ARCTIC BIRDS

Newsletter of International Breeding Conditions Survey

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A WORD FROM THE COMPILERS

The third issue of the newsletter of the International Arctic Birds Breeding Conditions Survey (ABBCS) focuses on describing and analysing breeding conditions for birds in the Arctic during last summer 2000. Since publication of the last issue of the newsletter our main efforts as coordinators have been to raise the profile of the survey among members of the Arctic research community and improve access to accumulated data. The Survey website was re-designed and updated in January 2001, incorporating the following main changes:

◊ The site has a new, global address on the web, to facilitate access: http://www.arcticbirds.ru. However, support of the mirror site at the former address (http://www.soil.msu.ru/~soloviev/arctic) continues.

◊ The amount of information that can be accessed via clickable maps was expanded substantially, including most of the data from part 1 of the questionnaire and some data from part 2. In line with increasing weight of the data source, individual reports on breeding conditions are now supplemented by recommendations for citation.

◊ The download section was expanded by two issues of annual newsletters available for download in pdf format, and electronic publication of the current issue is planned soon after the printing of paper copies.

The project website is expected to become the main tool for quick dissemination of information from the database, and we will be grateful for pointers to any problems associated with access to the site or downloading data.

After three years of the project's full-scale operation, the following statistics can be presented on changes of geographic coverage between years, in terms of numbers of localities by region:

Region	1998	1999	2000
Alaska	1	6	6
Canada	0	8	5
Greenland	2	3	3
Russia	37	28	38

The coverage of Greenland and Alaska was constant for two last year and disappointingly low, in particular for Alaska, considering the high intensity of ornithological research carried out there.

Although information was received from fewer locations in Canada in 2000 compared with 1999, the quality and explanatory power of available data improved. In 1999 all the data for the Canadian north came from a report of the Tundra Northwest 1999 expedition, with sparse data, mainly restricted to rodent abundance. For the 2000 season, we received reports (including detailed information) from ornithologists, with the emphasis on birds, which better fits the Survey scope. Information from all but one of the Canadian sites in 2000 became available as a result of cooperation with Northwest Territories/Nunavut bird checklist survey (http://www.mb.ec.gc.ca/nature/migratorybirds/nwtbcs/index.en.html), and due to the personal efforts of its coordinator, Vicky Johnston from the Canadian Wildlife Service. We hope that this cooperation will develop further.

Geographic coverage of the Russian Arctic in 2000 improved compared with the previous year, partly as a result of the surveys by the International Arctic Expedition of Russian Academy of Sciences on the Chukotsky Peninsula, from where no reports were available in 1999. The above statistics indicate that there is still a lot to be done to really bring the survey to a circumpolar scale, which is necessary to address some of the "hot" issues in current Arctic science.

One such issue, hot not only in the figurative meaning, is a threat of global warming and climate change, which has been attracting increasing interest among ornithologists during recent years. An annual conference of International Wader Study Group, held in Norwich, England early in September 2000 devoted a special workshop to global climate change with particular reference to its prospective impacts on birds, especially waders. A synopsis made at the end of meeting stated that most uncertainty relates to wader biology on northern breeding grounds, which thus emerges as a priority field of research. We hope that ABBCS will be able to make important contribution to understanding bird responses to global environmental changes, also in cooperation with other international initiatives, such as the Pan-Arctic Shorebird Research Network by CAFF (PASRN, see page 33 for details). The latter survey is complementary to ABBCS in that it explicitly focuses on bringing together researchers involved in long-term monitoring in the Arctic, and we anticipate fruitful collaboration with potential participants of PASRN.

Apart from the regular reports on bird breeding conditions in various Arctic localities, provided by respondents, together with summary review and maps, the current issue of newsletter contains the following items:

- ◊ a paper by I. Travina on experience of evaluating lemming numbers on Wrangel Island, in development of the discussion featured in two previous issues;
- ◊ a review of current views on lemming taxonomy by N. Abramson;
- ◊ a view on Arctic wader breeding performance in summer 2000 from the Australian perspective, provided by Victorian and Australasian Wader Studies Groups.

In the current newsletter issue, we would like to make the first call for contributions of summer 2001 information on bird breeding conditions in the Arctic. As previously, forms for completion can be requested as a paper copy or electronically (Word for Windows document) from coordinators, or downloaded from the WEB site (now also in pdf format). In the current database set-up, most of the information from Part 1 of the questionnaire will be promptly published on the website, which will have the added value of increasing awareness about the studies carried out by respondents. By the end of 2001, a pilot scheme is scheduled to start, aimed at electronic publication of some data from the database on abundance of individual bird species, provided by respondents in Part 2 of questionnaire.

This newsletter will be widely distributed, but preferentially among contributors to the database. Feed-back from readers is sought, together with suggestions for future contents of the newsletter and/or the project in general.

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For last-breaking information about the survey visit the website

http://www.arcticbirds.ru

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

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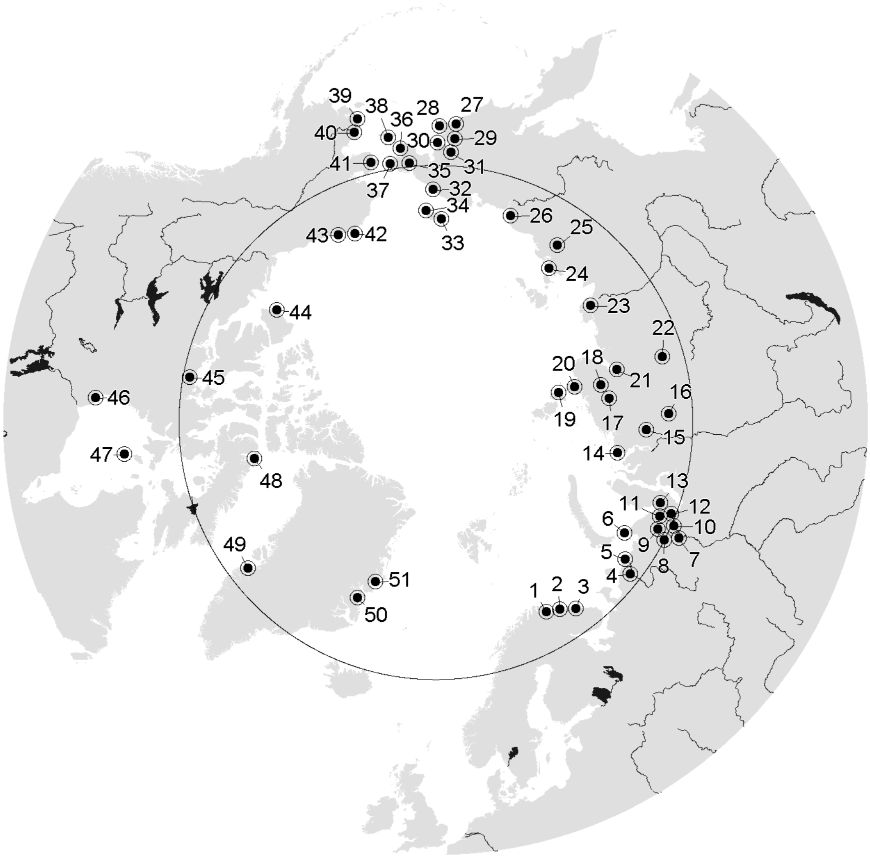


Figure. Arctic localities from which reports about bird breeding conditions became available.

LOCALITY REPORTS

1. Ainovy Islands, Russia (69°50'N; 31°35'E).

Spring was very early with warm weather. Snow melt was intensive in April, and snow cover reduced to 50% by the end of month. Prolonged cooling started in the beginning of May, and the weather in the 2000 breeding season was somewhat colder than average for the islands. Complete snow melt on flat areas occurred in late May. The weather became warm in late July - August. Strong rains and prolonged storms were not recorded, and the weather conditions were favourable for breeding birds. As usual Turnstones *Arenaria interpres*, Common Snipes *Gallinago gallinago*, Ruffs *Philomachus pugnax*, Redshanks *Tringa totanus* and Oystercatchers *Haematopus ostralegus* were breeding on the islands, but nesting of Wood Sandpiper *Tringa glareola* was recorded for the first time. Numbers of nesting Common Eiders *Somateria mollissima* declined sharply, because migrants did not settle to breed as a result of the warm spring. Numbers of Greyleg Geese *Anser anser* continued to increase.

Problems with food supply arose for most fish-eating birds. Chicks of Great Black-backed *Larus marinus* and Herring *L. argentatus* gulls died *en masse*, and reproductive performance of these species was low. Large numbers of Arctic Terns *Sterna paradisaea* and Black Guillemots *Cepphus grylle* abandoned nesting attempts, and only Great Cormorant *Phalacrocorax carbo* and Shag *P. aristotelis* increased in numbers and had successful reproduction. Rodents and mammalian predators are absent on the islands. Dunlins *Calidris alpina* and Purple Sandpipers *C. maritima* were numerous on autumn migration, while passage of Ruffs was weak and of short duration. Little Stints *Calidris minuta*, Curlew Sandpipers *C. ferruginea* and Bar-tailed Godwits *Limosa lapponica* were solitary. Five to six White-tailed Eagles *Haliaeetus albicilla* stayed on the islands in November during pup delivery by Atlantic Seals *Halichoerus grypus*.

I.P.Tatarinkova

2. Rybachy Peninsula, Murman coast, Russia (69°43'N, 32°28'E)

No visual records of rodents were made. Snowy Owl *Nyctea scandiaca* was observed hunting hares near Gorodetsky Cape on the Rybachy Peninsula. Long-tailed Skuas *Stercorarius longicaudus* bred successfully in inland areas of eastern Murman 30-40 km from the Barents Sea. Common wader species (Oystercatcher, Wood Sandpiper, Ringed Plover *Charadrius hiaticula*, Temminck's Stint *Calidris temminckii*) also bred successfully. A nest of Great Snipe *Gallinago media* was found on the coast.

Y.V.Krasnov, Y.I.Goryaev.

3. Gavrilovsky Archipelago, eastern Murman, Russia (69°05'-69°11'N; 35°49'-36°19'E).

Prolonged cooling followed early warming in April. Rains were rare. Lemmings were not recorded, but voles were numerous. Two pairs of Rough-legged Buzzards *Buteo lagopus* nested in the study area, and Northern Goshawk *Accipiter gentilis* bred near seabird colonies.

Numbers of breeding Golden *Pluvialis apricaria* and Ringed plovers, Dunlins and Redshanks increased on the tundra. Autumn migration was of average intensity, with higher than usual numbers of Greenshanks *Tringa nebularia*.

T.D.Paneva

4. Pechora River Delta, Russia (68°00'N, 53°30'E)

Ice broke on the river in mid May. Summer was relatively warm and dry, and even hot from 1-20 July, but in the period from 20 July to 10 August the weather became more variable: rains alternated with sunny days. No snowfalls were recorded during the study period. Generally, weather conditions were favourable for breeding of all bird species.

Lemmings and Arctic Foxes *Alopex lagopus* were not recorded, while Tundra *Microtus oeconomus* and Narrow-skulled *M. gregalis* voles were rare. Rough-legged Buzzards and Merlins *Falco columbarius* were rare, but they raised young. Skuas did not breed, but Common and Herring gulls were common and bred.

Nesting densities of nearly all bird species were at an average level. Reproduction of waterfowl could have been adversely affected by disturbance from fishermen, but for passerines, waders and gulls this factor was not important.

Y.N.Mineev, O.Y.Mineev.

5. Khabuika Lake, Russky Zavorot Peninsula, Russia (68°30'N, 53°50'E)

The season was early, warm and dry. By 20 June tundra was practically free from snow, but ice remained in some bays of Pechorskaya Guba. As no sharp and prolonged coolings or other extreme events were recorded, the weather was favourable for bird reproduction.

Lemmings were not recorded, while signs of vole activity were seen only near deserted human constructions and high hillocks. Numbers of Arctic Foxes in the study area were the same as in the previous 10 years, but they did not breed. For the first time wolverine was recorded, which destroyed one bird clutch and one brood with small chicks. Birds of prey were rare as in 1999, although Rough-legged Buzzards were slightly more common than usual. White-tailed Sea Eagles were not seen; in late June - early July Snowy Owls were seen daily sitting on elevated points. Numbers of gulls and skuas were lower than in 1999, and numbers of territorial breeding and non-breeding Bewick's Swans *Cygnus bewickii* were the smallest for the period 1991-1999. Average clutch size in swans was 3.25±0.75. All nests of waders (Temminck's Stint, Dunlin, Red-necked Phalarope *Phalaropus lobatus*, Ringed Plover, Grey Plover *Pluvialis squatarola*) contained full clutches, and the first Dunlin chicks appeared on 9 July.

Y.M.Shchadilov, A.V.Belousova.

6. Vaigach Island, Russia (69°40'-70°28'N; 58°30'-60°34'E)

Communications with local people indicated that spring was early with subsequent frosts. The weather was dry, warm and almost windless until late July, and mosquitoes became abundant. From late July temperatures dropped to approximately +10-15°C, fogs and rains started. After 7 August it stopped raining, but fogs remained regular, especially at the north of island, with temperatures +2-7°C, and northerly winds.

Lemmings were common, but voles rare. Arctic Foxes were common and bred. Among rodent-specialist avian predators, Rough-legged Buzzards were numerous and successful breeders, while rare skuas and common Snowy Owls did not nest.

M.N.Ivanov, P.M.Glazov, M.V.Glazov.

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

Spring started at the usual time for the area, but was very rapid in development. Snow accumulation was low; it melted to 50% cover by 12 May and was finally lost by 17-18 May. Ice on the Voikar River broke in May. Although two floods are normal for the river, warm to hot weather in May accelerated snowmelt in the mountains which resulted in a single flood. Later water levels dropped quickly, and stabilized at a level unusually low for the time of year. Birds started to build nests and lay clutches immediately after arrival.

No rodents were recorded. White-tailed Sea Eagle, Northern Harrier *Circus cyaneus* and Merlin nested. Weather conditions were favourable for most bird species. However, warm and dry summer weather adversely affected reproduction of waterfowl. Most species were present in average numbers, with exception of abundant Redpolls and Crossbills *Loxia curvirostra*. These species started breeding early and had chicks fledging when other birds were still incubating. There were low numbers of Bean Goose *Anser fabalis*, Whooper Swan *Cygnus cygnus* and Capercaillie *Tetrao urogallus*, compared to other years.

