERS IN THE NORTHERN TAIGA OF THE KOLA PENINSULA

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Our studies were carried out in the Laplandsky State Nature Reserve situated at 119-177 km to the north of the Polar Circle, at the east of Fennoscandia and in the central part of the western Kola Peninsula. Zoogeographic position, and the history of the formation of the topography and of the mammalian fauna are peculiar on the Kola Peninsula. For many millions of years mountain massifs of the Kola Peninsula were part of the great Timano-Altai Range providing one of the principal migration routes of animals and plants from the Urals and Siberia to Fennoscandia. The biogeographical barrier, which is represented by a narrow portion of the White Sea separating the Kola Peninsula from the mainland at the southeast, is geologically young (about 7000 years, Siivonen 1979).

The Kola Peninsula was twice subject to surface glaciation during the Pleistocene (70 and 25-23 thousand years ago). The ice sheet did not melt synchronously across Lapland, remaining longer in its central elevated part, which was due in part to the warming influence of the Gulf Stream. The ice sheet was retreating from the foothills towards the mountain tops, and "each newly established vegetation belt was so radically different from the previous one in animal environment that this allowed penetration of animal forms into Lapland which could previously survive only outside of the region" (Pleske 1887, p. 13). European, Siberian and Arctic faunistic complexes came into contact and intermixed in Fennoscandia. However, the White Sea isolated Arctic species of small-sized mammals, for example Norwegian Lemming *Lemmus lemmus*, for a long period of time from allied eastern populations which resulted in independent evolutionary development of these groups (Siivonen 1979).

The region is inhabited by 8 species of small rodents, of which the dominants in terms of numbers are the Norwegian Lemming and Grey-sided Vole *Clethrionomys rufocanus*, and subdominants are Ruddy *Cl. rutilus* and Bank *Cl. glareolus* voles. In some years Root Vole *Microtus oeconomus* and Wood Lemming *Myopus schisticolor* can reach high numbers. The population dynamics of small mammals has been studied in the Laplandsky Nature Reserve since 1929 (Semyonov-Tyan-Shansky 1970). However, the Kola Peninsula in general was also covered by various rodent studies (e.g., Koshkina 1980, Kataev 1983, Kataev et al. 1994, Kataev & Boiko 1995, Kataev & Pozdnyakov 1996).

During first 6 years of monitoring, rodent abundance was categorized as "present"/"absent" for lemmings and "many"/"few" for voles, while in 1936 direct counts were started at the Elnyun field station on the reserve (67°39' N, 32°36'E) using snap-traps (Kucheruk 1961). Since then, counts have been carried out using standard techniques annually during 1-10 September with a single discontinuance in war time from 1942-1945 (Semyonov-Tyan-Shansky 1970, Kataev et al. 1994, Stenseth 1999). Data for the 4 missing years were interpolated from the two adjacent population cycles: 1938-1941 and 1945-1948 (Fig.). Monitoring of numbers of Norwegian and Wood lemmings until 1974 was based on direct observations and registration of signs of their activity (primarily winter nests), while later we used small ditches in addition to snap-traps for rodent counts (Kucheruk 1961).

While generally Arctic lemmings have a circumpolar distribution, the range of the Norwegian Lemming is restricted to Fennoscandia, including the Kola Peninsula in Russia, and it does not overlap with the ranges of other lemming species. This species is typical of mountain landscapes, in particular during population lows, while peak numbers are associated with a wider distribution. Intensive reproduction resulting in a high number of Norwegian Lemmings in the region usually involves two consecutive years: 1929-30, 1933-34, 1937-38, 1941-42, 1946, 1958-59, 1969-70, 1977-78, 1982-83. This series shows that the population of the Norwegian Lemming peaked at 4-year intervals until the middle 40s, but afterwards that time, regularity was completely broken. Annual monitoring and application of additional survey techniques from 1974 allowed us to discover Norwegian Lemmings in certain localities of the central Kola Peninsula in non-peak years as well (e.g., in 1968, 1969, 1970, 1971, 1974, 1979, 1998 and 1999).

Numbers of Norwegian Lemmings changed between years, but also between seasons within a year and among habitats, depending on the stage of the population cycle (e.g., this was documented for 1977-1978 by Kataev 1983). O.I.Semyonov-Tyan-Shansky (1982) has described one population peak of the species that started in the Khibiny Mountains, the Kola Peninsula, in 1957 spreading westward to the Laplandsky Nature Reserve in the next year, and then to the mountains of northern Sweden in 1959.

Norwegian Lemmings are famous for particularly pronounced migrations in spring and autumn. The migration flow of these animals is usually determined by landscape characteristics and thus remains specific to an area. Rodent abundance can have spatial gradients within the species range. Thus, after a long discontinuity from 1982, lemmings appeared in large numbers in 2001 in the mountains of Finland (Tannerfeld et al. 2001). In summer 2002, lemmings were found in central Norway, and in the autumn they spread to the north of the country (R. Ims, D. Erhich, N. Yoccoz, *in litt*.). At the extreme northeast of Norway and the Kola Peninsula, lemmings did not reach high numbers until November 2002, whereupon snow cover established and direct counts were stopped. It is possible that area of high lemming numbers will extend eastward in 2003 and spread over the Kola Peninsula.

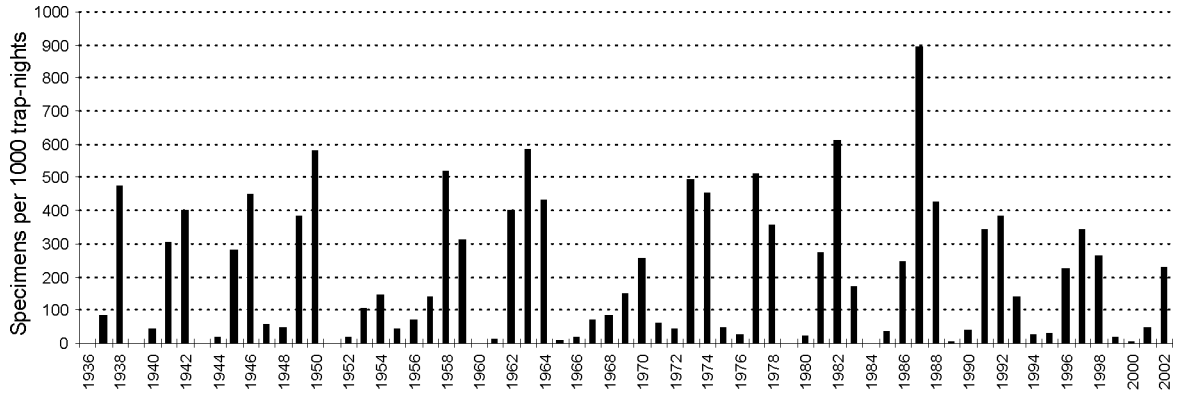


Figure. Long-term dynamics of numbers of Grey-sided Vole *Clethrionomys rufocanus* in the Laplandsky Nature Reserve based on annual autumn counts.

The cyclicity of numbers of red-backed voles *Clethrionomys spp.* follows a typical pattern for Scandinavia. Among 14 cycles of Grey-sided Vole, 7 cycles were 4-years long, 6 were 5-years long and one was 6-years long (Fig.). It means that numbers of this dominant species on the Kola Peninsula fluctuated over a period of 4 years, but since 1959 the duration of some periods was extended owing to the addition of an extra year with decreasing vole numbers just after the peak year – namely 1959, 1964, 1983, 1988, 1993, 1998 (Fig.). Recently, Grey-sided Vole outnumbered Bank Vole according to data from the Elnyun fieldstation. Long-term cyclicity of the formerly dominant Bank Vole over intervals from 3 to 5 years was also characterized by the insertion of additional years after peaks (Kataev & Koshkina 2003).

In Wood Lemmings, only 4 pronounced two-year peaks were observed in the region: in 1933-34, 1937-38, 1958-59 and 1969-70. Besides, Wood Lemmings were found on the Kola Peninsula in its central part in 1971, 1998-1999 (Semyonov-Tyan-Shansky 1982, Kataev & Kataeva 1999) and in its southern part in 1981, 1982-83, 1996 (Boiko 1986, A.Mironov, pers. comm.). These rodents were found in northern Norway in 1969, and in Karelia in 1987-88 and 1993-95 (Wikan et al. 1994, Kataev & Pozdnyakov 1996, A.Kutenkov, pers. comm.). Wood Lemmings were recorded in 2002 in the central Kola Peninsula and they were also reported from the south of the peninsula (N.S.Boiko, pers. comm.). In 2003 numbers of this species are expected to increase dramatically on the Kola Peninsula.

Populations of Grey-sided Voles and Norwegian Lemmings often peaked in the same years (1938, 1942, 1946, 1958, 1970, 1977, 1982). Low points almost always occurred simultaneously in voles and lemmings and were very well expressed (1936, 1939…1951, 1960, 1965, 1979, 1984, 1989, 2000). The biomass of small forest rodents is the highest, not only among mammals, but among terrestrial vertebrates in general. Peaks of abundance every 4-5 years result in a very high density of lemmings and voles, roughly averaging one animal per 10 $m^2$. Predators obtain abundant food in such years and reproduce successfully. The diet of mammalian predators primarily consists of rodents in such years (Kataev & Makarova 1981), and their impact on bird populations is unlikely to be great.

Predator–prey interactions also receive considerable attention from researchers in northern Europe. Abundance of voles and lemmings is known to affect numbers and breeding status of both avian and mammalian predators. For example, low points in vole populations led to starvation of Red Foxes *Vulpes vulpes* and Ermines *Mustela erminea* during winters 1939-1940, 1951-1952, 1960-1961, when these predators were captured in traps of hunters more often than usual. According to observations in the Laplandsky Nature Reserve the population response of Red Foxes was delayed by 1-2 years, and high numbers of predators occurred during the low point in their prey populations (Kataev & Makarova 1981).