M.G.Golovatin

8. Paier massif, the Polar Urals, Russia (66°43'N, 64°23'E)

Spring was early and summer, July in particular, was very warm and dry which resulted in forest fires in the mountain foothills. Extreme weather events were not recorded during the period of study. The weather deteriorated in mid July when rains started, but the drop in temperature was not significant. Autumn was warm and prolonged.

Voles were not recorded visually. However, Grey-sided *Clethrionomys rufocannus*, Ruddy *Cl. rutilus* and Middendorff's *Microtus middendorffi* voles all recorded 0.25 specimens per 100 trap-nights.

Breeding conditions were favourable for most bird species due to the good weather and low numbers of predators. Successful reproduction of passerines, waders, Willow Grouse *Lagopus lagopus* and Rock Ptarmigan *L. mutus*, Arctic Tern, ducks and Black-throated Diver *Gavia arctica* were confirmed by records of broods. Among waders, the most numerous were Golden and Ringed plovers, and Wood Sandpiper, but such species as Greenshank, Common Sandpiper *Actitis hypoleucos*, Ruff, Temminck's Stint and Dotterel *Eudromius* *morinellus* occurred in low numbers as a result of unsuitable habitats. Among passerines, the highest numbers were of Meadow Pipit *Anthus pratensis*, Bluethroat *Luscinia svecica* and Redpoll. The Willow Grouse population was increasing.

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

See also: Golovatin, M.G. & S.P.Paskhalny. 2000. Notes on bird fauna of the Polar Urals (Paier massif vicinity). In: Ryabitsev, V.K. (ed.). Materials on bird distribution on the Urals, in Cis-Urals foothills and Western Siberia. Ekaterinburg. p. 60-63. In Russian.

Paskhalny, S.P. & M.G.Golovatin. 2001. Biological resources of Polar Urals. Collected science papers. Salehard. In Russian.

9. Usa River upper reaches, the Polar Urals, Russia (67°00'-67°30'N, 64°00'-65°50'E)

Precipitation in winter was not high, and locally on watersheds snow was completely removed by wind. This accounted for a quick and early snowmelt followed by an early and rapid spring. By mid May, snow cover was about 50%, but remained only in river floodplains and cloughs. Snow melted completely by early June. Rivers thawed during 20-25 May, but did not over-top the riverbanks. Lakes became ice-free by 10-15 June. All phenological events (plant vegetation, appearance and flying of insects) were 3-4 weeks earlier than normal. The summer was also warm and dry, without weather anomalies.

Populations of small mammals remained low during the whole period from spring to autumn. Lemmings were not recorded. A few Narrow-skulled Voles and shrews were found, only in August, in some small areas.

Predator numbers were very low. Red Foxes *Vulpes vulpes* were not seen and a barking Arctic Fox was heard only once. Brown bears were seen twice and their tracks were encountered regularly.

Numbers of most rodent-specialist avian predators were low as well. Owls were not recorded. Rough-legged Buzzards and Northern Harriers were rare, and these were mostly wandering birds. Long-tailed Skuas were encountered more often, usually in groups. Most of these birds did not breed, except at two small localities. At one of these, we found a buzzard nest with one, almost-fledged chick, two pairs of harriers nesting nearby, and one pair of Long-tailed Skuas with young. A few pairs of Long-tailed Skuas, one of which had nest with a single chick, were found in another locality.

Due to low predation and favourable weather conditions in spring and summer, numbers of waders alarming near broods were high, and broods usually contained 3-4 chicks, which is indicative of successful breeding. Wood Sandpiper, Terek Sandpiper *Xenus cinereus* and Great Snipe were particularly abundant. Interestingly, Golden Plover and Dotterel occurred in low densities, but nesting success was still high in the former species.

V.V.Morozov

10. Labytnangi, Lower Ob' area, Russia (66°40'N, 66°30'E)

Substantially less snow accumulated during winter 2000 than in 1999, and it melted nearly one month earlier. Accordingly, spring was early and developed quickly. May was warm (in particular the second half with a mean temperature of +1.6°C), and rather rainy. Leaf-burst started earlier than usual, on 27-28 May. Snow cover reduced to 50% on 14 May and had disappeared by 19 May. Ice-break on the Ob' River near Salekhard happened on 19-20 May, 10-11 days earlier than average. Flooding on the Ob' River was low and brief. June was warm (in particular the last 20 days with mean temperatures +11.7°C) and moderately wet. July was very warm (+14.7°C) and dry, August also was warm (+13.5°C), but rainy in the middle of the month. Thus, the summer was warm and dry. Autumn started at the usual time. September was cool and moderately wet, with the air temperature dropping to 0°C on the 20th. The first snow fall occurred on 21st September. Extreme weather events were not recorded except for local fires in the second half of July.

No rodents, nor their tracks, fresh burrows, winter nests or droppings were recorded on excursions.

Most birds arrived at the usual time, but some arrived up to one week earlier (among waders: Whimbrel *Numenius phaeopus* - on 19 May, Wood Sandpiper - on 20 May, Temminck's Stint - on 23 May). Peak of arrival occurred from 20 to 31 May, but some of the northerly sandpipers (Little Stint and Dunlin) continued to migrate until 10 June. Migration generally was not intensive and densities of migrants were low, which could have been due in part to early snowmelt and dispersal of birds over a large area.

Arctic and Red foxes, owls (except for two Snowy Owls on 19 May) and skuas were not recorded. Rough-legged Buzzard was recorded only during spring migration. Gull numbers were at their usual levels. Ducks were uncommon in both spring and autumn, and numbers of Long-tailed Duck *Clangula hyemalis* nests were 5 times lower than in 1999 due to a population shift to the north in this early year. Most of these nests were predated by gulls. Numbers of most wader species were also low in the beginning of summer, with the exception of Wood Sandpiper and Pintail Snipe *Gallinago stenura* that were relatively common. Among records of rare species, two Black-tailed Godwits *Limosa limosa* and a pair of Little Ringed Plovers *Charadrius dubius* were notable. Active autumn migration of waders was recorded from 10-15 August, after which numbers dropped substantially, with only single flocks of Golden Plovers and Ruffs being seen up to 3 September. Among passerines, reproduction was most successful in pipits, warblers, buntings and finches, judging by observations in late summer and autumn.

Breeding conditions in 2000 were favourable for most passerines and waders, but post-breeding numbers did not increase noticeably due to low breeding densities.

S.P.Paskhalny

11. Southern Yamal, Russia (67°50'N, 67°40'E)

Arctic Foxes were numerous in late July and August, while rodents were not recorded.

M.Pulin

12. Schuchya River, middle reaches, Yamal Peninsula, Russia (67°00'-67°40'N; 67°30'-69°40'E)

Spring was extremely early; 3 weeks earlier compared with the average. There was unusually low precipitation: it rained only 5 times for 1-2 hours during 8 weeks. Water in the rivers dropped to very low levels and, also very early, the tundra dried out. Greening and fruiting of plants were early.

Lemmings were completely absent on the tundra, while just a few inhabited burrows of Ruddy and Narrow-skulled voles were found in forested river floodplains.

Arctic Foxes were not recorded, and for the whole area of about 1000 km^2 only 4 nests of Rough-legged Buzzards were found in the forested vicinity of the Schutchya River tributary (2 chicks in one of them). Numbers of Gyrfalcons *Falco rusticolus* were average in spite of the very low density of Willow Grouses (no nests found and only 2 broods seen). Peregrine Falcons *Falco peregrinus* nested at a slightly lower density than in previous years, Merlins and White-tailed Sea Eagles were present in their usual numbers. Two nests of Golden Eagles *Aquila chrysaetos* were located as before, with 2 almost feathered chicks in one of them.

Black-throated Divers were common as usual, but non-breeding Red-throated Divers *Gavia stellata* were surprisingly numerous on rivers. Bean and Lesser White-fronted *Anser erythropus* geese were very rare: only one brood of the former and 2 broods of the latter were recorded. A brood of Horned Grebes *Podiceps auritus* was seen, which is the only breeding record of this species at such a high latitude in the last 30 years. Among waders, tundra species (plovers, Whimbrel, Bar-tailed Godwit) were less common than average, while Common Sandpiper was more common. Other waders (Wood and Terek sandpipers, Red-necked Phalarope, Temminck's Stint and Ringed Plover) occurred in usual numbers. Lapland Buntings *Calcarius lapponicus* were very rare among passerines, while Red-throated Pipits *Anthus cervinus* were unusually common. Also, normally rare Shorelarks *Eremophila alpestris* (few suitable habitats) were more common in this season, while Chiffchaff *Phylloscopus collybitus* was less common.

S.A.Mechnikova

13. Erkata River, Yamal Peninsula, Russia (68°11'-68°16'N, 69°16'-69°32'E)

The summer was hot and dry, with only 3 rain showers during more than 30 days. Air temperatures often exceeded +20°C during the day, while at night temperatures generally did not fall below +5°C.

Very low numbers of both Siberian *Lemmus sibiricus* (very rare records and only in pellets) and Collared *Dicrostonyx torquatus* lemmings were observed in 2000, and numbers of *Microtus* voles decreased by a factor of two compared with 1999.

Solitary adult Arctic Foxes were common, but inhabited dens were not found in the study area. A single pair of Rough-legged Buzzards nested in a 100 km^2 plot, which was occupied by 16 pairs in 1999. Breeding success of buzzards was amounted to 3 fledglings raised from 7 eggs. Two of their nests were 40 m and 200 m from two different nests of Peregrine Falcons, and the third one was 300 m from a tent of Nenets people, established in March. Peregrine Falcons occupied all suitable steep river banks, and their breeding success was 88.2%. Non-breeding Snowy Owls were rather common - up to 2 birds per 10 km^2, perhaps due to low rodent numbers in their breeding area to the north of our study site. Numbers of Willow Grouses started to increase in 2000, and owl pellets contained the remains of these birds more often than rodent remains. Among skuas, wandering Arctic Skuas *Stercorarius parasiticus* were relatively common.

Among passerines, Lapland Buntings were less abundant compared with 1999, while pipits were common. Low lemming numbers should have adversely affected breeding success of tundra birds, but apparent specialization of both owls and foxes on the abundant Willow Grouses (nests and broods), probably, relaxed the pressure on waders. Fledglings of almost all wader species and broods of various ducks were seen.

A.A.Sokolov, V.A.Sokolov, G.M.Tertitsky.

See also: Shtro, V.G., A.A.Sokolov & V.A.Sokolov. 2000. Bird fauna of the Erkatayakha River. In: Ryabitsev, V.K. (ed.). Materials on bird distribution on the Urals, in Cis-Urals and Western Siberia. Ekaterinburg. p. 183-187. In Russian.

14. Medusa Bay, Taimyr Peninsula, Russia (73°13'N, 80°21'E)

On 6 June (arrival) snow cover was already <50%. The Medusa River started flowing on 12 June which is much earlier than usual. Snow melt was much earlier, probably due to a warm period early in spring, but June was exceptionally cold, with mean temperatures hardly above 0°C, and wet with lots of snow, drizzle and mist. The first week of July was sunny but cold, the second week cold and wet again. The remainder of July and early August were sunny and even warm with a maximum temperature of 20°C.

We saw lemmings only occasionally - once in every few days. The few lemmings seen were mainly Siberian Lemmings, with occasional Collared Lemmings. In July young were observed more often.

Lemming numbers were very low and Snowy Owls, skuas and Brent Geese *Branta bernicla* did not attempt to breed. However, Long-tailed Skuas were territorial. Pomarine skuas *Stercorarius pomarinus* were present only on passage. A few breeding attempts of White-fronted Geese *Anser albifrons* were observed. Predated nests of Taimyr Gulls, Glaucous Gulls *Larus hyperboreus* and Arctic Terns were found on nearby islands. Several Rough-legged Buzzard pairs started breeding but either abandoned their clutch or their nests were predated. At least three different (non-reproducing) Arctic Foxes frequented the 4 km^2 intensive study area.

Wader nests were predated mainly by foxes, judging by the presence of droppings or smell. Snow Buntings *Plectrophenax nivalis*, breeding between rocks, were also predated by Arctic Foxes and Stoats *Mustela erminea*. At the nearby rivers Efremova, Maximovka and Lemberova, Peregrine Falcons bred successfully and several pairs of Red-breasted Geese *Branta ruficollis* and White-fronted Geese bred in their vicinity.

Waders were present in numbers comparable to those in previous years. Hatching success (calculated using daily survival probabilities) was low: 0% in Curlew Sandpipers, 3% in Dunlins, 13% in Pacific Golden Plovers *Pluvialis fulva*, 19% in Ringed Plovers, 0.4% in Little Stint. Passerines did much better with 47% in Snow Bunting, 29% in Lapland Bunting and 21% in Shore Lark. Of all 249 nests found (including passerines and Rock Ptarmigans) 191 were predated (76%). Of the 197 wader nests, 163 were predated (83%). Although special care was taken in approaching and marking nests (using GPS), we are convinced that research activities increased predation rate. Dunlins, Little Stints, Ringed Plovers and Pacific Golden Plovers laid replacement clutches, but Curlew Sandpipers did not. Due to the chronology of weather conditions, the peak in arthropod abundance occurred very late and, combined with the high temperatures, led to favourable growing conditions for chicks. In late July, a reasonable number of fledged Little Stints, Dunlin and Curlew Sandpipers passed through the area.

I.Tulp, H.Schekkerman, R.Klaassen, S.P.Kharitonov, A.Bublichenko, Y.Bublichenko, M.Berezin, S.B.Rosenfeld, S.V.Khomenko.

<u>See also</u>: Tulp, I., H.Schekkerman & R.Klaassen. 2000. Studies on breeding shorebirds at Medusa Bay, Taimyr, in summer 2000. Wageningen, Alterra, Green World Research. Alterra-rapport 219. 86 p.

<u>15. Agapa River basin, Taimyr, Russia (70°03'-71°40'N, 86°23'-89°15'E)</u>

Snow started melting early and some birds arrived as early as May, but then prolonged cooling in June followed. July and August were very warm and dry with no rains for more than 50 days. As a result there was very low water level in rivers and many small marshes dried out.

Lemmings were not recorded, nor breeding rodent-specialist predators: Arctic Foxes, owls, Rough-legged Buzzards, skuas, Herring Gulls. Drying out of waterbodies and marshes resulted in low numbers and low reproductive success of waterfowl and most waders. Low abundance of waders caused reduced density and brood size in Peregrine Falcons. Generally, breeding success can be evaluated as being below average because of reduced breeding densities and productivity.

Y.I.Kokorev

<u>16. Kutaramakan Lake, Putorana plateau, Russia (68°47'N, 91°54'E)</u>

Spring was early, and lakes thawed early. Ice on Kutaramakan Lake broke by 18 June. The area was visited again between 6-10 July, and both visits left an impression of very low rodent numbers. Predators were not recorded. Generally, the season was probably successful for waders and small passerines. Broods of Greenshanks and Ruffs were observed on the marshes, as well as many nests with chicks of Dusky Thrushes *Turdus eunomus*.

V.Y.Arkhipov

<u>17. Bolshaya Bootonkaga River, Taimyr Peninsula, Russia (74°07'N, 97°40'E)</u>

The summer season was warmer than usual, and dry. Common in spring, lemmings were rarely recorded in July and August, while Arctic Foxes were numerous and occupied most dens. Almost all clutches of birds were predated by Arctic Foxes and gulls. In July waders, passerines and Rock Ptarmigans were less common than usual. Rough-legged Buzzards bred successfully.

A.A.Gavrilov

<u>18. Olen'ya River mouth, Taimyr Lake, Russia (74°39'N, 102°33'E)</u>

Maximum air temperatures rose above freezing in May, but the whole of June was cool and cloudy with sub-zero, minimum temperatures (monthly mean +2.1°C) and frequent precipitation. In the second half of June, a snow layer up to 25 cm thick was formed several times, and remained for up to one day. However, phenological events in animals and plants, as well as ice-break on rivers and Taimyr Lake, developed on average dates. When the birds arrived, 90% of the area was under snow, with only hills and bank crests being snow-free. Mass arrival of birds occurred between 1-10 June, while 50% snow cover was reached on 15 June, and snow melted completely by 18 June. Weather in the first half of July was average for the area, while the end of July and the whole of August were warmer than usual, with the maximum temperature +24.1°C on 26 July, and monthly means for July and August of +9.2°C and +10.3°C, respectively. Only two rainy days were recorded for the whole period, and the frequency of strong (exceeding 15 m/s) winds was below the average (except for the beginning of June).

Lemming abundance was high at the beginning of the season (and probably in winter too), with 3-4 animals recorded per one km during snowmelt in wet slope tundra. Numbers decreased in the second half of the summer.

High lemming numbers at the start of the season was confirmed also by the presence of breeding Arctic Foxes, which had 11 and 13 pups in two dens closest to the camp, and by the breeding performance of Rough-legged Buzzards which occurred at densities of 2 nests per 1 km along the deepened river valley, and had 3-6 eggs in clutches.

Rock Ptarmigans, Herring and Glaucous gulls, Long-tailed Skuas, Snowy Owls, Rough-legged Buzzards, Snow Buntings, Pied Wagtails *Motacilla alba* and Shorelarks were already present in the area on our arrival on 30 May. Most other species appeared from 1-14 June, Pectoral Sandpiper *Calidris melanotos* being the latest to appear on 19 June. Passerines started to nest from 5-10

June, waders from 14-20 June. The first fledgling of Lapland Bunting was seen on 7 July, mass hatching of White-fronted Geese happened on 11-13 July, and broods of most wader species appeared from 8-15 July. It is noteworthy that there was a substantial delay in goose moult - no more than 30% of birds were able to fly by 25 August.

Many bird species were common only on migration and did not stay to breed, which may be due to adverse weather in the pre-nesting period, but also could have been a site-specific attribute. Thus, Bean Geese almost did not nest, Red-breasted Geese were rather rare in contrast with adjacent localities to the east and west. Few Long-tailed Ducks were seen migrating, and none breeding which is strange given the proximity to a large lake. Long-tailed Skuas were less common compared with records in nearby areas in other seasons. Pomarine Skuas were more common, but, probably, did not nest. Among waders, only Pacific Golden Plovers, Grey Plovers, Curlew Sandpipers, and Dunlins were numerous, while such species as Bar-tailed Godwit, Red Phalarope *Phalaropus fulicarius*, and even Little Stint were encountered infrequently.

Despite rather high lemming numbers, clutch predation by Arctic Foxes was not exceptional, as lots of non-breeding foxes inhabited the area and could be recorded there several times a day in the first half of the summer. However, clutch loss due to predation by skuas and gulls was not recorded. A single nest of Peregrine Falcons in the area was trampled by reindeers or musk oxen *Ovibos moschatus*. Nesting was most successful in Pacific Golden Plovers, Grey Plovers, Ringed Plovers and Temminck's Stints, judging by the frequency of brood records. None of 7 controlled nests of White-fronted Geese was predated, and their broods were seen very often. Herring Gulls nested successfully. All chicks of Rough-legged Buzzards fledged, except for a single one in the largest brood of 6 chicks. Passerines also bred successfully, despite intensive predation by Arctic Foxes on nests of Lapland Buntings.

I.N.Pospelov

19. South of Severnaya Zemlya, Bolshevik Island, Russia (78°12'-78°26'N; 103°17'-104°28'E)

Spring was prolonged with late snowmelt, but the summer was warm, dry and sunny. From 14 July to 31 August there were only 19 days without bright sun, including 6 days with light rain, 2 days with some snow and 18 foggy days. The wind was unusually light for most of the season: calm on 6 days and only 6 days with strong winds. Mass aerial activities of midges, Chironomidae were frequent. Other Diptera insects, Mycetophilidae, Trichoceridae and Muscidae were active on the soil surface.

Lemming numbers were fairly high, with a density of winter nests of 3-5 per 1 km stretch of the coastal plain and 1 per 1 km on the denudation plain.

Despite the high density of territorial Snowy Owls, juveniles were not recorded. Numbers of Arctic Foxes were high and they bred. Also, Stoats were common in some river valleys. Reproduction in 2000 was presumably successful only in some gulls and Snow Buntings (dates of fledging are known, as well as the ratio of adult to juvenile birds). Brent Geese did not nest in the area as in previous years, but moved, probably due to late snow melt, to the north of the island, where nesting in high numbers is known to be normal. No indications of wader breeding were recorded. From 16 August to 8 September geese flocks of 20-60 birds were migrating south. Between 10 and 15 September flocks of Purple Sandpipers of up to 20 birds were recorded on the coast, and flocks of Snow Buntings of up to 30 birds were seen on the shore between 17 August and 25 September.

O.L.Makarova

20. Unga River, Chelyuskin Peninsula, Russia (77°28'N, 105°07'E)

It was a late, cold and dry summer season in the polar desert of the area, with six snowfalls in the second half of June and then again in August. Water appeared in the Unga River on 1 July only, and reached its maximum level on 18 July. It was rainy once, on 1 August, and there was a frost during 8-9 August.

Lemmings were seen only in the beginning of the season. Arctic Foxes were common, but did not breed. Brent Geese were common until 5 July, then disappeared. Snowy Owls were common, but did not breed.

M.V.Bogoyavlinsky

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

The start of season in 2000 was neither early nor late, but the last 3 weeks of June were the coldest since 1994 and 1996, which were exceptionally late seasons. These three weeks of June were very rainy, with only 2 dry days, which is a record for the seven-year period of observations. The situation improved rapidly in July, when temperature went up steeply and reached average values by mid-July. Precipitation was also moderate in July and the number of sunny days was higher than usual, allowing chicks to hatch in favourable weather conditions.

Flood followed the 1999 pattern, with an early rise in level, on 11 June, and an early retreat. This made flood-plain habitats available for birds relatively early in the season. Despite the July warming, insect and plant phenology was seriously affected by the cold June, being delayed compared with other years, except for the extremely late 1994 and 1996 seasons.

Siberian Lemming numbers further increased compared with 1999 when they were already high enough to allow successful reproduction of birds. After complete snow melt, on 19 June, lemming winter nests were counted on a transect 7.9 km long and 10 m wide, located principally within flat-hillock marsh, the dominating habitat in the study area. On this transect 49 winter nests were recorded which corresponds to the density 6.2 nest/km, or 620 nests/km^2. In total 580 lemmings were recorded in June-July 2000 by four observers, which is four times higher than the previous maximum recorded in 1996. Numbers reached their peak on 17 June with 51 animals, and dropped to less than one per day by mid July. Collared Lemmings made no contribution to the peak, accounting for only 1.5% of the identified animals. Broods of Siberian Lemmings were found and juvenile animals became more common in the second half of July.

Arctic Foxes were seen rarely. They presumably bred, but destroyed very few bird clutches in the vicinity of the camp. Weasels *Mustela nivalis* were recorded twice in June. Pomarine, Arctic, and Long-tailed Skuas all nested successfully, but densities of the two former species were very low. A nest of Rough-legged Buzzards with 2 chicks was found on Khatanga River bank.

Ruffs and Little Stints nested at unusually high densities, but the combined density of wader species remained at an average level of 100 nests/km^2, because Pectoral Sandpipers were present in low numbers. The density of Lapland Buntings was also low, presumably due to adverse weather conditions in June, but predation on their nests was negligible and most of them survived to fledging. Willow Grouse, Arctic Tern and ducks had mostly high nest success.

Among waders, nesting success was particularly high in Pacific Golden Plover (80%) and Dunlin (88%), while nomadic species were less successful, although still having good productivity (Red Phalarope - 65%, Little Stint - 57%, Ruff - 60%, Pectoral Sandpiper - 56%). Fledging success could have been reduced by the activities of Arctic and Long-tailed skuas, which had apparent difficulties catching lemmings in late July to early August. A nest with hatching eggs of Sharp-tailed Sandpiper *Calidris acuminata* was found on 31 July, which extends the species' breeding range about 600 km westwards.

M.Y.Soloviev, V.V.Golovnyuk, E.N.Rakhimberdiev, T.V.Sviridova.

22. Moyero River middle reaches, Yakutia, Russia (68°30'N, 106°00'E)

On 24 May, the whole area was covered by snow up to 50 cm thick. There were a few snow-free patches, close to settlements. Areas of open water were present on rivers only in sites where ice was jammed. It rained with snow on this date, and from this time onwards, intensive snow melt started. Day-time air temperatures reached +15°C on 28 May. By 30 May, 80% of the land was flooded due to the thaw and rivers spread out, making it difficult to identify the locations of river beds. The general impression was of a normal spring in terms of timing but a rapid one.

Rodent numbers were presumably low, as neither these animals, nor their bodies were observed during the flood period. White-tailed Sea Eagles nested at high density (5 nests were found). Rough-legged Buzzards, Peregrine Falcons, Eurasian Kestrel *Falco tinnunculus*, Merlin, European Hobby *F. subbuteo*, and old nests of Northern Goshawks were also recorded.

The first waders to arrive on 26 May were Ruffs, and mass migration occurred from 27-30 May. Waders (still mostly Ruffs) were passing eastwards in flocks of 5-10 birds. Eastern Curlew *Numenius madagascariensis* and godwits were recorded. Ruffs, Wood Sandpiper, Common and Pintail snipes had complete clutches by 7 June. Jack Snipe *Lymnocryptes minimus* were displaying.

N.A.Nakhodkin

23. Lena River delta, Yakutia, Russia (72°25'N, 126°50'E)

The spring was early and warm. Snowfall in the beginning of the second week of June settled and remained from 9-11 June. The Lena River broke on 30 May near "Stolb" polar station, which is 8-10 days earlier than usual, and the flood was lower than average. The summer was slightly cooler than average.

Lemming numbers were at a peak, with Siberian Lemmings being numerous and Collared Lemmings common.

Arctic Foxes were numerous and bred. For the first time since the previous lemming peak in 1996 breeding Snowy Owls were present in high numbers. On some islands, owl nests were only 1.5-2 km apart. Rough-legged Buzzards were abundant breeders, and Pomarine Skuas nested everywhere in the delta. The pressure of predators on birds was low due to high lemming numbers. Favourable weather conditions in the pre-nesting period allowed many bird species to have higher nest densities than in 1999. Thus, Steller's Eider *Polysticta stelleri* was breeding for the second season in a row and in much higher numbers. The only known exception was Brent Goose: monitored colonies decreased in size and nesting was not very successful.

V.I.Pozdnyakov

24. Oyogos-Yar, Dmitry Laptev Strait, Yakutia, Russia (72°40'N, 143°27'E)

The summer was colder than normal, with temperatures below +10°C. Snow remained until the second week of July in sheltered sites. Sea ice near the shore disappeared in the first week of August. East to north-east winds of moderate velocity predominated, and quite often turned into strong ones. Calm weather was recorded only in late July. Precipitation was abundant, seemingly above the average.

Lemmings were numerous, while Arctic Foxes were strangely less common than in 1999. Wolves *Canus lupus* were common (fresh tracks were observed frequently) and could have deterred Arctic Foxes. Two polar bears *Ursus maritimus* were present in the area, and a weasel was noted with a brood. Six breeding pairs of Rough-legged Buzzards and one nest of Snowy Owls with 5 chicks were recorded in an area of 25-30 km^2.

Recorded birds included abundant eiders, Long-tailed Ducks, various waders, White-fronted and Bean geese, Snow and Lapland buntings, Redpolls, Pied Wagtails and Wheatears *Oenanthe oenanthe*. A flock of 11-12 Snow Geese *Anser caerulescens* stayed near Svyatoy Nos Cape from 25 August to 5 September.

P.A.Nikolsky

25. Djukagirskoe Lake, "Kytalyk" reserve, Indigirka River basin, Russia (70°30'N, 145°30'E)

Spring was early and warm. The first Bean Geese appeared near Chokurdakh on 7 May. The weather deteriorated during 25 May to 1 June, when temperatures dropped to -10°C and there were snowstorms. Once the weather warmed, by 2 June, birds started to arrive *en masse* (14 species recorded). The peak of migration was reached on 5-6 June, when numerous Steller's Eiders were passing and waders migrated in flocks of 20-50 birds. Among identified waders, 90% were Red Phalaropes. Dotterels, Curlew Sandpipers and Sharp-tailed Sandpipers were seen only on migration. Snow melted completely by 10 June.

Lemming and vole numbers were very high. All known dens of Arctic Foxes were occupied, and pups were recorded from mid-July onwards. Stoats were abundant. Rough-legged Buzzards started nesting early: a clutch of 2 eggs was found on 22 May. Buzzards not only occupied all known nests, but built new ones, and all completed clutches contained 4 eggs. For the first time during several years of records Short-eared Owls *Asio flammeus* appeared and nested.