It can be supposed that changes in productivity and abundance of birds is linked to long-term fluctuations of rodent numbers in northern boreal ecosystems via changes in predation pressure by predators. In particular, low numbers of voles and lemmings may force mammalian predators to switch to other foods, including birds. The lack of complete synchronicity in the population dynamics of rodents, mammalian predators and birds is notable. Reproductive success of predators can also be affected by weather conditions and the specific reaction of their populations to changes in food abundance (Kataev & Makarova 1981, Sittler & Berg 2002).

The general impression is that reproduction in birds was particularly successful in years when the vole cycle extended by a year or two and reached a duration of 5 or 6 years (1959, 1964, 1970, 1983, 1988, 1993 and 1998). Years 1959, 1970 and 1983 were also characterised by mass reproduction of lemmings in the region which made them particularly favoured prey for rodent-specialist predators. This knowledge allows us to make certain inferences about the relative reproductive success of birds, depending on rodent numbers.

In my opinion, the principal difficulty in predicting reproductive success in birds, based on rodent numbers, originates from the fact that it is almost impossible to

predict the exact duration of a vole cycle, even from long-term data. However, an attempt to provide a short-term prognosis of reproductive conditions for birds is presented below. Assuming the four-year population cycle numbers of Grey-sided Voles should decrease after 2002. However, in case of longer duration of the cycle spring-summer numbers of voles in the region in 2003 will remain at the 2002 level, or even exceed it by autumn. Furthermore, the start of mass reproduction of Norwegian Lemmings is possible. Accordingly, numbers of predators are expected to increase further, while their pressure on birds will remain weak in 2003 and also during the nesting period of 2004. Rodent numbers are expected to decrease from the second half of 2004 which will result in the first shortage of food for rodent-specialist predators after three favourable years. Mammalian predators will decrease reproductive activity in 2005, while their pressure on birds will increase.

**Literature**


Boiko, N.S. 1986. To ecology of Wood Lemmings – *Myopus schisticolor* Lillj. on the south of Murmansk Region. Pages 43-46 in: Nature and economy of the North. – Murmansk, # 14. In Russian.

Kataev, G.D. 1983. Small mammals of the mountain areas of the Kola Peninsula. Abstract of Thesis of the Candidat Dissertation. Sverdlovsk. P. 1-20. In Russian.

Kataev, G.D., Boiko, N.S. 1995. Dynamics of numbers of voles (*Clethrionomys*) at the north of Kola Peninsula: ecological aspect. P. 560-575 in I.A.Shilov (ed.). Ecology of populations: structure and dynamics. Materials of the All-Russia conference (15-18 November 1994, Puschino). Moscow, Nauka. In Russian.

Kataev, G.D., Kataeva, R.I. 1999. Wood Lemming in fauna of the north of Kola Peninsula. P. 100-103 in L.V.Puchnina (ed.). Materials of the conference dedicated to 25 anniversary of the Pinezhsky Reserve (16-25 August 1999, Pinega). Arkhangelsk. In Russian.

Kataev, G.D., Koshkina, T.V. 2003. Long-term (1936-2002) dynamics of numbers of small mammals on the Kola Peninsula. P. 153 in V.N.Orlov (ed.). Materials of the International Conference "Mammal fauna of Russia and adjacent countries". (Moscow, 6-7 February 2003). Moscow. In Russian.

Kataev, G.D., Makarova, O.A. 1981. On winter diet of Red Fox during rodent number depression. Ecologia. **2**: 88-89. In Russian, English summary.

Kataev G.D., Suomela J., Palokangas P. 1994. Densities of microtinae rodents along a pollution gradient from a copper-nickel smelter. Oecologia 97: 491-498.

Kataev, G.D., Pozdnyakov, S.A. 1996. Current fauna of small mammals on protected territories in the northern taiga subzone at the northwest of Russia. P. 158-160 in Y.F.Marin (ed.). Issues of protected territories. 25th anniversary of the Visimsky Nature Reserve. Ekaterinburg. In Russian.

Koshkina, T.V. 1980. Characteristics of population cycles of small rodents in Subarctic illustrated by voles and lemmings of the Kola Peninsula. P. 77-81 in G.P.Krasnoschekov (ed.). Regulation mechanisms for numbers of lemmings and voles at the Extreme North. Vladivostok. In Russian.

Kucheruk V.V. 1961. New developments in methods of quantitative surveys of detrimental rodents and shrews in the USSR. P. 55-57 in Y.A.Isakov (ed.). Issus of organization and methods of counts of resources of terrestrial vertebrate fauna. Materials of the Meeting (Moscow, 4-8 March 1961). Moscow. In Russian.

Pleske, F.D. 1887. Critical review of mammals and birds of the Kola Peninsula. Notes of the Imperial Academy of Sciences. Vol. 56. Book. 1. Appendix 1. St.-Peterburg. 536 p. In Russian.

Semyonov-Tyan-Shansky, O.I. 1970. Cyclicity in populations of forest voles. Bull. Moscow Soc. Naturalists, Biol. Div. 75(2): 11-26. (in Russian with English summary). In Russian.

Semyonov-Tyan-Shansky, O.I. 1982. Mammals of the Murmansk Region. P. 62-71. In Russian.

Siivonen, L. 1997. Mammals of the northern Europe. Moscow. Lesnaya Promyshlenost Press. 231 p. Translation into Russian.

Sittler B., Berg T. 2002. Lemming cycles in North-East Greenland. Pp. 35-37 in: Soloviev & Tomkovich (comp.) Arctic Birds: Newsletter of International Breeding Conditions Survey, No. 4.

Stenseth, N.C.1999. Population cycles in voles and lemmings: density dependence and phase dependence in a stochastic world. Oikos **87**: 427-461.

Tannerfeld, M., Angebjorn, A., Henttonen, H., 2001. Bevarande av fjallrav *Alopex lagopus* I Sverige och Finland Aktivitetsrapport. http://www.zoologi.su.se/research/alopex/Rapport_SEFALO_2001.PDF.

Wikan, S., Makarova, O., Aarseth, T. 1994. Pasvik. Oslo. 94 p.

# DYNAMICS OF RODENT NUMBERS ON THE YAMAL PENINSULA AND THE IMPACT ON THE ARCTIC FOX POPULATION

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Reproductive success of birds in the Arctic and Subarctic is known to depend considerably on nest predation, in particular by the Arctic Fox *Alopex lagopus*. The hypothesis about the instrumental role of fluctuations in rodent numbers, mediated by predators, on bird productivity has received many confirmations. However, the operation of the mediator (Arctic Fox population) in this chain remains inadequately investigated.

This paper describes the dynamics of numbers of rodents (Lemmings *Lemmus* and *Dicrostonyx* as well as voles *Microtus* and *Clethrionomys*) and Arctic Foxes on the Yamal Peninsula at the extreme northwest of Siberia. The vast Yamal Peninsula extends into the Kara Sea between the Polar Urals and Baidaratskaya Bay to the west and Obskaya Gulf to the south and east. The peninsula landscape is relatively homogenous and flat, prolific in rivers and lakes. The large south to the north extent (670 km) creates a zonal gradient from forest tundra to Arctic tundra.

The relationships of rodents and rodent-specialist predators has attracted considerable interest from researchers, and studies of either group of animals on Yamal have been, to a lesser or greater extent, related to this problem (Dunaeva, Kucheruk 1941, Korzinkina 1946, Dunaeva, Osmolovskaya 1948, Elshin, Shubin 1983, Balakhonov, Lobanova 1988, Sokolov 2000, Shtro 2000). The relationships between predators and rodents were not always straightforward, in particular for birds of prey (Ryabitsev 1993). Our data show strong relationships between lemming abundance and breeding activity by female Arctic Foxes, occupation of dens by litters and survival of cubs.

Qualitative information on rodent numbers on Yamal is available for the period from 1973 to 1977. Quantitative data on relative rodent numbers were collected from 1978 and can be instrumental for reconstructing bird reproductive success. The data were collected using a unified method, which included the setting of 50 snap-traps for two days in a line traversing, when possible, different habitats. Raisins were used as bait, and traps were placed 5 meters apart on tracks, near burrows or toilets of rodents, but not over 1 meter from a point on the line. The trap line was checked twice a day, in the morning and evening (Sosin et al. 1985, Paskhalny et al. 2000).

Rodent numbers obtained from trap catches and expressed as numbers of individuals per 100 trap-nights (t/n further on) were converted to a 5-rank scale for convenient comparisons: depression – <1 animal/100 t/n, low – 1–4, average – 5–8, high – 9–14, very high – >15 animals/100 t/n).

The breeding condition of female Arctic Foxes was evaluated by examination of fox bodies collected in winter by hunters. The presence of spots in the *cornua* of the *uterus* indicated that a female had been pregnant (Tavrovsky 1946). From 62 to 1000 animals were examined annually in the period 1974 to 1986 (excluding winters 1981/82 and 1984/85), among them from 2 to 147 adult females. The age of foxes was determined on the basis of the degree of overgrowing of the caspid canal, which is distinctly different between young and adult foxes (Smirnov 1959, 1960). To determine the fraction of occupied dens, we annually surveyed 150-200 of them. Information on occupation of dens by fox litters is given below for the whole territory of Yamal after averaging across sub-zones, because the latter differed considerably in the number of dens, and sometimes in degree of their occupation. Systematic observations of Arctic Fox reproduction were not conducted after 1986.

**Results of observations on rodents and Arctic Foxes**

Lemming numbers started to decrease in 1973 in the sub-zone of southern (shrub) tundra. In 1974 rodent depressed numbers were observed across the whole territory of Yamal (Ryabitsev et al. 1976), and 32% of Arctic Fox females bred. In summer 1975 numbers of rodents, in particular lemmings, started to increase and reached high values in summer 1976 (Kalyakin 1980). The fraction of breeding fox females increased as well and reached 50% and 87% in respective years.