Breeding wader species for the area included Grey Plover, Pacific Golden Plover, Red and Red-necked phalaropes, Ruff, Pectoral Sandpiper, Dunlin, Temminck's Stint, Bar-tailed Godwit, Long-billed Dowitcher *Limnodromus scolopaceus*, Spotted Redshank *Tringa erythropus*, Common Snipe, Jack Snipe. Reproduction was successful in all birds.

S.M.Sleptsov

26. Chukochy Cape, Yakutia, Russia (70°05'N, 159°59'E)

September 2000 was warm, and snow cover did not establish by the end of the month, although snowfalls were frequent.

Arctic Foxes and lemmings were numerous and voles were common. Rough-legged Buzzards were abundant and their chicks fledged. Owls were common, but breeding was not confirmed.

D.G.Fedorov-Davydov

27. Meynypilgynskaya lake-river system, Koryak Highland, Chukotka, Russia (63°06'-63°26'N; 175°41'-177°55'E)

June and July were characterised by nearly complete absence of precipitation. Extreme weather events were not recorded from June to November.

Spring started at the normal time for the area, while in 3 previous years (1997-99) it was delayed by 7-12 days. Feeding conditions were favourable, judging by amount of fat carried by birds in autumn. Arctic Foxes were rare. Numbers of voles increased substantially, which allowed Rough-legged Buzzards and Pomarine Skuas to raise chicks. Bird breeding conditions were the most favourable since 1997, and reproductive success of birds (geese, ducks and waders, in particular) was at a high level. However, human influence on some easily accessible colonies of geese and Common Eiders has increased during recent years, as local people practice egg collection for subsistence.

E.V.Golub

28. Kainupilgen Lagoon area, SE of the Lower Anadyr lowland, Russia (63°26'N, 178°52'E)

Spring was early according to reports of local people, and the summer was warm and dry. Despite particularly heavy rain on 18-19 July and other precipitation, many marshes and shallow lakes were free of water indicating a dry season. However, in late July snow patches still remained locally on steep hill slopes and in cloughs.

Both rodent and predators' numbers were low in the second half of July. Arctic Ground-Squirrels *Citellus parryi* were breeding in small numbers everywhere on the spits, separating the lagoon from the sea. A single lemming was recorded during 10 days of observations and excursions, but their winter nests were rather common.

One Red Fox and one Stoat were seen during a 12-day period. Among avian predators, Herring Gulls were numerous, as they nested in dense colonies on lagoon islands, and Arctic Skuas were common and bred. A Peregrine Falcon was taking small waders from migrating flocks feeding on the mudflats of the lagoon.

Any negative impact of the dry summer on bird reproduction was unlikely, as undulating spit relief allowed birds to find suitable habitats. The presence of broods of Sandhill Cranes, geese, ducks, waders and other birds indicated quite successful nesting. Good reproductive performance was also confirmed by the relatively high density of Grey Plovers with broods or nearly-hatched clutches, which only happens in seasons of low pressure by terrestrial predators.

P.S.Tomkovich, E.G.Lappo, E.E.Syroechkovski, Jr.

29. Southern coast of Chukotka, Anadyr Estuary, Russia (64°01'-64°44N; 177°31'-178°38E)

Spring was early as a result of low snow accumulation during the winter. Snow had melted by the end of May on planes, whilst ice on the upper reaches of rivers started to thaw by the end of the first week of June, and on the lower reaches by 12 June. The summer was warm and dry, causing some marshes and shallow water bodies to dry out.

Siberian and Collared lemmings and voles had patchy distributions throughout the study area, judging by records of live and dead animals and winter nests. Numbers varied between low and average, as they were rarely seen on excursions by observers, but regularly found by a dog. Lemmings were common locally, and rare in other places: on 15 July 13 winter nests were counted on a 5 km transect on the northern spit of Tymna Lagoon. At the same place 7 rodents, including one Siberian Lemming, 5 adult Collared Lemmings and one Root Vole, were transported by Red Fox and then dropped. Voles predominated near Anadyr city (64°44'N, 177°31'E), Siberian Lemmings at the mouth of the Vtoraya River, and Collared Lemmings near mouth of the Nikitikha River.

Arctic and Red foxes, Stoats, Wolves and Brown Bears *Ursus arctos* were present in relatively low numbers, but foxes certainly bred. Breeding was confirmed for Long-tailed and Arctic skuas, Glaucous and Herring gulls (numbers of the latter species are growing steadily according to reports by local people). Rough-legged Buzzards, falcons and Short-eared Owls nested in small numbers in the hilly vicinity of Anadyr city. According to observations in the area of the Vtoraya River (64°22'N, 177°25'E) in June, clutch predation was rare and mainly from avian predators. The colony of Brent Geese on Kosa Strela Island at the south of the estuary had no birds, most likely as a result of regular visits of bears to the island. Nesting of gulls in the Vtoraya River area was successful, while Herring Gull nests near the mouth of the Nikitikha River (64°11'N, 178°02'E) were empty in early July - cause unknown. Generally, bird reproduction was successful as indicated by nests, broods and fledglings of Sandhill Cranes *Grus canadensis*, geese, ducks, waders, and even uncommon passerines.

P.S.Tomkovich, E.G.Lappo, E.E.Syroechkovski, Jr.

30. Northern shore of Anadyr estuary, Chukotka, Russia (64°33'-64°42'N; 178°00'-178°55'E)

The summer was early, warm and very dry. In the start of nesting period weather was favourable, and relatively high densities of territorial pairs of many waders (Grey Plover, Turnstone, Dunlin), gulls and terns (colonies of Arctic Tern and Sabine's Gull *Xema sabini*) and waterfowl (Eider, Brent, Emperor *Anser canagicus* and Bean geese) were recorded. However, predation pressure was relatively high, which led to the destruction of goose and eider nests by large gulls, predation by Red Foxes in colonies of gulls, and the disappearance of clutches of Grey Plovers and Turnstones. Hence, the reproductive success of waders and waterfowl can be evaluated as average in general. Disturbance and hunting have seasonal effect on the reproduction of large bird species.

E.G.Lappo, E.E.Syroechkovski, Jr.

31. Southern edge of Zolotoy Khrebet, Chukotka, Russia (64°40'-64°45'N; 177°55'-178°50'E)

Snow cover reduced to 50% by 5 June, and melted completely by around 10 June. The summer was early, warm and very dry. Extreme weather events were not recorded. The weather conditions at the start of summer were favourable for bird reproduction.

Lemmings were present in average numbers locally in the foothills and Arctic Foxes were common. We found 3 nests of Rough-legged Buzzards, 5 nests of Snowy Owls with 7-8 eggs or chicks, the only surveyed area in Chukotka with breeding Snowy Owls. Skuas, including Pomarine, nested as well. The pressure of hunting is seasonal. Nesting success of geese, waders, gulls and Sandhill Crane was evaluated as high.

E.G.Lappo, E.E.Syroechkovski, Jr.

32. Mys Shmidta settlement, Chukotka, Russia (68°53'N, 179°26'W)

High numbers of Snowy Owl broods were located in the vicinity of Mys Shmidta (5-6 per 30 km distance) indicating the presence of high lemming numbers there.

I.E.Menyushina

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

Snow cover of about 98% remained until 4 June, so only about 5,000 Snow Geese settled in the colony. Warm spring weather started on 4 June and continued for 3 days, but this was sufficient for 30% of the colony area to become snow-free, and for 50,000 geese to start nesting. Snowstorms from 7-10 June arrested further nesting attempts. The weather was favourable in the first half of the brood-rearing period, but from 23 July until the departure of juveniles from the island in late August, snowstorms and sub-zero temperatures were regular.

Our expectations of peak lemming numbers were not realised, possibly due to the cold winter, with little accumulated snow, adversely affecting under-snow reproduction of lemmings. Lemming numbers were lower than average in the Snow Goose colony area and low in the northern parts of the island. Conditions for lemmings in winter are different there from the central part of the island, where snow is always present in sufficient quantities.

Arctic Fox numbers in vicinity of the goose colony were below the average, and reproduction was detected in only 4 dens. Fox activities in the colony were recorded in a restricted area, and only during the first days of nesting when solitary nests were present. During incubation, fox records in the colony were rare: none would appear during several hours of observations, while in 1989 up to 20 different animals could have been recorded during same time. As previously, Wolverines *Gulo gulo* preyed upon goose nests, and bodies of adult birds were found in two food caches of this animal. Wolves appeared on the island again, but they were not recorded in the vicinity of the colony. From the start of colony formation to departure of broods, the goose colony was inhabited by 50-60 Glaucous Gulls, which is slightly more than average.

Mean clutch size in Snow Geese was 3.54±0.04 (n=828), which is lower than in seasons with optimal spring conditions. The spring population was estimated to be 95,000 birds, with 24,800 nests in the main colony and nesting success of 88%, the latter corresponding to a good season. Death of birds from diseases was recorded on the colony in 2000. About 69,000 goslings left the colony, but reproductive success decreased due to adverse weather in late July, when the growth of many goslings, in particular from late broods, was suppressed, and they took longer to fledge. According to our evaluation, the proportion of juvenile birds on the wintering grounds should be 25-30%.

V.V.Baranyuk

See also: Baranyuk, V.V. 2000. Weather surprises and breeding of the Snow Geese on Wrangel Island in 2000. Casarka. No. 6: 359-364. Moscow. In Russian, English summary.

34. Neizvestnaya River, Wrangel Island, Russia (71°13'N, 179°20'W)

Snowmelt was late, but the start of the summer was warm and dry. In late July, a prolonged snowstorm with north-west winds occurred. The temperature was freezing, snow completely covered the tundra surface, and ice started to form near river banks. This resulted in the death of most chicks and mass departure of adult waders and passerines.

Lemming numbers were average and increasing. Snowy Owl numbers were low, and about 50% of Arctic Fox dens were occupied. In a permanent study area of 46 km^2 the density of Arctic Foxes was 0.11 pairs/km^2, while birds occurred at the following densities (in nests/km^2): Snowy Owl - 0.22, Pomarine Skua - 0.13, Long-tailed Skua - 0.24. Predation pressure on tundra birds was significant, in particular during the July snowstorm, after which 9 remains of waders and passerines were found along a transect of 2.5 km. The majority of wader broods and many Snow Buntings died, as a result of starvation and predation, during the snowstorm.

I.E.Menyushina

35. Iony Lake area, Chukotsky Peninsula, Russia (65°48'N, 173°22'W)

Communications with local people indicated that lemmings were unusually abundant. Six nests of Snowy Owls were discovered in the area. Several pairs of Bean Goose were breeding there as well.

D.V.Karelin

36. Mechigmenskaya Gulf, Chukotsky Peninsula, Russia (65°20'- 65°50' N, 171°00'-173°00'W)

On the date of our arrival on 10 June there was still snow cover (flat area) of about 20%. From 20-24 June was a rainy period with strong winds and lower air temperatures (about +3-5°C) than during the days before and after this time. But I guess this is not an unusual event in this region and may have had only a slight influence on breeding success. According to information from the local people, the season was obviously late in terms of the ice breaking-up on the Mechigmensky Bay and Gulf. More importantly for the inland breeding birds, the weather conditions on the tundra were probably not especially "warm" or "cold", "dry" or "rainy", just more or less normal for the region. An unusually dry, warm summer was reported from the region around Anadyr and southwards, but we could not confirm what conditions prevailed on the Mechigmenskaya Gulf.

Lemmings and voles were seen only rarely although old nests could be found more frequently. Their abundance was apparently at a low level.

There is no information available about year-to-year changes in bird numbers. Not a single Snowy Owl has been observed. Nevertheless foxes were quite abundant. Arctic and Red foxes inhabit the same range of habitats and their dens could be found just 5 km away from each other. Breeding success of Arctic Foxes was surprisingly high, families with 7 and 4 young were recorded. They were catching lemmings and voles as shown by the remains of these rodents at their dens. But given the overall low abundance of this prey they surely determined the breeding success of birds, at least to some extent. Avian predators like Arctic and Long-tailed skuas affected bird breeding success too, as both bred in the area.

Abiotic conditions were more or less favourable. Hunting activities have an important influence on the abundance of local waterfowl, especially geese, at least in the vicinity (of up to 100 km) of the permanent human settlements. Subsistence hunting is currently allowed for the local Chukchi all year round, but all hunters take advantage of this privilege.

G.Eichhorn

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

Spring was late in the vicinity of Lavrentia, for the fifth year in a row. Average temperatures in July (+5.7°C), August (+6.2°C) and September (+2.2°C) were below the long-term average. The snow-free period was 3 weeks shorter than average, however, in contrast to previous dry seasons, the total amount and distribution of precipitation for July-October did not differ from the average. As no summer frosts, snowfalls, prolonged periods of rain or storms were recorded, weather conditions were considered favourable for most tundra birds.

Lemmings were common around Lavrentia, although not as abundant as inland, in the Iony Lake area, according to local people reports. Mass dispersion of juveniles and their burrowing activities occurred in the second half of August, when 8-10 animals per 5 km transects were recorded. Arctic Ground-Squirrels were common everywhere, but inhabited colonies were particularly frequent near settlements, roads and banks. Northern Pikas *Ochotona hyperborea* were common on the rocks.

Arctic and Red foxes became more common due to the increased abundance of lemmings; also Pomarine Skuas were recorded. Peregrine Falcons were seen rarely, but on a regular basis (0.08 birds/km^2). Rough-legged Buzzard and Gyrfalcon were also rare, and their status in the area remained uncertain. Both breeding Long-tailed Skuas (1 bird per 1 km^2) and Ravens (0.25 pair per 1 km^2) were common. Glaucous Gulls were abundant along the shoreline, near seabird colonies and settlements (6-8 birds/km), with a ratio of juveniles to adults of 1:10. Herring Gulls were less common (1.5 birds/km).

Sandhill Cranes were abundant - 0.5 pair per 1 km^2, with juveniles becoming common in August. Mass migration of cranes across the Lavrentia Bay started earlier than normal, on 22 August, and continued to 22 September, the principal direction being to the north-north-east.