In summer 1977 rodent numbers dropped, and 43% of fox females bred. Rodent populations increased to some extent during the cold summer of 1978, in shrub tundra, and continued to increase in typical tundra sub-zone where considerable numbers of lemmings (8.7 ind./100 t/n) were observed in 1979. Lemming numbers in shrub tundra were significantly lower (Balakhonov et al. 1988). The fraction of breeding fox females on Yamal in 1978 and 1979 was 65% and 85%, respectively. The summer of 1980 was very cold and rainy; rodents were scarce across the entire Yamal – 2.6–3.2 ind./100 t/n (Strelkov, Elshin 1983, Bakhmutov et al. 1985, Balakhonov et al. 1988), and 64% of fox females bred. Central Yamal was affected by a strong cyclone in October 1980, after which slush froze into an ice layer up to 10 cm thick. The result was devastating for rodents; their numbers continued to decrease during summer 1981 in the arctic and typical tundra sub-zones (Sosin et al. 1985), and dropped below 1 ind./100 t/n in shrub tundra (Balakhonov, Shtro 1995). Data on breeding by Arctic Foxes are not available.

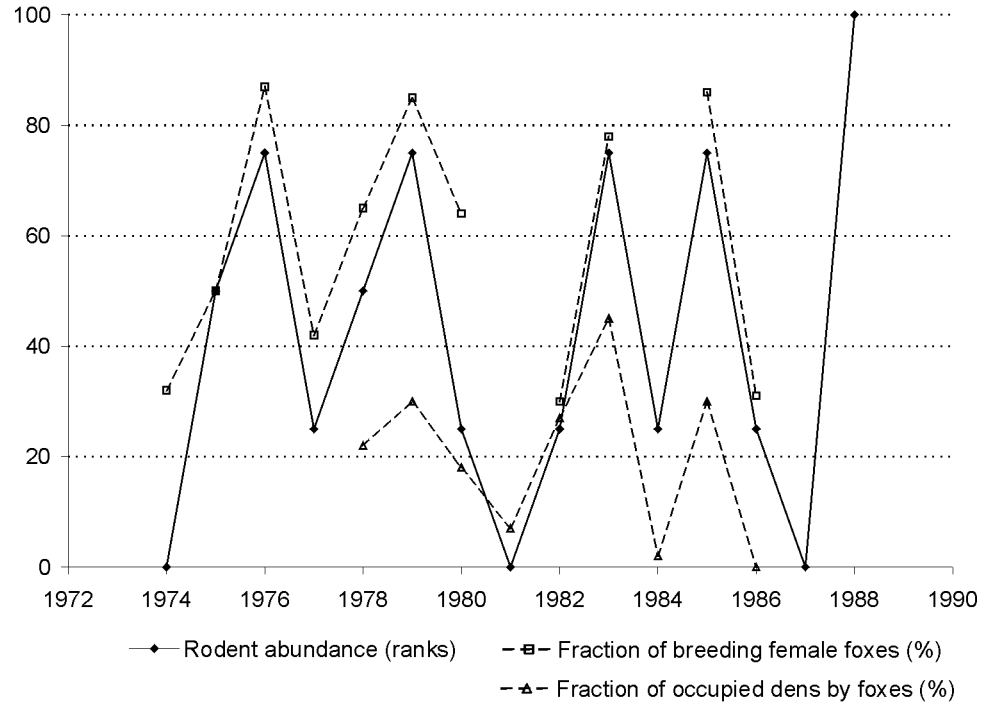


Figure. Dynamics of rodent numbers in the typical tundra sub-zone and breeding parameters of Arctic Foxes on Yamal Peninsula.

In 1982 spring was very early, and rodent populations were increasing everywhere on Yamal – up to 2.0–3.8 ind./100 t/n (Shtro 1995). Arctic Fox reproduction was not intensive (30% of females involved). The continuing increase of rodent numbers in summer 1983 resulted in average abundance 10 ind./100 t/n (primarily lemmings), and 78% of fox females bred. Rodent numbers started to decrease during winter 1983/1984, resulting in a population low in the following summer, when fewer than 1 ind./100 t/n were captured. Arctic Foxes were not sampled due to their scarcity. Rodent reproduction in winter 1984/1985 led to very high numbers in summer 1985 (over 10 ind./ 100 t/n) and breeding by 86% of fox females. Peak numbers of lemmings continued until spring 1986 when they perished in large numbers, with solitary survivors being trapped (0.1 ind./100 t/n), and 31% of fox females breeding. The population of rodents remained at a very low level in summer 1987. Population increase started in winter 1987/1988 and in summer 1988 resulted in the highest value for the period of observations. Numbers reached 20 ind./100 t/n in the second half of the summer in typical tundra (Dobrinsky, Sosin 1995), 32 ind./100 t/n in the best habitats in shrub tundra, including 12.5 ind./100 t/n of lemmings (Shtro 2000).

Lemming populations remained at a low point during summer seasons 1989 and 1990, with a density of 1.5–2 ind./100 t/n in shrub tundra (Balakhonov, Shtro 1995), and an almost complete absence of lemmings in typical tundra (Dobrinsky, Sosin 1995). This situation did not change in 1991 in shrub tundra (1.3 ind./100 t/n), but numbers in typical and arctic tundra sub-zones increased. Numbers dropped again to 0.5–2.3 ind./100 t/n in 1992 and 1993 across the whole of Yamal. There was a slight increase in 1994 (5.0 ind./100 t/n), which gave way to low numbers in 1995 (1.3 ind./100 t/n), followed by an almost complete absence of animals in 1996. Numbers of rodents remained low in shrub tundra in summer 1997 (Golovatin, Shtro 1998), but increased rapidly in typical tundra (Paskhalny 1998). Total rodent numbers in 1998 matched the record level of 1988, comprising primarily Narrow-skulled Vole *Microtus gregalis,* while lemming populations were average in shrub tundra and low in typical tundra (Shtro 1999). Lemming populations continued to decrease from 1999 to 2001, while voles were still abundant in shrub tundra in 1999 (16-18 ind./100 t/n, Sokolov 2000), became rare in 2000 and increased again in 2001. In 2002 lemmings and voles reached the high density of 6–10 ind./100 t/n.

The figure shows the dynamics of rodent abundance, expressed by rank, in the typical tundra sub-zone for the period of 1974-1988, overlaid with available data on parameters of Arctic Fox reproduction in this period. Rank evaluation of rodent abundance is a convenient approximation of the situation with food supply for rodent-specialist avian predators (Paskhalny et al. 2000).

**Dynamic processes in the population of Arctic Foxes on Yamal**

Dramatic annual changes, for various reasons, are typical in populations of the Arctic Fox. The dependence of fox numbers primarily on rodent abundance is generally recognized (Tavrovsky 1946, Korzinkina 1946, Dunaeva, Osmolovskaya 1948, Chirkova 1955, Sosin et al. 1985). Our data indicate a direct dependence of fox breeding conditions on rodent numbers. Very high fertility of Arctic Foxes and their capability of raising many cubs enable them to increase the population rapidly when lemmings are abundant. The figure compares the fox breeding parameters and rodent numbers. In peak rodent years, 85–87% of female foxes bred, having on average 12.9–17.8 spots per *uterus* in different years.

The fraction of breeding females correlates well with the fraction of dens occupied by litters (R=0.95). In peak rodent years, the number of cubs in surveyed dens correlates with the number of yearlings captured by hunters (R=0.92). While an increasing fraction of breeding females contributes to population increment (R=0.89), the role for the latter of high cub survival is still larger.

Interestingly, vole numbers of the same level as lemming numbers do not have a similar effect on Arctic Fox populations. Thus, very high numbers of voles in shrub tundra for two years in a row (1998 and 1999) did not lead to notable increases of den occupation by foxes, and their litter size did not exceed 5 cubs.

In low rodent years 31.0–42,8% of fox females bred, but the reduction in fertility was not dramatic, 11.4–12.1 spots. We observed increased duration of rut, delay of spring moult (completely white Arctic Foxes were recorded until July) and high variability in size of cubs. The apparently size differences of cubs in famine years was due to varying abundance of rodents between localities in focal survival areas.

Pair formation usually starts in February in Arctic Foxes, with a delay in cold winters (Tavrovsky 1946). Young females initiate reproduction 10-20 days after adult females. By this time Arctic Foxes disperse more or less uniformly in areas suitable for denning and occupy the largest dens. Rut and accordingly whelping are spread over two months. Cubs appear in a den in May-June. Lactation continues for 45–60 days, but one month old cubs start eating rodents brought by their parents. Cubs come out of dens in July, and from that time, adults may transport the whole or part of the litter to a different nearby den. The number of surviving cubs depends entirely on the stage of the rodent cycle. Most cubs survive and litters consist of 12-15 cubs when high rodent numbers are established in winter and rodents continue to breed into summer. If rodent numbers drop in spring, and their summer reproduction is low, litter size in Arctic Foxes is small, not exceeding 5 cubs, and may reduce further by autumn. During depression of rodent numbers 95-99% of cubs may perish.

Conditions are most favourable for foxes in typical tundra, where the density of dens is higher, and where the largest part of the population resides even in famine years. The size of home range of breeding pairs strongly depends on environmental conditions. In peak rodent years, home range size during cub feeding averages 4.4–5.3 $km^2$, and increases with a decrease in rodent abundance.

Predators normally try to find an area with maximum concentration of potential prey. Arctic Foxes marked with ear-tags in the late 1930s wandered broadly within Yamal and beyond the peninsula to Novaya Zemlya at the west and to 64º N at the south. About 67% of marked animals remained on Yamal, 18% went west and 15% went to the Ob River basin. None of their markers were recovered farther east (Sdobnikov 1940). Marking with self-banding loops in the early 1960s yielded a different pattern. Arctic Foxes from Yamal migrated westward, but also long-distant recoveries at Rivers Yenisei and Olenyok and at Cape Barrow, Alaska, to the east were also recorded (Smirnov 1965, 1967). Migrants from Yamal on average accounted for 7% of hunted foxes in the European North of Russia in winters 1960/1961 and 1963/1964. It is noteworthy that almost none of these migrants attempted to breed (Shilayaeva 1967).

Despite the absence of distinct differences among Arctic Foxes from various geographic regions of Eurasia, they differ to a certain extent in some morphological features of skin and hair (Pichugin 1974). Foxes from Yamal differ from foxes from Yenisei in skull length (Yakushkin 1970), they have harsher fur, thicker and longer hair (Pichugin 1974). Skulls of Yamal foxes differ from north-european foxes in fewer palatal holes, larger jugal width and larger condilobasal length of skull (Shilayaeva 1974), and longer hair (Pichugin 1974). Thus, morphological differences of Arctic Foxes from Yamal and foxes from either Bolshezemelskaya Tundra or Taimyr, along with peculiar dynamics of numbers enable the distinction of the former as a separate population.

Apparently, the majority of Arctic Foxes stay within breeding areas with optimal conditions for existence of the species. However, limited exchange of animals between populations occurs which supports the integrity of this circumpolar species. For example, less than 5% of Arctic Foxes migrated to Yamal from the Gydan Peninsula in the period from November to March (our data).

Most wandering animals are young foxes which survive in favourable feeding conditions. Nomadic movements turning into mass migrations in years of peak numbers are believed to be caused primarily by shortage of food and unfavourable weather conditions (Chirkova 1955, Rakhmanin 1959, Shilyaeva 1967, 1985). The presence of rodents may restrict movements to a certain area. Thus, high numbers of lemmings remained from summer 1985 to spring 1986, and Arctic Foxes scarcely left their dens during the whole winter, compelling hunters to become beaters rather than trappers. Rodents started perishing in March-April, when an epidemic of viral encephalomyelitis occurred also among Arctic Foxes. Fox movements were recorded only after rodents started to perish in shrub tundra, and were probably related also to the initiation of breeding.

Sometimes the start of movements coincided with the disintegration of families and the establishment of snow cover. However, when rodent numbers were decreasing, fox movements occurred sometimes by mid summer. Not all Arctic Foxes were involved in movements, sometimes considerable numbers remained settled (Tsetsevinsky 1940, Smirnov 1965, our data). Usually the overwhelming majority of young Arctic Foxes do not return to their birthplace after leaving Yamal due to high mortality from hunting, starvation and diseases. For example, about 35% of young Arctic Foxes die during epidemics of viral encephalomyelitis. Trapping could have resulted in the removal of 50-80% of the fox

population (Smirnov 1964), and young animals accounted for up to 95% in years of peak numbers. However, the hunting impact on sex and age structure of the Arctic Fox population differed depending on rodent numbers. When rodent numbers decrease during winter, hunting is active, and mostly young males are taken during the first half of winter. Then the sex ratio becomes more balanced due to the involvement of females in movements, and adult females prevail in the take on the eve of spring. When rodent numbers remain high during winter, Arctic Foxes show little interest in bait, and the harvest is shifted to the second half of winter. In this case the take consists mostly of males as the most mobile part of the population. Despite losses from hunting and diseases in the next summer after mass reproduction of Arctic Foxes, almost 50% of their population is represented by one-year old animals.

Based on the results of our studies of summer rodent abundance using relative evaluation, counts of winter nests of lemmings and analyses of Arctic Fox stomach contents, it is possible to conclude that for foxes to remain more or less settled, winter density of lemmings should approximate to the average summer density of at least 20 individuals per hectare. Winter lemming numbers can be evaluated by numbers of their under-snow nests, and the latter may exceed the above figure (Sdobnikov 1957). These data are in agreement with the fact that growth of lemming populations occurs primarily during the under-snow period. Lower rodent numbers stimulate the development of migration activities in Arctic Foxes.

### Literature


Bakhmutov V.A., Sosin V.F., Shtro V.G. 1985. Distribution and numbers of some terrestrial vertebrates in northern tundra of Yamal during summer. P.39-66 in V.F.Sosin (ed.). Distribution and numbers of terrestrial vertebrates on the Yamal Peninsula. Sverdlovsk: Inst. for Plant and Animal Ecology. In Russian.

Balakhonov V.S., Lobanova N.A. 1988. Numbers and fecundity of Rough-legged Buzzard at different abundance of rodents in shrub tundra of Yamal. Ecologia. No. 2: 83-84. In Russian.

Balakhonov V.S., Lobanova N.A., Pavlinin V.V, Shtro V.G. 1988. Distribution and numbers of some species of mammals in the shrub tundra subzone of Yamal. P.133-148 in A.V.Borodin (ed.). Current state and history of animal wildlife of the West-Siberian Lowland. Sverdlovsk. Ural Branch of Academy of Sciences. In Russian.

Balakhonov V.S., Shtro V.G. 1995. Some species of terrestrial vertebrates in the shrub tundra subzone of Yamal. P.159-193 in B.C.Balakhonov (ed.). Current state of plant and animal wildlife of Yamal Peninsula. Ekaterinburg, Nauka. In Russian.

Chirkova, A.F. 1955. An experience of visual evaluation of Arctic Fox numbers at a wide scale and prognosis of harvest. P.74-122 in N.M.Ovchinnikov (ed.). Issues of biology of fur animals. Proc. of Inst. for Hunting Trade. No. 14. Moscow. In Russian.

Dobrinsky N.L., Sosin V.F. 1995. An experience of evaluation of impact of the Bovanenkovo gas-condensate field development in central Yamal on dynamics of Arctic Fox numbers. Ecologia. No. 3: P.229-234. In Russian.

Dunaeva T.N., Kucheruk V.V. 1941. Materials on ecology of terrestrial vertebrates in tundra of southern Yamal. Bull. Moscow Soc. Naturalists, Biol. Div. **19**(4): 5-80. In Russian.

Dunaeva T.N., Osmolovskaya V.I. 1948. Materials on the diet of the Arctic Fox on Yamal. P.144-155 in A.N.Formozov (ed.). Proc. of Inst. of Geography. Vol.41. In Russian.

Elshin S.V., Shubin S.E. 1983. To the diet and distribution of rodent-specialized avian predators in Yamal tundra during low lemming number. Bull. Moscow Soc. Naturalists, Biol. Div. **88**(2): 30-36. In Russian.

Golovatin M.G., Shtro V.G. 1998. Breeding conditions for waders in Russian tundra in 1997: Yuribei River upper reaches. P.32 in P.S.Tomkovich (ed.). Information Materials of the Working Group on Waders (CIS). No. 11. Moscow. In Russian.

Kalyakin V.N. 1980. Dynamics of lemming numbers on south of Yamal in 1973-1979. P.60-65 in G.P.Krasnoschekov (ed.). Regulation mechanisms for numbers of lemmings and voles at the Extreme North. Vladivostok. In Russian.

Korzinkina E.M. 1946. Ecology and number dynamics of Microtine rodents of southern Yamal. P.77-112. In V.M.Sdobnikov (ed.). Proc. of the Arctic Inst. Vol.194. Moscow & Leningrad. In Russian.

Paskhalny S.P. 1998. Breeding conditions for waders in Russian tundra in 1997: Kharasavey and Bovanenkovo. P.31 in P.S.Tomkovich (ed.). Information Materials of the Working Group on Waders (CIS). #11. Moscow. In Russian.

Paskhalny S.P., Sosin V.F., Shtro V.G. 2000. On lemming number evaluation by counts of winter nests in relation to rodent abundance assessment for purposes of ornithological studies. P.18-21 in Soloviev & Tomkovich (comp.) Arctic Birds: an International Breeding Conditions Survey, Newsletter No. 2.

Pichugin Y.V. 1974. Geographical variability of skins of white Arctic Foxs. P.49-55 in V.G.Safonov (ed.). Hunting, Fur and Game. No. 46. Kirov. In Russian.

Rakhmanin, G.E. 1959. Fur trade of the Yamalo-Nenets National Region and measures to increase its efficiency. P. 101-176 in S.S.Shwarts (ed.). Materials on fauna of the northern Ob region and its use. Proc. of Salekhard Station. No. 1. Tyumen. In Russian.

Ryabitsev V.K. 1993. Territorial relationships and dynamics of bird communities in Subarctic Ekaterinburg, Nauka. 290 p. In Russian.

Ryabitsev V.K., Ryzhanovsky V.N., Shutov S.V. 1976. Impact of predators on efficiency of bird reproduction on Yamal during rodent population depression. Ecologia. No. 4. P.103-104. In Russian.

Sdobnikov V.M. 1940. Experiments on mass marking of Arctic Foxes. Issues of Arctic. No. 12: 106-110. In Russian.

Sdobnikov V.M. 1957. Lemmings in northern Taimyr. P.109-126 in G.L.Rutilevsky (ed.). Vertebrates of Arctic. Proc. of the Arctic Inst. Vol. 205. Leningrad, Morskoi Transport. In Russian.

Smirnov V.S. 1959. Determination of age and description of age structure of Arctic Fox population on Yamal. P.220-238 in S.S.Shwarts (ed.). Materials on fauna of the northern Ob region and its use. Proc. of Salekhard Station. No. 1. Tyumen. In Russian.

Smirnov V.S. 1960. Determination of age and description of age structure in mammals with Red Squirrel, Muskrat and five species of predators as examples. P.97-112 in S.S.Shwarts (ed.). Issues in flora and fauna on the Urals. Proc. of Inst. of Biology. No. 14. Sverdlovsk. In Russian.