Pacific Golden Plovers were common among breeding waders on the tundra plain (4-6 pairs per 1 km^2). Ringed Plovers inhabited floodplains and gravel flats of streams (0.3 bird/km), Red-necked Phalaropes occupied lake shores (0.5 bird/km), and Dunlins were present on wet sedge tundra. Wader broods were rare in August. Dunlins were the dominant species among waders on tundra and coasts during migration between 9 August and 22 September, with hundreds passing daily during the peak period. Western Sandpipers *Calidris mauri* (9-31 August, with 50-80 birds seen daily on peak), Pectoral

Sandpipers (from 11 August through September, 30-40 birds daily on peak), and Long-billed Dowitchers (during 31 August to 20 September, 10-20 birds daily on peak) were common during migration. Rare migrants included Red-necked Phalarope (4 records of 1-4 juveniles).

Adult Common Eiders, together with broods, were common on the sea in August (2 birds/km). Lagoons and coastal lakes near Lavrentia and Lorino settlements from late July to August were used by aggregations of 150-300 Pintails, as well as by moulting Common and Spectacled *Somateria fischeri* eiders, Long-tailed and Harlequin ducks *Histrionicus histrionicus*, and Greater Scaups *Aythya marila* (tens of birds). Brunnich's Guillemots *Uria lomvia* were seen on the sea, close to the shore, and on lagoons. The density of Pelagic Cormorants *Phalacrocorax pelagicus* was 2.3 bird/km in mid-August, and of Black Guillemots was 0.1 bird/km. Willow Grouse broods of 8-10 birds were not uncommon in inland scrub tundra in mid August (1 brood per 3 km^2).

Breeding passerines were dominated by Lapland Buntings with post-breeding density of 14 birds/km, while Yellow Wagtails *Motacilla flava*, Snow Buntings, Wheatears, Red-throated Pipits and Redpolls were common in their respective preferred habitats. Fledgings of young in all these species was recorded in mid-July, and they were abundant migrants. Pied Wagtails were less common.

D.V.Karelin

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

Usual weather for the Bering Sea region. Breeding conditions were generally favourable for all birds. Voles were numerous and were seen several times every day. Rodent-specialist avian predators (owls and buzzards) were absent; among skuas only Long-tailed was recorded. Seabirds were preyed upon by Herring and Glaucous gulls, and Ravens *Corvus corax*, in stony talus - also by common to abundant Arctic Foxes.

V.A.Zubakin

39. Yukon-Kuskokwim Delta, Alaska, USA (60°-63°N, 163°-166°W)

Ice and snow phenology was approximately 3-5 days later than in 1999 and 7 days later than normal. Minor flooding due to snowmelt and delayed run-off was reported. Ice-break took place around 3 June on the coastal study area, and on 20 May on the Kuskokwim-Yukon Rivers. All habitats became available by 2 June.

Tundra voles were abundant along the coast to 15 km inland during nest surveys between 5 and 15 June.

As reported by observers on the ground, Arctic Foxes were seen more often than normal and increased rates of nest predation were recorded. According to subjective evaluation, Arctic Skuas and Short-eared Owls were more abundant than normal.

Numbers of estimated breeding pairs of geese went down 20-22%, although nest phenology was approximately 3 days earlier than in 1999.

C.P.Dau

40. Kanagayak, Yukon Delta National Wildlife Refuge, Alaska, USA (62°13'N, 164°47'W)

On the Yukon-Kuskokwim Delta, arvicoline rodent numbers (particularly Tundra Voles) have peaked every 4 years since 1984. Although widespread, these highs are often somewhat patchy due to local variation in storm tides, amount of winter snowfall, and patterns of mid-winter melting, thawing and re-freezing. This environmental variation results in geographic variation in the amplitude of the Delta's rodent highs. The year 2000 was no exception. For the first time in many years, rodent numbers in the coastal zone of the Delta were quite high; probably a function of the absence of storm tides in both fall 1999 and spring 2000.

Abundant rodents supported atypically high local nesting densities of Short-eared Owls on the central Delta. The southern Delta supported unusually high numbers of Snowy Owls in late summer and early fall. By the fourth week of August, up to 220 Snowy Owls were estimated in a study area of 2,444 km^2. Despite the presence of aerial surveys and ornithological field camps on the Delta for more than three decades, similar concentrations of Snowy Owls have not been previously reported by ornithologists on the Delta over that interval. Red and Arctic Foxes are both uncommon in the area, but skuas and mink are fairly common.

We studied the breeding ecology of the Western Sandpiper from 1998 to 2000 at a permanent field site. The density of nesting pairs in 1999 and 2000 was 2.95/ha. and 3.01/ha., respectively, among the highest densities recorded for this species. Mayfield nest success on a 16 ha. plot from 1998 to 2000 was 0.56, 0.24 and 0.35, respectively. Fledging success, defined as a nest fledging one or more young, was 75% (12 of 16 hatched nests) in 1999 and 68% (19 of 28 hatched nests) in 2000.

B.J.McCaffery, D.R.Ruthrauff.

41. Seward Peninsula, central part, Alaska, USA (61°15'-66°00'N, 164°30'-167°30'W)

We were not present long enough to speculate on the effects of the weather. "Break-up" occurred at the end of the first week of June. Many creeks and rivers started flowing during the visit period, from 30 May to 6 June.

Greenland Collared Lemmings present in other years were not observed in 2000. Not very many voles were seen, but it was still a bit early in the season and snow cover was high at the time of the visit, which prevented an evaluation of their abundance.

L.Tibbitts

42. Browerville, Alaska, USA (71°23'N, 156°45'W)

Lemmings were common to abundant, while voles were common. Arctic Foxes were rare, but three active dens were found during the visit from 23 to 27 June. Skuas, including Pomarine, were common and breeding. Snowy Owls were abundant breeders, Short-eared Owls also nested.

R.E.Gill, Jr.

43. Coastline, barrier islands - Arctic Coastal Plain, Alaska, USA (69°-70°N, 141°-164°W)

Weather phenology was slightly later than in 1999. Coastal ice conditions were more severe in 2000. Onshore nesting areas were open and no breeding delays were believed to have occurred.

Only trails of Brown and Collared lemmings were seen. They were reported rare by field workers on the ground.

Arctic Foxes were breeding, Snowy Owls were rare, with only a few, non-breeding records. Arctic Skuas were common breeders, but Pomarine and Long-tailed were rare.

C.P.Dau

44. Big River region, Banks Island, Northwest Territories, Canada (72°23'N, 125°04'W)

Spring arrived abruptly and two to three weeks late on Banks Island in 2000. Daily temperatures jumped six to seven degrees around 8 June and a fast and complete snowmelt ensued. The strange spring weather settled down into more-or-less "average" weather later in June. Mean monthly air temperatures were -11°C (May), +2.9°C (June), +6.1°C (July), and +2.4°C (August). Weather data were supplied by M. LaPalme, Environment Canada, Edmonton, Alberta.

Some species of shorebirds were into courtship display on and around 10-12 June (e.g. Baird's Sandpiper *Calidris bairdii*, Pectoral Sandpiper, Buff-breasted Sandpiper *Tryngites subruficollis*). Grey Plover copulation was observed on 15 June. A complete White-rumped Sandpiper *Calidris fuscicollis* clutch was observed on 18 June. By the 20 June most Lapland Buntings had completed clutches (6 eggs). The late spring seems to have delayed shorebirds and songbirds but did not preclude their nesting.

Breeding bird phenology: We estimate that goose nesting in the Big River Snow Goose colony was at least 10 days behind schedule - on 12 June those nests that were initiated had a maximum of 2 eggs. There were also reports from Sachs Harbour of some goose and duck mortality prior to the abrupt onset of snowmelt. There were also reports from local people of goose eggs that were shrunken inside. Breeding success can be evaluated as poor.

P.Latour, J.Hines, V.Johnston.

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

The average mean temperatures for Karrak Lake, Queen Maud Gulf Bird Sanctuary, were -6.2°C (May 20-31), +3.1°C (June), +14.8°C (July), and +12.6°C (August 1-12).

Breeding bird phenology: Average nest initiation dates for Ross' Geese *Anser rossii* and Lesser Snow Geese were 18 June and 17 June, respectively. These dates are notably later than the 14-year averages of 10 and 9 June.

Data for other large birds are as follows: Long-tailed Duck - nest initiation 15-25 June (median 21 June); Canada Goose *Branta canadensis* - nest initiation 12-23 June (median 17 June); Arctic Tern - parents incubating full clutches on nests between 24 June and 7 July, one hatch date of 28 June; Red-throated Loon - three nests laying between 26-30 June, parents incubating full clutches on other nests between 27 June and 24 July, one hatch date of 27 July; Herring Gull - one nest laying on 25 June, parents incubating a full clutch on another nest on 24 June; Glaucous Gull - parents incubating full clutches on nests between 24 June and 7 July. Breeding success can be evaluated as average.

D.Warner, R.Alisauskas.

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

In wet places, snow cover reduced to 50% probably 10 days or more before 6 June, on which date it almost completely disappeared. On moss-heath tundra the 50% level was reached on 1-6 June. In narrow areas between ponds and in places shaded by trees some snow was still present on 1 July. Ice broke about 10 June on the Churchill River.

The years of 1998 and 1999 were both very early and warm, with the mean monthly anomalies of May and June of +4 to +6°C, when compared to the respective mean values of the base period of 1961-2000, using the data from the Global Historical Climatology Network from the National Climatic Data Centre. In 2000, the mean temperature anomalies of May were +1°C, and of June -1°C, respectively, which indicates this year was close to the average. For comparison, in 1992, remembered as an exceptionally cold and late season, average anomalies of May were -0.5°C, and of June -3°C. Despite average temperatures, commence of shorebird (but not geese) nesting in 2000 appeared to be very late. Most probably it had been delayed not only by low temperatures, but by long-lasting snow cover and high water level early in the season, caused by heavy precipitation in February and May (anomalies of +50% and +60%, respectively).

Small mammal populations were very low, both in the vicinity of Churchill (Peter Scott, Churchill Northern Studies Centre), and at Owl and Broad rivers, about 50 km away (Jack DuBois, Manitoba Museum of Man and Nature, Winnipeg, Manitoba, pers. comm.). One lemming was seen from 6 June to 15 July.

In 2000, markedly fewer Killdeer *Charadrius vociferus* nested in the Churchill area, and markedly fewer Semipalmated Plovers *Ch. semipalmatus* nested on the dry tundra near the coast than in two earlier years. Several known territories of American Golden Plovers *Pluvialis dominica* and Whimbrel remained unoccupied. Whimbrels were numerous throughout the whole season. This was also the first year when no nest of the Stilt Sandpiper *Calidris himantopus* was found. This species was common in some areas in the 1960s and has declined steadily in the last decade. Although no formal surveys were carried out, the numbers of the Lesser Yellowlegs *Tringa flavipes* seemed to be lower, and the numbers of the Common Snipe higher than in 1998 and 1999.

Canada Geese nested throughout the area in similar numbers as previously, and the size of the clutches was relatively large, as most of the accidentally found nests contained 4 or 5 eggs. Hatching started only a few days later than in earlier years. This might be due to the spells of warm weather early in the season. Gosling mortality was markedly higher than in previous years, and broods with large chicks were much less common.

In the American Golden Plover, clutch size was very large (3.95, n=21); predation rate was higher (min. 52.3%), but not significantly so, than in previous years (min. 40% in 1999). Hatching was much more synchronised than in previous years, and occurred at exactly the same dates as the second wave of hatching in warmer years. There were also some behavioural differences: some pairs were seldom present on their territories prior to incubation, and no nests from the previous years were re-used.

There was high predation rate on the Yellow Warbler *Dendroica petechia* nests early in the season, (Morgan Wilson, pers. comm) possibly due to lack of concealment (leaves) at that time.

J.Klima

47. East Bay, Southampton Island, Nunavut, Canada (61°21'N, 84°00'W)

At the ornithological research camp at East Bay, the season was considered to be relatively mild, sunny and calm. Weather records from the nearby community of Coral Harbour show mean temperatures of -6.2°C in May, 2.3°C in June, +11.9°C in July, and +9.3°C in August. Average winds were 17.9, 19.5, 16.4, and 18.2 km per hour for each month, respectively. Weather data were supplied by M. LaPalme, Environment Canada, Edmonton, Alberta.

Common Eiders started to arrive at their breeding colony on 9 June; nest initiation was in late June, and the hatching period was 21 July to 8 August. Workers estimated a good nesting year with 90% hatching success.

M.Robertson, G.Gilchrist.

48. Bylot Island, Nunavut, Canada (73°13'N, 78°34'W)

The spring of 2000 was characterized by a thick snowpack: snow depth on 1 June was 45 cm compared to a long-term average of 34 cm. Spring temperatures were cold with an average air temperature of -3.0°C between 20 May - 20 June compared to a long-term average of -0.3°C. This resulted in a delayed snowmelt even though conditions were exceptionally sunny and dry in June (0 mm of precipitation). In contrast, the temperatures in late June and July were much warmer than normal and precipitation was near average (55 mm in July and 9 mm up to 21 August). These conditions, combined with a good spring run-off, resulted in an excellent growing environment for plants this year.

For our small-mammal survey, we captured 39 Brown Lemmings and 5 Collared Lemmings, yielding an index of abundance of 4.39 lemmings/100 total trap nights, the highest value recorded since the beginning of the small mammal monitoring in 1994. Five Collared Lemmings were captured at the Camp-2 site, which yielded a moderate index of abundance (1.03 lemmings/100 total trap nights). This suggests that overall lemming abundance in 2000 was very high and that populations were at the peak of their cycle.

We found signs of fox activity (diggings or fresh prey remains) at 18 of 39 known den sites (46%), compared with 38% in 1999 and 56% in 1998. We confirmed the presence of pups at 7 dens, compared with 3 in 1999 and 9 in 1998. Five dens were occupied by Arctic Foxes and two by Red Foxes. Litter size was a minimum of 1 to 5 pups. This suggests that fox breeding activity was high, presumably a consequence of the high lemming abundance. After 3 years of nesting absence, we found 1 Snowy Owl nest in the Camp-2 area and 12 in the Base-camp Valley, a high value. In previous lemming peaks, 7 owl nests were found in the Base-camp Valley.

Greater Snow Goose breeding phenology: Even though departure of geese from their spring staging areas in Quebec occurred around the usual dates, the arrival of geese on Bylot Island was delayed for a second year in a row. Virtually no geese were present upon our arrival on 29 May and daily counts of geese on the hills surrounding the Base-camp Valley were low until 10 June (<200 pairs). Then there was a large influx of birds with a peak count of 400 pairs on 19 June, which was about 10 days later than usual.