Smirnov V.S. 1964. Methods of counts of mammals. Proc. of Inst. of Biology. No. 39: 3-86. Sverdlovsk. In Russian.

Smirnov V.S. 1965. Marking of animals with self-banding loops. P.21-27 in S.S.Shwarts & G.P.Pomerantsev (eds.). Ecology of vertebrates on the Extreme North. No. 38. Sverdlovsk. In Russian.

Smirnov V.S. 1967. Analysis of dynamics of numbers of the Arctic Fox on Yamal and ways ofintensification of its trade. P.70-90 in S.M.Uspensky (ed.). Issues of the North. No. 11. Moscow. Nauka, In Russian.

Sokolov A.A. 2000. Diet of Rough-legged Buzzard (*Buteo lagopus*) in shrub tundra of Yamal. P.48-51 in V.N.Ryzhanovsky (ed.). Scientific Bull. No. 4, part 1. Materials to the knowledge of the fauna and flora of the Yamalo-Nenets Autonomous Region. Salekhard. In Russian.

Sosin V.F., Paskhalny S.P., Shtro V.G. 1985. Distribution and numbers of some species terrestrial vertebrates in arctic tundra of Yamal during summer period. P.3-33 in V.F.Sosin (ed.). Distribution and numbers of terrestrial vertebrates of Yamal Peninsula. Sverdlovsk, Inst. of Plant and Animal Ecology. In Russian.

Strelkov Y.N., Elshin S.V. 1983. Population dynamics of common rodent species in tundra of Yamal. P.50 in F.B.Chernyavsky & R.M.Viktorovsky (eds.). Biological Issues of the North. Part 2. Magadan, Inst. of Biological Problems of the North. In Russian.

Shilayaeva L.M. 1967. To the problem of studies of Arctic Fox migrations. Issues of the North. No. 11. Moscow. P.91-98. In Russian.

Shilayaeva L.M. 1974. To the issue of structure of mainland population of Arctic Fox. Ecologia. No. 1: 54-61. In Russian.

Shilayaeva L.M. 1985. European North. P.5-18 in A.A.Nasimovich & Y.A.Isakov (eds.). Arctic Fox, Red Fox, Racoon Dog. Moscow, Nauka. In Russian.

Shtro V.G. 1995. Arctic Fox and lemmings of Yamal. P.151-158 in B.C.Balakhonov (ed.). Current state of plant and animal wildlife of Yamal Peninsula. Ekaterinburg, Nauka. In Russian.

Shtro V.G.1999. Breeding conditions for waders in Russian tundra in 1998: Mutnaya River; Southwestern Yamal; Yamalsky settlement. P.23-25 in P.S.Tomkovich (ed.). Information Materials of the Working Group on Waders (CIS). No. 12. Moscow, In Russian.

Shtro V.G. 2000. Some observations on rodent-specialized predators in a peak lemming year. P.44-47 in V.N.Ryzhanovsky (ed.). Scientific Bull. No. 4, part 1. Materials to the knowledge of the fauna and flora of the Yamalo-Nenets Autonomous Region. Salekhard. In Russian.

Tavrovsky V.A. 1946. Peculiarities of Arctic Fox reproduction in relation to dynamics of its numbers. P.5-75 in V.M.Sdobnikov (ed.). Proc. of the Arctic Inst. Vol.194. Moscow & Leningrad, Glavsevmorput. In Russian.

Tsetsevinsky, L.M. 1940. Materials on ecology of Arctic Fox of northern Yamal. Zoologichesky Zhurnal. Vol.**19**(1): 183-191. In Russian.

Yakushkin G.D. 1970. Some data on morphology of Arctic Foxes from Taimyr. P.169-181 in P.N.Vostryakov (ed.). Issues of agriculture and hunting trade of the Extreme North. Proc. of the Inst. of Agriculture of the Extreme North. Vol.18. Krasnoyarsk. In Russian.

# ARCTIC BREEDING SUCCESS IN 2002, BASED ON THE PERCENTAGE OF FIRST YEAR BIRDS IN WADER POPULATIONS IN AUSTRALIA IN THE 2002/2003 AUSTRAL SUMMER

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Monitoring of wader populations in S.E. Australia (Victorian Wader Study Group) and N.W. Australia (Australasian Wader Studies Group Expeditions and N.W. Australia Wader Study Group) continued during the 2002/2003 Austral summer. This paper gives results of the apparent breeding success, measured by the percentage of juveniles in cannon net catch samples, during the 2002 Northern Hemisphere summer of wader populations which spend their non-breeding season in these two regions, 3000 km apart on the Australian continent.

This data collection is part of long term study programmes which commenced in 1978 in S.E. Australia and in 1981 in N.W. Australia. Procedures have been standardised as far as possible throughout this period. Results for the previous four breeding seasons (1998 to 2001) were detailed in Arctic Birds newsletters 2, 3 and 4.

**Methods**

Only samples of birds which were caught in cannon nets were included in the data analysed. This is because previous, and current, evidence suggests that catches made by mist netting may quite often have significantly higher proportions of young birds. This is probably caused by their greater naivety, but is also possibly associated with habitat.

The dates for which data are included for the 2002/2003 Austral summer samples are consistent with those used previously. Only catches made after most of the juveniles have arrived or before the adults commence their northward migration are included.

Consideration of potential limitations of this method of measuring breeding success were detailed in the Arctic Birds newsletter 2 and are still relevant. As stated in the Arctic Birds newsletter 2, 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**

Tables 1 and 2 give the results of wader catches in 2002/2003. As previously, the number and size of catches made for each species is shown also, to give an indication of the spread of samples obtained.

S.E. Australia

Overall, the 2002 Arctic summer seems to have been reasonably good for breeding for most wader species.

Most notable was the record high proportion of juvenile Sanderling (43%). Sharp-tailed Sandpipers (20% juveniles) also seemed to have a good breeding year, certainly the best for this species over the last 5 years.

In contrast, Red-necked Stint (13%) had only moderate breeding success following their exceptional run of excellent breeding seasons in three of the previous four years. Curlew Sandpipers (15%) fared moderately well, though were still down on the high level of the previous year (27%).

Another wader breeding in northern Siberia, the Ruddy Turnstone, appeared to have reasonably good breeding success also (17%), the second highest level for this species in the last five years. At one stage, it seemed possible that 2002 might have been an exceptional year for this species as the first juveniles arrived in S. E. Australia (12,000 km from their breeding grounds) in mid-September. Two were actually cannon netted in a sample on 21st September.

Unfortunately, Red Knot proved extremely elusive to catch this year. Certainly there were not the widespread flocks of juvenile birds around as recorded in the 2001/2002 Austral summer. Some young were clearly produced in 2002 but the figures given in the table for the very small sample should not be considered indicative of the situation in the population as a whole.

The Bar-tailed Godwits spending the non-breeding season in S.E. Australia are all thought to be of Alaskan origin (*baueri* sub-species). With 16% juveniles, they had a much better breeding season in 2002 than in the disastrous 2001 (1.4%).

Of waders which breed further south in Siberia, small samples of Greenshank and Eastern Curlew suggested that they did not have a particularly good breeding year in 2002. However it should be noted that in Eastern Curlew the percentage of juveniles in cannon netted samples has always been at a very low level.

N.W. Australia

For wader populations spending their non-breeding season in Northwest Australia the 2002/2003 breeding season also seems to have been reasonably good.

Great Knot had a much better breeding season (17% juveniles) than the previous year (5.2%). This is particularly welcome since in three of the previous four years breeding appears to have been very poor and populations have noticeably declined in N.W. Australia, the species' principal non-breeding area.

Curlew Sandpiper (15%) had the same proportion of first year birds as in S.E. Australia and also exhibited some reduction from the higher level the previous year (19%). Surprisingly, Red-necked Stint (41%) showed a very much greater apparent breeding success than in S.E. Australia, almost up to the record 1999/2000 level of 46%. It is just possible that this N.W. Australia figure is inflated by late migrating juveniles still on their way to non-breeding areas in southern Australia. On the other hand, banding recovery data suggests that the Red-necked Stints spending the non-breeding season in N.W. Australia may come from a significantly different breeding area (N.E. Siberia) to those from S.E. Australia (Yakutia, S.E. Taimyr). If this is the case it is quite feasible that markedly different breeding success may be experienced by the two populations.

The Sanderling figure (16%), though lower than the exceptional S.E. Australia figure (43%), still indicates that the Sanderling population had a reasonable breeding season in 2002.

Red Knot appear to have had a much needed boost to the population in N.W. Australia with 32% juveniles – way higher than the low figures recorded in three of the previous four years. The Red Knot in N.W. Australia are from the *piersmai* population breeding in the New Siberian Islands, several thousand kilometres to the west of the N.E. Siberia breeding grounds of the *rogersi* subspecies which supposedly occurs in S.E. Australia. Hence it's not surprising that there is no similarity (in fact, probably a negative correlation!) between the yearly breeding success of Red Knot in S.E. Australia and N.W. Australia.

The same is true for Bar-tailed Godwits. However N.W. Australian birds had a reasonable breeding outcome in the 2001 Arctic summer and followed this with similar breeding success in 2002.

Little Curlew continue to perplex. For the fourth year out of the last five, reasonable samples were caught and the proportion of young was high (30% in 2002/2003). This level (30-59%) is markedly higher than other similar-sized wader species such as Bar-tailed Godwit, Whimbrel and Grey Plover. Whether there is a major segregation of young birds into the populations of Little Curlew visiting N.W. Australia or whether this is a high reproduction rate/compensating high mortality rate species is yet to be determined.

Of waders which nest further south in Siberia (or northern China/Mongolia) only Greater Sand Plovers (32%) seem to have had a good breeding season in 2002. This tallies with limited data from S.E. Australia.

**Discussion and Conclusion**

Interpretation of percentage juvenile data must be carried out with caution, as detailed in Arctic Birds Newsletter No. 2. Nevertheless all the indications are that the systematically collected percentage juvenile figures in cannon netted samples of waders on their non-breeding grounds are a strong indication of the scale of variation in relative breeding success of each species/population

annually. Differences between the general situation for species within each non-breeding area, or between the two non-breeding areas themselves, can generally be related to known differences in the breeding origins of birds.

Overall, it appears that 2002 was a moderate to good breeding season across the wide range of the Arctic (S.E. Taimyr, right across Siberia and into N.W. Alaska) from which wader populations come to spend the non-breeding season in Australia. Sanderling travelling to S.E. Australia and Red Knot and possibly Red-necked Stint in N.W. Australia seem to have had exceptionally good breeding seasons in 2002. No species/population fared particularly badly.

In contrast, the data suggests that some of the wader species breeding further south in Siberia had less good breeding success in 2002, probably classed as moderate to poor. The exception to this is Greater Sand Plover, which did well.

Monitoring will be continued in the usual way in the 2003/2004 Austral summer, to enable estimates to be made of the success of the 2003 Arctic breeding season for wader populations which spend the non-breeding season in Australia.

**Table 1. Proportion of first year birds in wader catches in S.E. Australia in 2002/2003**

| Species | Number of catches | | Total birds caught | Number of first year birds | % first year |
|---|---|---|---|---|---|
| | Large >50 | Small <50 | | | |
| Ruddy Turnstone – *Arenaria interpres* | - | 4 | 89 | 15 | 17 |
| Red-necked Stint – *Calidris ruficollis* | 7 | 10 | 3357 | 438 | 13 |
| Sanderling – *C. alba* | 2 | 5 | 459 | 196 | 43 |
| Curlew Sandpiper – *C. ferrufinea* | 3 | 8 | 402 | 60 | 15 |
| Sharp-tailed Sandpiper – *C. acuminata* | 2 | 5 | 270 | 54 | 20 |
| Red Knot – *C. canutus* | - | 3 | 12 | 11 | (92) |
| Bar-tailed Godwit – *Limosa lapponoca* | 1 | 2 | 164 | 27 | 16 |
| Non-arctic northern migrants: | | | | | |
| Eastern Curlew – *Numenius madagascariensis* | - | 2 | 38 | 1 | (2.6) |
| Greenshank – *Tringa nebularia* | - | 1 | 41 | 1 | (2.4) |

All catches in period 28 Nov 2002 to 27 Feb 2003 except for Sanderling, Ruddy Turnstone and Red-necked Stint where catches up to 12 Mar 2003 are included. Cannon netting catches only.

**Table 2. Proportion of first year birds in wader catches in N.W. Australia in 2002/2003**

| Species | Number of catches | | Total birds caught | Number of first year birds | % first year |
|---|---|---|---|---|---|
| | Large >50 | Small <50 | | | |
| Red-necked Stint – *Calidris ruficollis* | 3 | 5 | 584 | 240 | 41 |
| Grey-tailed Tattler – *Heteroscelus brevipes* | 2 | 7 | 239 | 22 | 9 |
| Ruddy Turnstone – *Arenaria interpres* | - | 5 | 12 | 2 | (17) |
| Sanderling – *C. alba* | 1 | - | 64 | 10 | 16 |
| Curlew Sandpiper – *C. ferrufinea* | 1 | 9 | 247 | 36 | 15 |
| Great Knot *C. tenuirostris* | 3 | 8 | 411 | 69 | 17 |
| Red Knot – *C. canutus* | - | 10 | 90 | 29 | 32 |
| Broad-billed Sandpiper – *Limicola falcinellus* | - | 2 | 13 | 4 | (31) |
| Little Curlew – *Numenius minutus* | 1 | - | 269 | 82 | 30 |
| Whimbrel – *N. phaeopus* | - | 2 | 37 | 0 | 0 |
| Bar-tailed Godwit – *Limosa lapponoca* | 3 | 11 | 424 | 53 | 13 |
| Grey Plover – *Pluvialis squatarola* | - | 6 | 72 | 4 | 6 |
| Non-arctic northern migrants: | | | | | |
| Greater Sand Plover – *Charadrius leschenaultii* | 1 | 6 | 381 | 123 | 32 |
| Oriental Plover – *Ch. veredus* | - | 6 | 19 | 5 | 26 |
| Terek Sandpiper – *Xenus cinereus* | 1 | 8 | 193 | 21 | 11 |
| Black-tailed Godwit – *Limosa limosa* | - | 1 | 33 | 3 | 9 |
| Greenshank – *Tringa nebularia* | - | 5 | 23 | 1 | 4 |

Also Eastern Curlew (8, 2, 25%), Sharp-tailed Sandpiper (8, 1, 13%), Marsh Sandpiper *Tringa stagnatilis* (1, 0, 0%), Common Sandpiper *Actitis hypoleucos* (1, 0, 0%), Lesser Sand Plover *Charadrius mongolus* (5, 0, 0%), Pacific Golden Plover *Pluvialis fulva* (1, 1, 100%). All catches in period 18 Nov 2002 to 16 Feb 2003. Cannon netting catches only.

# SANDERLING AND RUDDY TURNSTONE BREEDING SUCCESS BETWEEN 1989 AND 2002 BASED ON DATA FROM S.E. AUSTRALIA

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The measurement of apparent breeding success of waders by calculating the proportion of juvenile birds in samples caught for banding is increasingly being used for demographic studies (Boyd & Piersma 2001, Atkinson et al., in press). Such data is also being used to assess other methods of estimating breeding success, including observations on the breeding grounds.

"Percentage juvenile" data obtained from banding studies in Australia has been published in Arctic Birds newsletters 2, 3, 4 and 5 and covers a variety of species for the breeding seasons 1998 to 2002. In addition an analysis of information gathered on Red-necked Stint *Calidris ruficollis* and Curlew Sandpiper *C. ferruginea* populations in S.E. Australia since 1991 was published in Arctic Birds Newsletter No. 4 (Minton et al. 2002).

This paper presents data on Sanderling *C. alba* and Ruddy Turnstone *Arenaria interpres* collected in S.E. Australia since 1989.

**Methods**

All data were collected from cannon net catches made by the Victorian Wader Study Group in Victoria and the southeast corner of South Australia (i.e. S.E. Australia). Only catches made in the period between the 18th November and 20th March are included. These dates were selected to ensure: (1) All juveniles have arrived in their non-breeding areas, and (2) No adults had commenced their northward migration (for these two species, most birds do not leave S.E. Australia on northward migration until April).

Note should be taken of the potential limitations and biases in reproductive rates measured by the percentage of juveniles in banding catch samples (see Arctic Birds Newsletter No. 2). It should also be noted that technically it is the recruitment rate into the non-breeding population which is being measured, rather than fledging rate. Some mortality of fledged birds will have occurred already during their southward migration from Siberia to the non-breeding areas in Australia where these samples were obtained.

**Results**

Tables 1 and 2 give catch data and the number/proportion of first year birds for Sanderling and Ruddy Turnstone respectively. Note that the Ruddy Turnstone sampling commenced a year earlier than that for Sanderling and that there is also an unfortunate gap in the Sanderling data for the 1991/1992 Austral summer.

**Table 1. Catches of Sanderling in S.E. Australia between 1990/1991 and 2002/2003**

| Year | No. of catches | | Total caught | No. first years | % first years |
|---|---|---|---|---|---|
| | Large >50 | Small <50 | | | |
| 90-91 | 1 | 0 | 208 | 29 | 14 |
| 91-92 | | | | | |
| 92-93 | 0 | 1 | 35 | 6 | 17 |
| 93-94 | 1 | 1 | 161 | 23 | 14 |
| 94-95 | 0 | 2 | 49 | 6 | 12 |
| 95-96 | 1 | 1 | 192 | 6 | 3.1 |
| 96-97 | 2 | 0 | 404 | 6 | 1.5 |
| 97-98 | 1 | 4 | 271 | 82 | 30 |
| 98-99 | 1 | 1 | 110 | 11 | 10 |
| 99-00 | 1 | 0 | 462 | 58 | 13 |
| 00-01 | 2 | 0 | 243 | 7 | 2.9 |
| 01-02 | 4 | 2 | 483 | 49 | 10 |
| 02-03 | 2 | 5 | 459 | 196 | 43 |
| **Median** | | | | | **12.5** |
| **Mean** | | | | | **14.25** |

**Table 2. Catches of Ruddy Turnstone in S.E. Australia between 1989/1990 and 2002/2003**

| Year | No. of catches | | Total caught | No. first years | % first years |
|---|---|---|---|---|---|
| | Large >50 | Small <50 | | | |
| 89-90 | 1 | 0 | 109 | 0 | 0 |
| 90-91 | 1 | 2 | 140 | 16 | 11 |
| 91-92 | 1 | 3 | 152 | 122 | 80 |
| 92-93 | 0 | 3 | 78 | 2 | 2.6 |
| 93-94 | 0 | 2 | 14 | 1 | 7.1 |
| 94-95 | 2 | 5 | 185 | 11 | 6.0 |
| 95-96 | 0 | 6 | 108 | 10 | 9.3 |
| 96-97 | 1 | 5 | 197 | 12 | 6.1 |
| 97-98 | 4 | 7 | 331 | 133 | 40 |
| 98-99 | 1 | 4 | 177 | 11 | 6.2 |
| 99-00 | 0 | 5 | 51 | 15 | 29 |
| 00-01 | 0 | 6 | 181 | 19 | 10 |
| 01-02 | 1 | 4 | 118 | 11 | 9.3 |
| 02-03 | 0 | 4 | 89 | 15 | 17 |
| **Median** | | | | | **9.3** |
| **Mean** | | | | | **16.7** |

Populations

The sample sizes obtained annually need to be assessed in the light of the populations of these two species in the study area. Both species occur all along the 700 km of the coast of Victoria. But numbers of both are modest by comparison to the much more numerous populations of Red-necked Stint, Curlew Sandpiper, Sharp-tailed Sandpiper, Bar-tailed Godwit and Red Knot.