Median egg-laying date was 16 June, which is relatively late. For the second consecutive year, reproductive effort of geese was low at the main breeding colony, but relatively good at the Base-camp Valley thanks to the presence of several Snowy Owls around which many geese established their nests. Nest density was nonetheless low as most nests were widely dispersed in the hills rather than in the lowlands in the Base-camp Valley. Clutch size was 3.65, which is near the long-term average. Nesting success was excellent this year with 83% of the nests hatching at least one egg, the second highest value recorded. Activity of predators at goose nests was much reduced due to the abundance of alternative prey (high lemming density) and the abundance of Snowy Owls with which many geese nested in association.

Peak hatching was on 13 July, the second latest on record. The gosling:adult ratio among geese captured at banding (1.08:1) was close to the long-term average, and the mean brood size (2.78 young, SD=1.10, n=180; counts conducted between 2-6 August) was slightly higher. By combining information on brood size and young:adult ratio at banding, we estimate that 78% of the adults captured were accompanied by young. This suggests that brood survival was good in 2000 and that the predation rate was relatively low.

G.Gauthier

49. Naternaq (Lersletten), Greenland (68°17'-68°22'N; 51°50'-52°05'W)

Spring (April and May) and early summer (June) 2000 had temperatures well above the average, with April being especially warm. During that period mean precipitation was low and especially June was very dry with almost no rain. July, on the other hand was very unstable, with changing but normal average temperatures, and with precipitation above the mean. Generally, flowers were about 14 days ahead of the previous year, and Lapland Diapensia *Diapensia lapponoca* and Mountain Avens *Dryas integrifolia* had almost dried out on 8 July. Again this year mosquitos and blackflies were abundant.

It seemed to be a rather good breeding year for most bird species. In 2000 only one Arctic Fox was seen, and Arctic Fox(es) was heard twice, so probably their pressure on birds has been minimal. Ptarmigans and passerines seemed to have a fine breeding year. Greenland White-fronted Goose *Anser albifrons flavirostris* had a very good year; we saw many more breeding pairs this year compared with 1999. In July there were 12 pairs with an average of 3.1 gosling/pair (a total of 300 adults/immatures, most of which were in moult) in a study area of about 113 km^2. The following bird species were also recorded in this area: Great Northern Diver *Gavia immer*: 3-6 birds, no obvious breeding pairs, Red-throated Diver: 1 pair with 2 pulli (total 2 pairs), Mallard *Anas platyrhynchos*: 1 female with 7 pulli (total c. 20 adults), Long-tailed Duck: 1 female with 7 pulli (total 10 adults), Canada Goose: 1 pair with 3 pulli (total 5 adults), Barnacle Goose *Branta leucopsis*: 1 (a very rare visitor in West Greenland), Red-necked Phalarope: 3 males with at least 1 pullus/male (total of 7 adults), Purple Sandpiper: 3 adults all probably with pulli, White-tailed Eagle: 1 juvenile (2-3 k) on 7 July, Gyrfalcon: 2 adults and 2 juveniles, Peregrine Falcon: 1 pair (possibly breeding), Rock Ptarmigan: 3 females with an average of 9 pulli, Snowy Owl: 1 adult male (9-18 July; vagrant in West Greenland).

C.Glahder, A.Walsh

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

Patterns observed on Traill Island (NE Greenland) clearly point to a very low population of lemmings. This situation was fully expected in view of the dynamics assessed in the two previous seasons. Indicators of this numerical depression include the very low number of winter nests recorded (second lowest figure in 13 years) as well as the extremely poor trapping success in the summer. A high proportion of winter nests were occupied by stoats, suggesting that high predation pressure during this season prevented any recovery of the population in the subnivean environment. These very low densities are related to the apparent failure of reproduction attempt in lemming predators in summer (absence of Snowy Owls, no fox pups, no breeding of Long-tailed Skuas). From a climatic point of view, one should notice that snow cover in winter was lower than average, with snow melt already fully completed by the end of June, i.e. more than 2 weeks earlier than usual. This earlier snow clearance may have favoured nesting of certain wader species like Sanderlings *Calidris alba* but reproductive success later suffered from predation.

B.Sittler, O.Gilg.

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

It was a very early breeding season in contrast to last summer's unprecedented late snow melt. In early June, at the start of the season, we had 40 cm of snow at our sonic snow depth sensor, compared with 130 cm last year, when we could use skies on the tundra until early July. This year, the snow melt was largely completed by mid-summer. The result was that the waders bred as early as we have recorded in previous early years; that is initial first egg dates around 8 June and the bulk of first egg dates within a few days later. The weather was beautiful during virtually all of June and early July, so the waders apparently had optimal conditions.

However, what should have been a very good breeding season, was interrupted by a fierce snow storm during the night of 17-18 July, i.e. in the middle of the chick rearing period. The result was demonstrated by more than 250 adult waders that appeared in the river deltas at the coast immediately afterwards - a clear indication of the many young lost during the snowstorm.

The population census in our 19 km^2 study area gave figures close to those obtained during the previous four seasons; that is about 100 pairs of Dunlins, around 40-60 pairs each of Ringed Plover, Sanderling and Turnstone, and about 25 pairs of Red Knot *Calidris canutus*, together with 1-2 pairs of Red-necked Phalaropes. Areas of apparently optimal breeding habitat that have been snow covered in other years, remained unused, and it seems as if the wader populations are adjusted to "average" conditions, as the species involved appear to be largely site-faithful.

About one quarter of the nests found were predated by foxes, which is within the range found in previous years. Three fox dens in and around our census area held pups. The lemming population was at an absolute low, but the local fox population seemed to have responded more to the numbers of musk oxen killed by wolfs and harsh weather during the previous winter.

Numbers of adult waders remaining on the tundra in late July tend to decline quite rapidly, but this year, particularly few alarm-calling waders remained after the snow storm, so there is little doubt that many of the chicks had died. However, numbers of juvenile waders appearing at the coast during August did not differ much from previous years. This means that conditions in other parts of the region must have been less severe. The snowstorm hit the central part of Northeast Greenland, so the southern and possibly also the northernmost parts were not affected.

A very early breeding season with average predation and regionally low fledging success due to a severe snowstorm in mid July. Bird breeding performance can be evaluated as moderate.

H.Meltofte

See also: http://biobasis.dmu.dk

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

BIRD BREEDING CONDITIONS IN THE ARCTIC IN 2000

Pavel S. Tomkovich & Mikhail Y. Soloviev

In 2000 information on breeding conditions became available from 51 localities in the Arctic and Subarctic, of which ¾ were in the Russian Arctic. Given the far higher levels of research activities in America and Northern Europe compared with Russia, this situation indicates that efforts put into stimulating international cooperation on the project turned out to be less effective than was hoped. There needs to be a much greater recognition of the importance of participation in the project by professional and amateur ornithologists, and hence more contributions to the database, to enable geographic variation in breeding conditions to be assessed for the whole Arctic. The nature of the submitted reports means that any assessment of breeding performance of Arctic birds, based on 2000 data, is largely restricted to Russia and part of Alaska.

Weather and other abiotic factors.

Weather conditions, timing of snowmelt and extreme events like summer snowfalls and out-of-season floods may have serious impacts on the numbers of Arctic breeding birds and their breeding success. Judging by the map of deviations of monthly mean air temperatures for June 2000 from the average over the last 7 years (Fig. 1 on page 35), the temperature regime was favourable during the start of the bird breeding season in most areas of the Arctic. Higher than normal temperatures were recorded in north-eastern Europe, western Siberia, north-eastern Siberia, interior parts of Alaska, northern parts of the Canadian Arctic archipelago, and in the west and south of Greenland. Low temperatures were recorded in June in north-east Greenland, Iceland, Scandinavia, Svalbard, southern parts of the Canadian Arctic archipelago, and in particular around Hudson Bay.

Temperature characteristics of June do not necessarily agree with the evaluation of spring phenology by respondents, because the latter depends also on the amount of accumulated snow, and in some regions (e.g. Scandinavia and western Alaska) spring normally starts in May. An early spring was reported in the north-east and west of Greenland and most of Russia, including north-eastern Europe, the Polar Urals, southern Yamal, many localities in Taimyr and northern Yakutia, and the lower reaches of the Anadyr River. On the northern Kola Peninsula, Taimyr and in the Indigirka River area in Yakutia early snowmelt was followed by a cold June, with snowfalls and rains on Taimyr. A late spring was recorded in the polar deserts of northern Taimyr and the neighbouring Severnaya Zemlya archipelago, on Wrangel Island, Chukotsky Peninsula, in Alaska and most localities in Canada. High flood levels on rivers and lakes were reported only from the area west of Hudson Bay.

Mean July air temperatures (Fig. 2 on page 35) were unusually high in northeast Europe, Yamal, north-eastern Siberia and Greenland. The situation improved in northeastern Greenland, on Svalbard, in central and eastern parts of the Canadian Arctic and Subarctic, while on western Taimyr, west of Yakutia, Chukotsky Peninsula and Alaska, in contrast, temperatures dropped below the average.

Respondents reported a warm and dry summer for north-east Europe and western Siberia, Anadyr lowland and further south, Wrangel Island and in north-east Greenland. However, snowstorms in the second half of July in the last two areas resulted in the deaths of many juvenile birds. The lack of precipitation in summer led to drying out of many marshes and small water bodies. Warm weather was also recorded on Bylot and Southampton islands in Canada. The summer was reported to be colder than usual on the northern Kola Peninsula, from western Yakutia, east of the Chukotsky Peninsula, western and northern Alaska and west of Hudson Bay.

Rodent abundance

Populations of microtine rodents (lemmings and voles) are known to show pronounced cyclicity in many Arctic regions, thereby affecting the distribution and population dynamics of predators (mammals and birds) that are dependent on rodents. This leads to variations in predation pressure on ground-nesting birds.

In 2000, lemmings were not detected or occurred in low numbers in north-east Greenland, in the north of European Russia, western Siberia, western Taimyr, Chelyuskin Cape on northern Taimyr, in some localities of the Chukotsky Peninsula, in northern Alaska as well as in western Alaska and west of Hudson Bay (Fig. 3 on page 36). High numbers were reported from Severnaya Zemlya archipelago, eastern Taimyr, Yakutia (at least between Lena and Kolyma river deltas), sporadically from Chukotka and northern Alaska, and from Bylot Island. Lemmings should have peak in vast areas of eastern Siberia from eastern Taimyr to the Kolyma River. Average numbers were recorded on Vaigach Island, the only reported European area with lemmings this year. On Wrangel Island, lemming abundance was low to average in different localities, and respondents gave different opinions about trends in numbers; a similarly diverse situation was observed on the Chukotsky Peninsula.

Voles, typical in the southern tundra and forest-tundra, peaked in the Yukon-Kuskokwim River delta area in Alaska, St.Laurence Island, in Indigirka area, and were locally common or abundant in northernmost Alaska, at Chukotka, west of the Kolyma Delta, Lena Delta, locally in certain habitats in southern Yamal, the Polar Urals, Pechora River delta and the northern Kola Peninsula.

Predators.

The numbers and breeding performance of predators generally followed the pattern of rodent abundance. Arctic Foxes, which are principal predators of tundra bird clutches, were either not recorded in European Arctic localities, or were common as non-breeders (to the north of the Pechora River delta). In northern Europe, they were common only on Vaigach Island, where bred. They were reported as being common at a single site in the Lower Ob' River area, but farther east from Taimyr to Chukotsky Peninsula foxes were common to numerous and bred at most sites. Red Foxes bred at some sites at Chukotka, while Stoats were numerous on Severnaya

Zemlya and in the Indigirka River area. They were also reported from the lower Anadyr River, north-western Taimyr and north-east Greenland, but did not breed in the latter site because of low lemming numbers. Breeding activity of both fox species was high on Bylot Island, while in west Greenland Arctic Foxes were rare and had minimal impact on birds.

Owls were either not found in the western part of the Russian Arctic, or were very rare (Fig. 1 on page 19). From central Taimyr further east owls were common at most sites, and bred in some of them. Breeding Snowy Owls were abundant on Bylot Island, near Barrow on Alaska, in the Lena River delta, and locally on Chukotka: in the vicinity of Mys Shmidta and Iony Lake, and at the foothills of the Zolotoy Ridge Mts. along the edge of Lower Anadyr Plain. They were common breeders in the centre of Wrangel Island, and nested near Svyatoy Nos Cape in Yakutia. High concentrations of non-breeding Snowy Owls were reported from Vaigach Island, Severnaya Zemlya archipelago, the Yukon-Kuskokwim River delta, Alaska, and possibly west of the Kolyma Delta. Short-eared Owls nested near the Indigirka River, near Anadyr city, in the Yukon-Kuskokwim River delta and near Barrow.

Breeding of Pomarine Skuas was recorded at just a few sites, but always in the presence of at least locally common or abundant lemmings: south-eastern Taimyr, Lena Delta, Wrangel Island, Zolotoy Range, and in the vicinity of Barrow (Fig. 2 on page 19).

Long-tailed Skua and Rough-legged Buzzard also showed some dependence on rodent numbers, either not attempting to nest in areas with few rodents, or occurring in substantially lower numbers in such areas. In the northwestern Taimyr, Buzzard nests were deserted or depredated. Most sites with high or moderate lemming numbers in the eastern part of the Russian Arctic had common or numerous Long-tailed Skuas and Rough-legged Buzzards (except for Chukotka where buzzards are never numerous) which bred successfully. The same was true for Vaigach Island. The absence of Owls and Buzzards on St.-Lawrence Island, where there were abundant voles, is of notable interest.

Distribution and numbers of waterfowl and waders.