Total Ruddy Turnstone and Sanderling populations in Victoria are probably normally not more than 1000 individuals during the non-breeding season. The Ruddy Turnstones are fairly widely spread in small flocks with only two or three locations where a flock of more than about 75 birds can be found. In contrast, most of the Sanderling occur at only four, widely separated, locations, with flock size at these ranging between 100 and 400/500 individuals.

In contrast, in the 60 km stretch of coast on which catches were made in South Australia (just across the border from Victoria) numbers and concentrations of both species are higher. This is because of the extensive accumulation of rotting seaweed, detached from offshore rock platforms, which collects on the coast and becomes full of maggots during summer. These weed beds, and the sandy shores containing run off from them, provide extremely rich feeding resources, particularly in late summer/early autumn. Around 1000-1500 Ruddy Turnstone generally occupy this relatively short section of coast, with individual flocks often being in the range of 50-150 birds. The Sanderling population in the same area, usually confined to two locations, is also at least 1000 birds and at times nearly all of these are gathered together in one flock.

In the context of the above figures, it can be seen that the annual sampling of the Sanderling and Ruddy Turnstone populations is significant.

Sanderling

The results for Sanderling (Table 1) may be summarised as follows:

a. The median percentage first year birds in the 12 years for which samples have been obtained was 12.5%.

b. For 7 out of the 12 years, the % first year birds was between 10 and 17%.

c. Exceptionally good breeding years occurred in 2002 (43%) and 1997 (30%).

   Unfortunately no sample was obtained in the Austral summer following the 1991 breeding season. This was a year in which most wader species in Siberia had extremely high breeding success.

d. Sanderling appear to have experience very poor breeding seasons in 1995 (3.1%), 1996 (1.5%) and 2000 (2.9%). Note that two of these were successive years. Fortunately for population levels, they were followed by one of the extremely good breeding seasons.

Ruddy Turnstone

For Ruddy Turnstone the results can be summarised as detailed below:

a. The median percentage juvenile figure for Ruddy Turnstone over the 14 years sampled is 9.3%, significantly lower than that for Sanderling.

b. In 8 of the 14 years, the percentage juveniles in catch samples ranged between 6 and 11%.

c. Ruddy Turnstones had extremely good breeding years in 1991 (an unbelievable 80%), 1997 (40%) and 1999 (29%).

d. During the whole 14 year period, Ruddy Turnstones appear to have only had two poor breeding years 1989 (0%) and 1992 (2.6%).

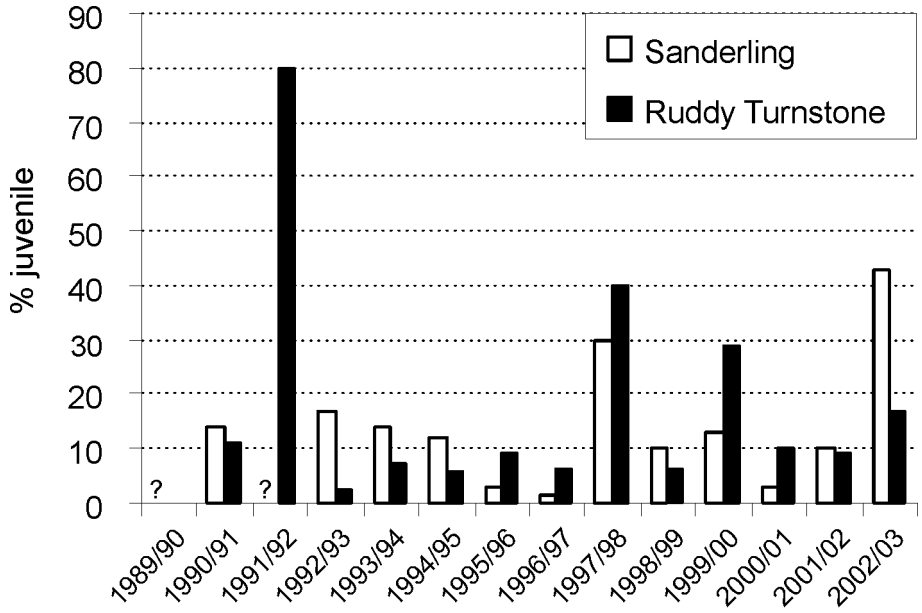


Figure. Percent of 1st year Sanderlings and Ruddy Turnstones in wader catches in SE Australia in 1989/1990 - 2001/2003. Question marks indicate missing data for Sanderling.

The year 1992 saw widespread breeding failures around the Arctic in most species of waders (Ganter and Boyd 2000). Figure shows the percentage of first year birds in each of the 14 annual samples of each species.

**Discussion and Conclusions**

Both Sanderling and Ruddy Turnstone exhibit high year to year variations in breeding success, as is observed in most species of waders breeding in the Siberian Arctic. No particularly regular pattern is apparent in the figures for either species. In some cases the level of breeding performance is very similar: for example in 1997 both species had exceptionally good breeding years, whereas in the preceding year both species were at, or close, to the lower end of their scales of breeding success rate. In contrast 1995 appeared to be a much worse season for Sanderling than for Ruddy Turnstone. And the exceptionally high 2002 breeding success for Sanderling was only partially reflected in the Ruddy Turnstone figures.

It would be easy to gloss over the 1989 figure for Turnstone of 0% for juveniles. Unfortunately at that time a suitable location to catch Sanderling had not yet been identified. But it is noteworthy that 1989 was also an exceptionally poor breeding year for Red-necked Stints spending the non-breeding season in S.E. Australia (0.7%) and also for Curlew Sandpipers (0.3%) in the same area (VWSG unpublished data). These figures are even lower (Red-necked Stint) or equal to (Curlew Sandpiper) the figures in the renowned poor breeding year 1992. Thus it would appear that the 1989 breeding season in the Arctic was even worse than that of 1992.

Population levels of both Sanderling and Ruddy Turnstone in the study area during the last 10-15 years are not considered to have changed significantly. Normal annual variations occur but no long term trend is apparent. It would thus appear that the pattern of percentage juvenile figures, representing indexes of annual breeding success, are currently at a level sufficient to sustain the populations of both species.

**Acknowledgments**

Considerable thanks go to the many members of the Victorian Wader Study Group, and others, who have assisted with the fieldwork over many years. Their efforts and perseverance to obtain annually the required samples within the given time period have been crucial to gathering suitable data for this analysis.

**References**

Atkinson, P.W., Clark, N.A., Bell, M.C., Dare, P.J., Clark, J.A. & Ireland, P.L. (in press) Changes in commercially fished shellfish stocks and shorebird populations in the Wash, England. Biological Conservation.

Boyd, H. & Piersma, T. 2001. Changing balance between survival and recruitment explains population trends in Red Knots *Calidris cantutus islandica* wintering in Britain, 1969-1995. Ardea **89**: 301-317.

Ganter, B. & Boyd, H. 2000. A tropical volcano, high predation pressure, and the breeding biology of Arctic Waterbirds: a circumpolar review of breeding failure in the summer of 1992. Arctic **53**: 289-305.

Minton, C., Jessop, R. & Collins, P. 2002. Variations in apparent annual breeding success of Red-necked Stints and Curlew Sandpipers between 1991 and 2001. Pp. 43-45 in: M.Y.Soloviev & P.S.Tomkovich (comp.) Arctic Birds: Newsletter of International Breeding Conditions Survey, No. 4.

## MAP COLLECTION

Four maps below are provided to illustrate various aspects of bird breeding conditions in the Arctic in 2002.

Each of the figures 1 and 2 represent an overlay of the map layers reflecting two different kinds of information. The first one is the deviation of the mean June/July temperature in 2002 from the mean June/July temperature averaged for the period 1994-2002. This deviation indicates whether the respective month in 2002 was warmer (positive value) or colder (negative value) than average. The colour of the points at 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 kind 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 around.

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 rather obvious from the 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.