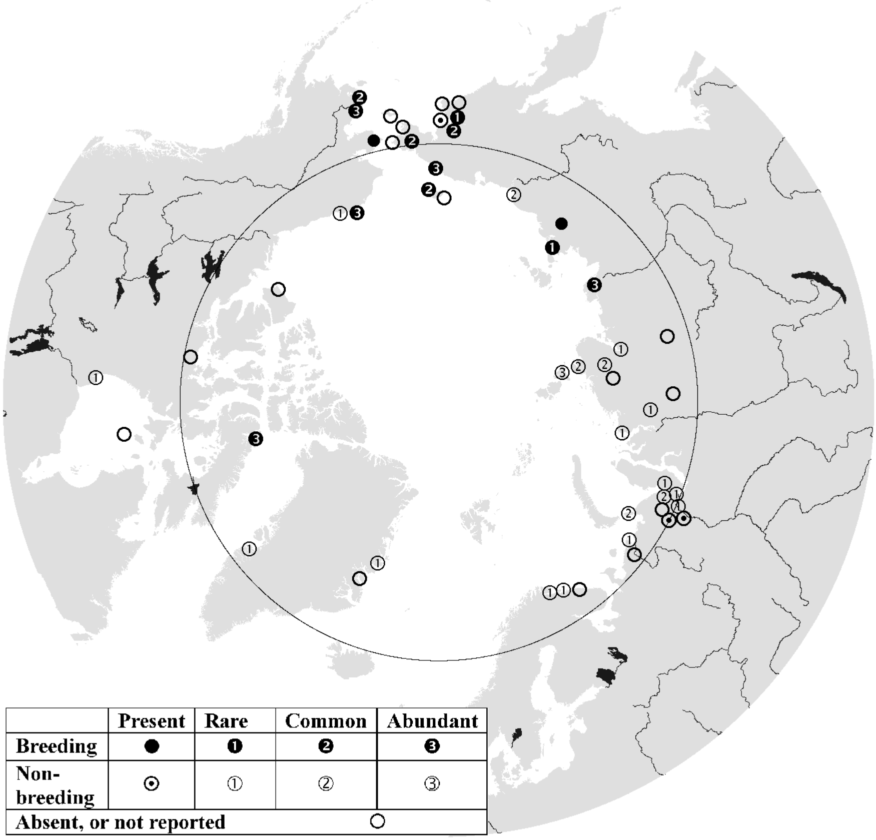
The numbers and sometimes distributions of waterfowl and waders can change, depending on the timing of snowmelt, spring temperature and the hydrological regime. Low flood on the Ob' River in combination with early snowmelt were presumably responsible for the low numbers of swans, geese, ducks and some waders in the lower reaches of this river. S.P.Paskhalny presumed that Long-tailed Ducks and possibly others migrated further north, a theory supported by the presence of high numbers of ducks and Red-throated Divers further north, in the middle reaches of the Schutchya River on Yamal. Numbers of Bewick's Swans in the area north of the Pechora River delta dropped to their lowest level in 10 years of counts. Nesting Brent Geese were less common than usual in the Yukon-Kuskokwim River delta, and chose not to breed at all on southern Bolshevik Island, Severnaya Zemlya archipelago. An early spring led to decreased numbers of breeding Common Eiders at Ainowy Islands.

The shortage of snow-free areas on Wrangel Island allowed nesting of only slightly more than half of the Snow Geese that had arrived on the island, and the nesting density of this species on Bylot Island was not high as a result of the late spring. A shortage of fish-food on Ainowy Islands resulted in mass non-breeding in Arctic Terns and chick deaths in large white-headed gulls. Low numbers of birds, waders in particular, were reported from western and central Taimyr, Wrangel Island and the western shore of Hudson Bay. In contrast, the breeding density of birds was higher at eastern Murman, in the Lena River delta and on Arctic Coastal Plain in Alaska.

A long-term increase in the numbers of Grey-lag Geese was reported on Ainowy Islands and of Herring Gulls at lower Anadyr.

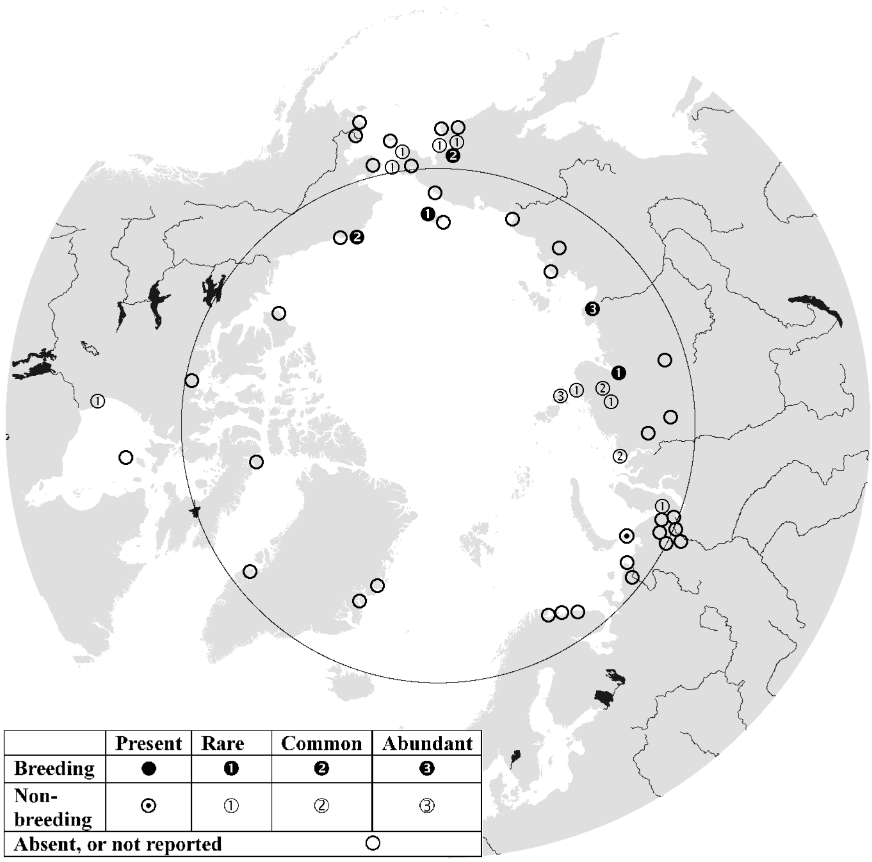
Breeding success

The evaluation of breeding success in 2000, as identified by respondents or inferred from other information they supplied, is shown on Fig. 4 on page 36. However, the exact figures of nesting/breeding success are available in only a few cases. As illustrated by the figure, breeding success was highest primarily in the eastern part of the Russian Arctic, i.e. in the belt of high lemming numbers. Additionally, birds bred successfully in west Greenland, northeast Canada, in the Yukon-Kuskokwim River delta, in Koryak Highland where there were abundant voles, in the Polar Urals and the Pechora River delta.



	Present	Rare	Common	Abundant
Breeding	●	❶	❷	❸
Non-breeding	⊙	①	②	③
Absent, or not reported	○			

Figure 1. Abundance of owls in the Arctic in 2000.



	Present	Rare	Common	Abundant
Breeding	●	❶	❷	❸
Non-breeding	⊙	①	②	③
Absent, or not reported	○			

Figure 2. Abundance of Pomarine Skuas in the Arctic in 2000.

There was intermediate breeding performance by birds in eastern Murman, the Lower Ob’ region, central Taimyr, central Canada, north-east Greenland and probably Vaigach Island. On Wrangel Island, Snow Geese had average breeding success, while that of waders and passerines was substantially reduced by a prolonged snowstorm in late July. Clearly, the low nesting success of tundra birds on western Taimyr resulted from heavy predation, as the lemming peak in 1999 was followed by depressed numbers in 2000. Poor breeding performance of geese on Banks Island (Canada) resulted from adverse weather in spring.

Comparison with predictions for 2000

The peak in numbers of lemmings in western Taimyr, associated with high breeding success, was supposed to spread in 2000 to adjacent areas in the west and east, and to decrease in western Taimyr. Migration of predators from western Taimyr, to the areas with abundant food supply, could have led to decreased predation pressure on birds in the vast areas of western and central Siberia (Newsletter No. 2, p. 14). This prediction was not confirmed in all parts. Lemming numbers changed as expected on Taimyr and farther east in Siberia, and consequently bird reproduction was successful there, but to the west of Taimyr the situation developed differently. According to information available from southern Yamal and the Polar Urals, locally high numbers of lemmings in 1999 did not spread to the whole region in 2000, but instead decreased to a very low level. Presumably, these processes occurred late in 1999, causing emigration (and dying?) of Arctic Foxes and a decline of their population in summer 2000, resulting in good, although not the best, reproduction of tundra birds. Such a scenario was, probably, common for the whole of north European Russia apart from Vaigach Island where a local lemming peak attracted predators. Weather conditions were generally favourable for birds in northern Russia, except for Wrangel Island. The result was good reproductive performance in most parts of the Eurasian North, and should have been reflected in the age composition of migrants on different flyways. It is noteworthy, that bird breeding success was still substantially higher in the eastern part of the Eurasian Arctic than in the western part, with the western Taimyr registering the lowest nesting success.

Predictions were ambiguous for Wrangel Island and northern Alaska and do not warrant comparison with the real situation. The scenario for north-east Greenland agreed with expectations: decreases in lemming numbers there in 1999 ended with deep depression in 2000. This should have caused an increase in predation and corresponding decrease of bird productivity, but the latter was observed only to the level of intermediate breeding performance.

Predictions for summer 2001

Knowledge of which Arctic regions had either high or low numbers of rodents in 2000 enables fairly confident predictions to be made of the likely levels of rodents, predation and bird breeding success in the coming summer, 2001. Lemming numbers may start to increase in northern Europe, western Siberia and in western Taimyr. Predators were not numerous in most areas of this vast region (with the exception of Taimyr) in 2000, and given low rodent abundance, numbers of predators are not expected to grow. It is most likely their numbers will decline in some areas by summer 2001 (although a proportion of Arctic Foxes can come from Taimyr and Vaigach). This gives grounds to expect low predation pressure and consequently successful reproduction of birds in the tundra of eastern Europe and western Siberia.

The situation is totally different in central and eastern Siberia, where lemming numbers should decrease after having peaked in 2000. While numerous after good reproduction in 2000, Arctic and Red foxes, Stoats and other predators will be short of food and will actively prey upon bird clutches with apparent adverse results for reproductive performance of most tundra birds. The areas with expected good and bad bird productivity in western and eastern Siberia, respectively, are separated by the Taimyr Peninsula, which can be invaded by Arctic Foxes dispersing from Yakutia. This could lead to low nesting success on Taimyr, with the possible exception of the western part of the peninsula.

Similarly, increased predation pressure can be expected in western Alaska after a peak in vole numbers in 2000, on Arctic Coastal Plains where lemmings were locally abundant for two years in a row, and on Bylot Island.

In north-east Greenland depression of lemming numbers may continue for a second year or be replaced by some increase. Anyway, numbers of Stoats and possibly of other predators dependent on rodents may decrease substantially, thus allowing higher breeding performance of birds.

Taking all these into account and allowing for unpredictable weather in any region, the predictions can be summed up as follows. Average or higher than average proportions of juveniles are expected in 2001 among Arctic birds using the East Atlantic Flyway on their southward migration from breeding grounds in north-east Greenland and western Eurasia. Few juveniles are expected on the Central Asian and East Asian-Australasian flyways, as well as reduced numbers among Arctic migrants on the Pacific coast of America. The actual situation on the breeding grounds and flyways can be verified only by respondents collecting data in the field and supplying these for the newsletter.

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DISCUSSION AREA

A COMPARISON OF TECHNIQUES FOR EVALUATING LEMMING NUMBERS FOR ORNITHOLOGICAL PURPOSES

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The project on bird breeding conditions in the Arctic (Tomkovich 1999) has prompted an assessment of techniques for evaluating rodent numbers in tundra landscapes, to assist ornithological research. This topic has attracted my attention because it is directly related to my studies of the ecology of lemmings (*Dicrostonyx vinogradovi* and *Lemmus sibiricus portenkoi*) on Wrangel Island. Studies were carried out in 1989-1997 in the central mountain area of the island, in the middle reaches of the Krasny Flag River. Although the principal technique I utilized was marking and recapture of animals using live-traps on plots and transects, visual evaluation of numbers was also used, and regular counts of winter nests were started in 1992. Here I compare these methods.

Visual evaluation. Visual evaluation of lemming numbers is carried out without employing special survey tools or approaches. The following rank scale was developed for lemming numbers: 1 – very low: animals are not recorded on excursions, tracks of their summer activities are very scarce; 2 – low: lemming records are extremely rare on excursions, but fresh summer tracks are periodically found in optimal habitats; 3 – average: lemmings are occasionally seen on excursions, fresh tracks of summer activities are common; 4 – high: lemmings are common on excursions, tracks of summer activities are numerous; 5 - very high: a unique situation of "super-peak" which has not been witnessed by the author but, according to other observers, the tundra is "overcrowded" with lemmings in such seasons. Lemming numbers were evaluated 3 times during each season in the study area: during snowmelt, after snowmelt in the first half of summer, but before the young of summer broods left burrows, and in the second half of summer. Information from other parts of the island was obtained from reserves staff.

My experience indicates that, in most cases, visual evaluation of numbers adequately reflects the state of lemming populations. Comparisons with mark-recapture data on study plots have shown that generally rank "1" corresponded with the total density of two lemming species not exceeding one animal per 1 ha, "2" was equivalent to 1-5 animals/ha, "3"equated to 6-15, and "4" was equivalent to over 15 animals/ha. Knowledge of the results of counts from trapping lemmings could have involuntarily affected my visual estimation of numbers, but the latter also worked in 1991, when substantially higher lemming numbers were reported in southern parts of the island, compared with the centre, and only then confirmed by trapping.

Rank scale for the evaluation of lemming numbers was used on Wrangel Island previously, by Litvin & Ovsyannikov (1990), who gave no criteria details in their publication, but personal communication with K. Litvin confirmed that their criteria were similar to those given above.

The visual evaluation of lemming numbers during snowmelt can lead to an over-estimate due to increased activity of animals, dispersion from undersnow habitats, their increased conspicuousness on snow and snow-free patches. However, the same mistake is often made by rodent-specialist predators which start breeding during snowmelt, and then may occasionally fail to raise broods, not because of decreased numbers of lemmings, but because of decreased availability. A serious drawback of visual number evaluation is that in many cases this method cannot provide data for predicting numbers in the next year, while analysis of age and sex composition in a population enables a confident prediction to be made (Chernyavsky & Tkachev 1982).

The 5-rank scale of number evaluation assumes good knowledge of the different stages of the lemming population cycle in a given region, otherwise a researcher may be advised to use just 3 ranks: low – average – high.