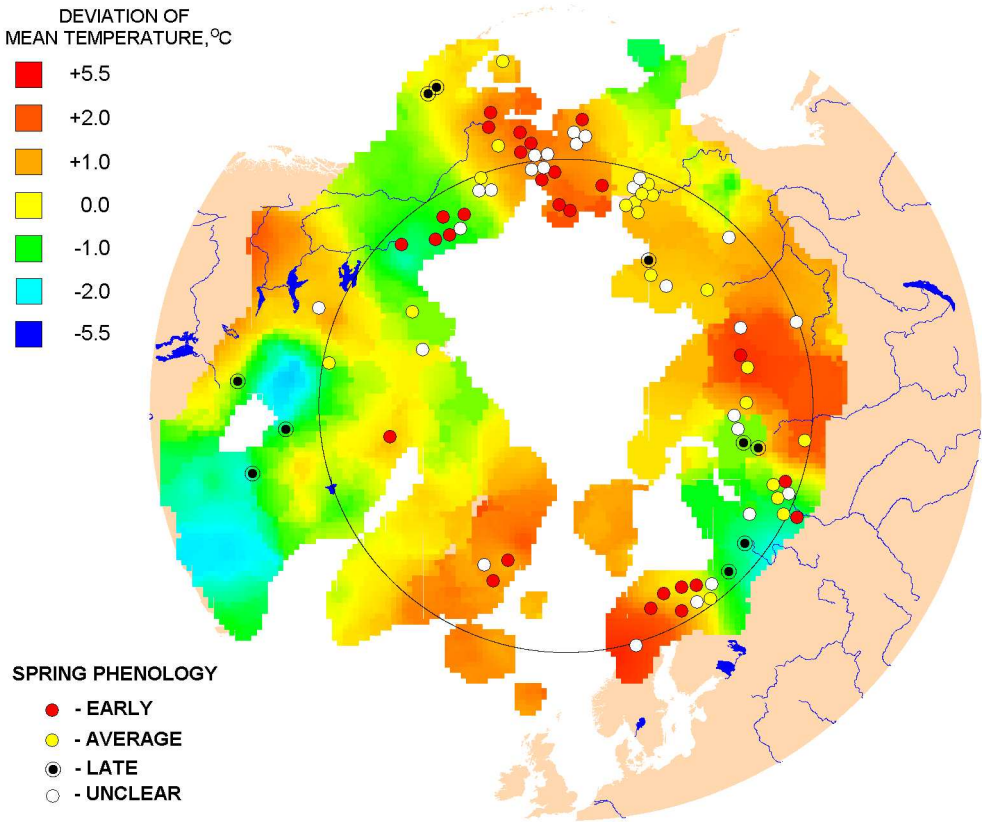


Figure 1. Temperature and phenological characteristics of early summer in the Arctic in 2002. See text above for legend

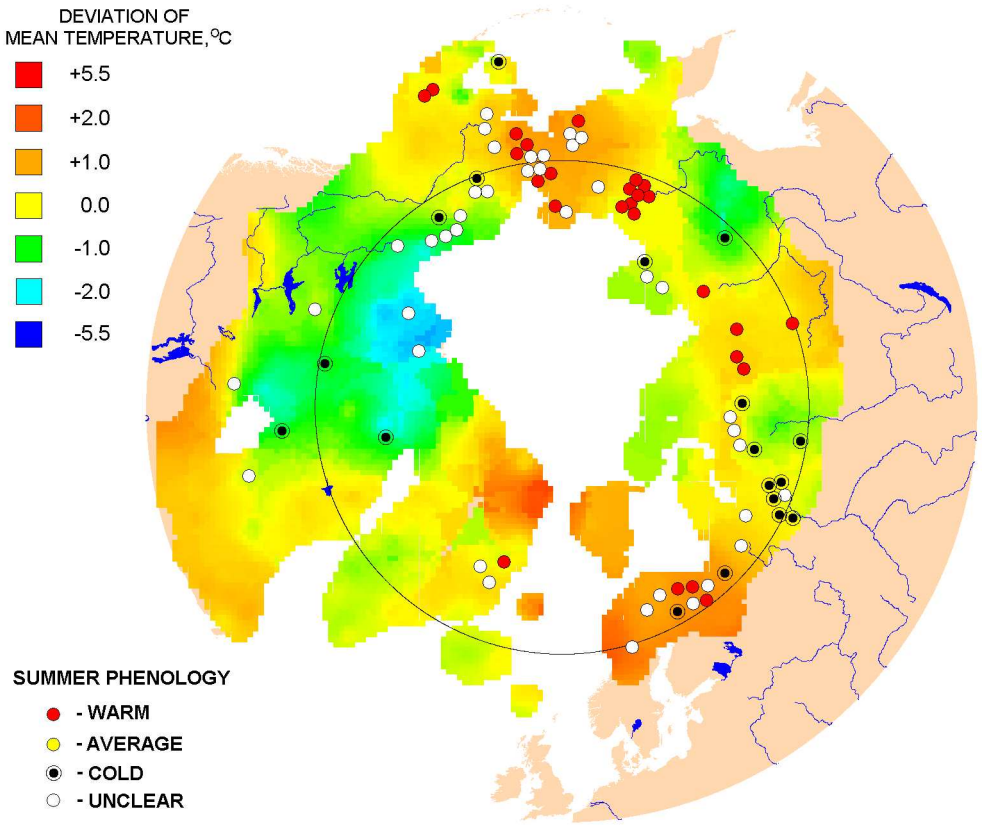


Figure 2. Temperature and phenological characteristics of mid summer in the Arctic in 2002

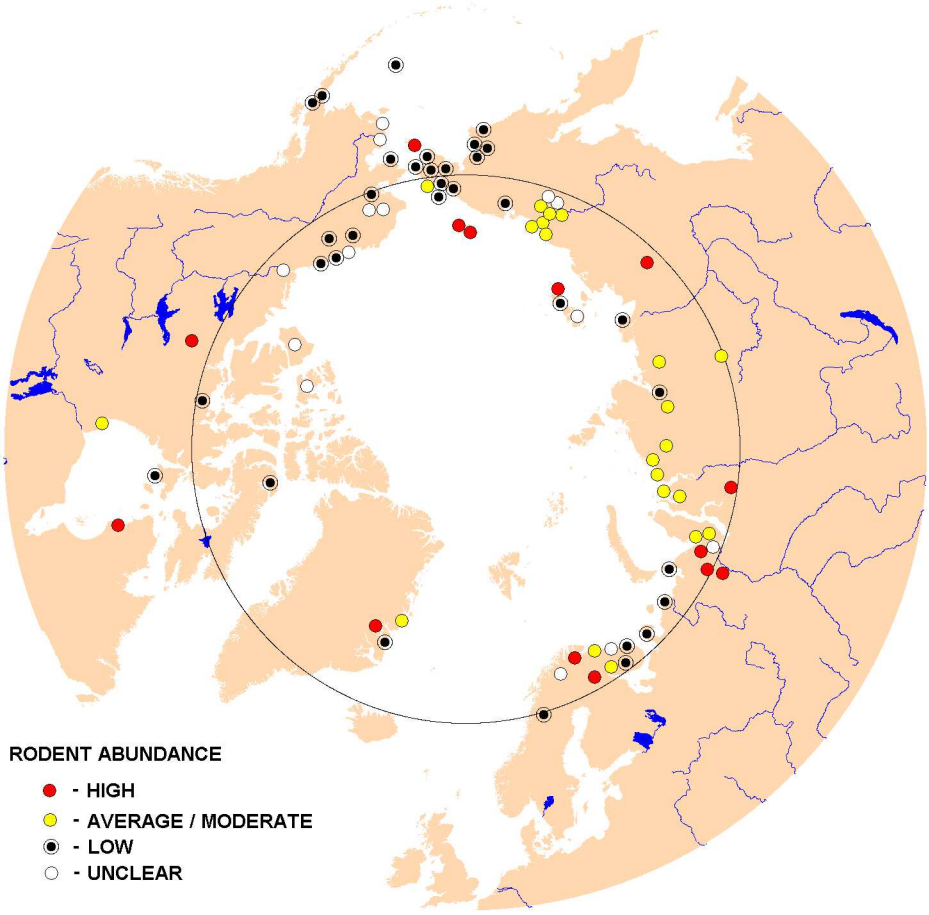


Figure 3. Rodent abundance in the Arctic in 2002

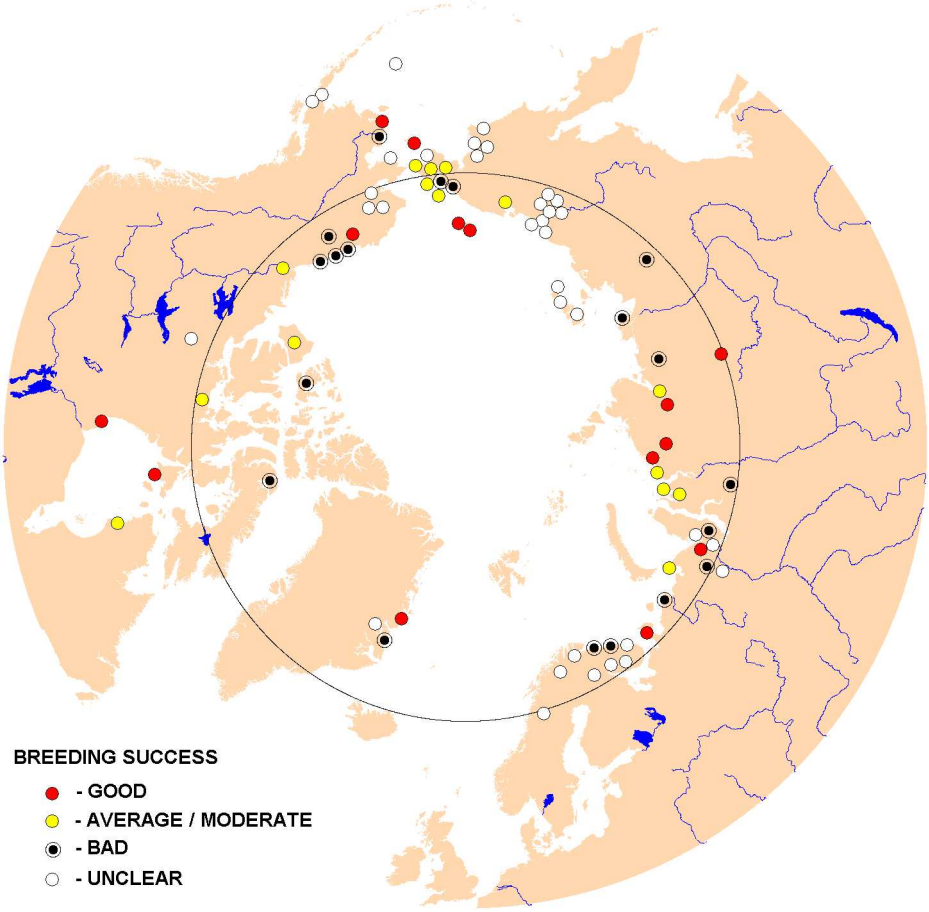


Figure 4. Bird breeding success in the Arctic in 2002