Counts of winter nests. Previous research has shown that winter settlements of lemmings are primarily situated in sites of early snow accumulation (Chernyavsky et al. 1981). Therefore I counted winter nests along edges of river terraces, streams, beds of temporary waterflows and ravine walls, with the exception of high precipices and other sites where snow remains during the whole summer. All nests were counted within the belt of 10 m to each side of a surveyed watercourse. The permanent count route was 33 km long for a study area of 16 km^2. Because a fresh winter nest is not always possible to distinguish from an old one (Sittler 1995), counted nests were destroyed to avoid further sampling bias, in accordance with the usual practice in such surveys. Results of winter nest counts are shown on the Figure, along with the abundance of two lemming species, evaluated on 5-rank scale in the beginning of summer (before young of summer broods were coming out on to the surface).

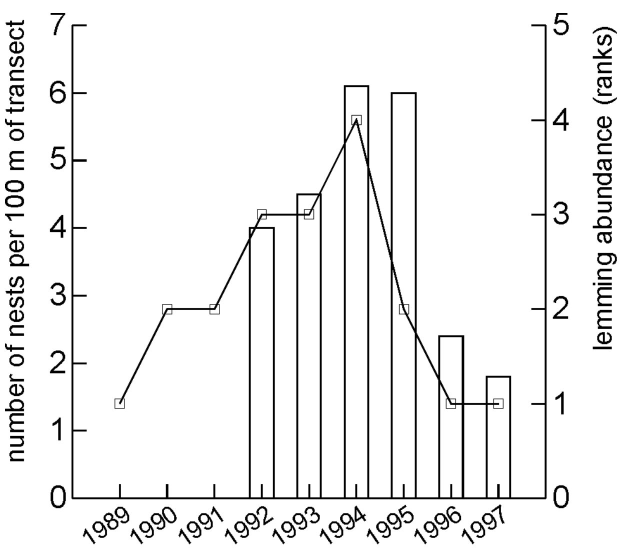

Figure. Dynamics of numbers of two lemming species (*Dicrostonyx vinogradovi* and *Lemmus sibiricus portenkoi*), and relative numbers of their winter nests on Wrangel Island. Bars=no. nest, line=lemming abundance.

The Figure shows that the highest density of winter nests was recorded in summer 1994, in the peak year of lemming populations. In 1995 nest density was almost as high, but summer abundance of lemmings was low. The reason for the discrepancy becomes apparent from trapping data which showed that in 1994 the population of Siberian Lemmings in the study area crashed during July, but numbers of Vinogradov's Lemmings remained high to the end of summer and led to a high density of winter nests. Population decline of the latter species occurred only during winter 1994/1995, despite some undersnow reproduction. This example gives further confirmation that not only notable increases in lemming numbers, but also their decreases occur most often under snow (Chernyavsky & Tkachev 1982), and the density of winter nests does not adequately reflect decreases in lemming numbers.

Although density and local distribution of winter nests provide a lot of valuable information about the state of lemming populations during the undersnow period, a reliable, quantitative relationship between lemming numbers (even in winter!) and numbers of winter nests constructed by them has not been established. Several previous attempts to identify this relationship yielded unexpected results. For example, 70 lemmings of two species were captured in their undersnow pathways in March 1979 on Wrangel Island, but after snowmelt only 5 nests were discovered in the same area (Chernyavsky et al. 1981). The authors suggested that the particular conditions of snow accumulation in winter 1978/1979 enabled the lemmings to continue to use underground burrows so obviating the need to build nests above the ground. Similar conditions were recorded in 1994, which also resulted in fewer winter nests being found.

In her publication advocating the use of winter nest counts to assess the number of lemmings in summer, Menyushina (1999) cited papers of a number of well known researchers which gave an impression of general recognition of this technique. However, some of these papers do not contain any information about winter lemming nests (Krebs 1964, Pitelka 1958, Chernyavsky 1979), while Chernyavsky & Tkachev (1982) noted this method only once in their monograph along with other techniques providing approximate evaluation of rodent numbers. Studies of Sittler (1995), devoted to the impact of stoats *Mustela erminea* on lemming population dynamics, were based entirely on the results of counts of winter nests, including those destroyed by stoats. In this case the chosen method optimally corresponds to the study goals. Sittler (1995) considered that the density of winter nests adequately reflected winter lemming numbers, but for summer numbers he used counts of inhabited burrows along transects. Complete counts of winter nests in an area of 1,000 ha by Sittler required annual censuses of about 600 km of transects, making this a labour-intensive method.

The discussion of methods above, leads me to think that in most ornithological studies visual evaluation of lemming numbers is essential and quite sufficient, while counts of winter nests may lead to considerably biased estimates of summer lemming numbers. The demonstration of functional links between predators and lemmings has required a strictly quantitative approach, including direct counts of lemmings (Dorogoi 1987). This work shows that direct counts of lemmings are compatible with intensive ornithological studies. Since this point of view is shared by other ornithologists, we would like to draw their attention to suitable methods for studying the spatial structure of microtine mammals by using lines of live-traps (Schipanov et al. 2000).

The drawbacks of the widely employed method of accessing relative density of rodents by using snap traps are well known, even when leaving aside the ethical aspect of this approach. The use of live-traps, developed by Schipanov (1973), instead of snap traps has considerable advantages. Detailed discussion of this technique does not fell within the scope of this paper, but several of the most relevant advantages are mentioned here. Live-traps are easy to install, have exceptionally high capture efficiency for all age groups of lemmings (starting from young just leaving nest), they are safe for small birds which are frequently killed in snap traps, and captured animals are not accessible to predators. Capture results enable both the assessment of the sex and age structure of the lemming population and, combined with individual marking, provide information about density in a given habitat over a short time period.

It is noteworthy, that non-destructing methods of rodent counts are particularly important when carrying out research on protected areas. In some Arctic areas only these methods are acceptable, given that such lemming taxa as *Dicrostonyx vinogradovi*, *Lemmus sibiricus portenkoi* (Wrangel Island) and *Dicrostonyx torquatus ungulatus* (Novaya Zemlya archipelago) in Russia are currently included in a list of races requiring special protection (Appendix 2 of order No. 290 from 12.05.98 by former State Committee on Ecology of Russian Federation).

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TAXONOMY OF ARCTIC LEMMINGS: A REVIEW OF CURRENT DEVELOPMENTS

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The role of lemmings in ecosystems of the Arctic tundra is well known. However, until now researchers have not reached agreement about the number of lemming species inhabiting the current tundra landscape, the limits of their ranges, the origin and relationship between species, and whether their populations follow the same or different cycles. This review is aimed at acquainting ornithologists with the results of the latest studies of lemming taxonomy and zoogeography as well as with the most controversial issues in this field of research. As more studies are required to clarify these issues and new data are likely to modify our understanding of lemming taxonomy, the information presented below should not be viewed as definitive.

To start with, the specific names of lemmings, like many widespread animal names, do not correspond to the formal definition of the taxon. Simpson (1945) distinguished four genera in the tribe Lemmini: *Dicrostonyx* Gloger – collared lemmings, *Synaptomys* Baird – bog lemmings, *Myopus* Miller – wood lemmings and *Lemmus* Link – true lemmings. However, further research revealed that despite a number of common external characteristics, collared lemmings did not share a common ancestry with the three other genera. The latter represented an independent phylum in the subfamily Arvicolinae and, from the second half of the 20th century, most researchers considered lemmings from the family Arvicolidae (or subfamily in some systems) to be two independent taxa of subfamily rank - Lemminae and Dicrostonychinae (Chaline 1972), or as two tribes (Gromov & Polyakov 1977), or as the tribe Lemmini and sub-tribe Dicrostonychina (Pavlinov & Rossolimo 1998).

The first remains of true lemmings are known from the late Pliocene in Eurasia (Simbugino, south Urals), and already they had formed characteristic morphological features. This is one of the few groups of herbivorous mammals whose diet comprises mainly low-calorie mosses and grasses. Such unique dietary specialization was associated with typical features of their dentition (Abramson 1993), allowing easy identification of their remains in the pellets of predators, even from small fragments of molars and lower jaw. Morphology and geography of true lemming remains from the late Cenozoic era indicate that the group evolved in wet marshy habitats of the boreal zone of Eurasia (Kowalski 1980, 1995), and these lemmings still live in such habitats. It is noteworthy that among three of the current genera (*Synaptomys, Myopus, Lemmus*), comprising the taxon Lemmini, only lemmings of the *Lemmus* genus inhabit the Arctic tundra of both the New and Old World, where their distribution is associated with low patches of polygonal marshes and does not expand as far north as that of collared lemmings. However, unlike the latter, certain species of true lemmings (*L. amurensis*) extend into forest-tundra and taiga. The only current genus of collared lemmings, *Dicrostonyx,* in contrast to true lemmings, inhabits exclusively drier elevated areas of the Arctic and Subarctic tundra. According to paleonthological data, the evolution of *Dicrostonyx* was associated from the very beginning with crioxerophylous landscapes of tundra-steppe, resembling its environment in the current tundra (Kowalski 1980, 1995).

Thus, Arctic lemmings belong to two genera of different origin, and accordingly two different phyletic branches of the subfamily Arvicolinae. Currently, both collared and true lemmings have a circumpolar distribution, but occupy different ecological niches and differ in their food specialization and optimal habitats (e.g. Batzli & Pitelka 1983, Rodgers & Lewis 1985). Collared and true lemmings are sympatric within nearly the whole tundra zone, with the exceptions of Scandinavia and the Kola Peninsula (only *Lemmus* is present), Greenland and some islands of the Arctic basin (e.g. Severnaya Zemlya - only *Dicrostonyx* is present). Lemmings are absent from Svalbard, Franz Josef Land and Kolguev Island. Interestingly, even attempts to acclimatise lemmings on Kolguev were unsuccessful. This island represents a mystery in this respect for zoologists, because few other Arctic islands that have no lemmings also have no suitable conditions for them. On Kolguev it seems that all necessary conditions for both collared and true lemmings exist, but the absence of rodents was reported by researchers back in the 19th century.

Taxonomy of *Lemmus* genus: brief history and current state of the issue

The composition of this genus was fundamentally revised several times during the 20th century, based on species concept, applied methods, and sometimes just because of an author's personal fancy to split or combine species. Three stages can be distinguished in the studies of lemming taxonomy based on the methods used.

The first stage (1920s – mid 70s) of research was based on analyses of variation in fur colour, body measurements and some cranial characteristics (e.g. Vinogradov 1925, Ognev 1948, Krivosheev & Rossolimo 1966). The results were controversial because the number of species varied from two (*L. lemmus* and *L. sibiricus*) to five (*L. lemmus*, *L. sibiricus, L. amurensis, L. trimucronatus, L. nigripes*) with different numbers of subspecies recognised. An extreme point of view that has not received recognition was formulated by Sidorowicz (1964), who believed in the existence of one polytypic species *L. lemmus* with 3 subspecies.

The second stage (mid 70s – end of 80s) was related to the invention of cytogenetic methods and experimental hybridisation (Raush & Raush 1975, Pokrovski et al. 1984, Gileva et al. 1984). The main and most striking result of these studies was that there were not the expected profound genetic differences between generally recognized "good" species – Norwegian (*L. lemmus*) and Siberian (*L. sibiricus*) lemmings, nor between true lemmings of the New and Old World. Lemmings from the Chukotsky Peninsula, in many systems considered to be subspecies of *L. s. chrysogaster,* had a karyotype identical to North American *L. trimucronatus*, but were different from all other Eurasian lemmings (*L. lemmus*, *L. amurensis* and *L. sibiricus*, including *L. s. portenkoi* from Wrangel Island and *L. s. flavescens* from Kamchatka) in karyotype and having reproductive isolation. All the latter Eurasian forms hybridised readily in experiments and have an identical karyotype (Pokrovski et al. 1984). Subsequent research has shown that there is a boundary between the two karyological forms along the Kolyma River (Fredga et al. 1999). However, the proposal to consider the genus as containing two species, *L. trimucronatus* and polytypic *L. lemmus* (Kuznetsova 1995) did not receive support, and the current practice of most reviewers continues to split the genus into three (*L. lemmus*, *L. sibiricus* and *L. amurensis* – Musser & Carleton 1993) or four (*L. lemmus*, *L. sibiricus, L. amurensis* and *L. trimucronatus* – Gromov & Erbaeva 1995, Jarell & Fredga 1993) separate species.

The novelty of the latest stage studies (i.e., through 1990s, by Chernyavski et al. 1993, Abramson 1999a, 1999b, Frega et al. 1999, Fedorov et al. 1999) is related to attempts to synthesise data from palaeontology, paleogeography, cytogenetics, classical morphology, and, finally, the now popular analysis of mitochondrial (mt) DNA, together with obtaining additional material from poorly surveyed regions of the Arctic. These studies have shown, in particular, that Siberian Lemmings from Wrangel Island and Kamchatka Peninsula and Amur Lemmings, despite substantial differences in size and fur colour, share characteristics of dentition in the lower jaw with true lemmings of the late Pleistocene (Chernyavski et al. 1993). Interestingly the relatedness of these forms was later confirmed by analysis of variability of mtDNA (cytochrome b, Fedorov et al. 1999). Molecular-genetic data confirmed the previous results of cytogenetic and hybridisation studies in demonstrating the large genetic divergence between *L. trimucronatus* from Chukotka and Alaska and other Eurasian true lemmings. Also, these studies provided the basis for species-level recognition of some previously suggested taxa: *L. lemmus, L. s. novosibiricus* from New Siberian Islands and *L. s. portenkoi* from Wrangel Island. The application of molecular-genetic and morphological methods to the same material has revealed genetic separation of continental Palearctic populations of *L. sibiricus* into western and eastern groups with the boundary most likely to be along the Lena River. In this case the genetic distance was the next largest after that between *L. trimucronatus* and Eurasian true lemmings, while the level of morphological differences was low. This separation previously was not reflected in lemming taxonomy, and recalled the subspecies *L. sibiricus bungei Vinogr*., 1925, described from a small sample on the Lena River delta, which failed to receive recognition. Currently little controversy exists about the number of taxa within the genus, but opinions of researchers about the rank and status of the *bungei* race have split. Fredga et al. (1999) assign most importance to differences obtained by analyses of mtDNA and consider *bungei* to be a separate species, and thus distinguish five species within the genus. From my point of view, the morphological characteristics favour its status only as a subspecies, while making inferences for taxonomy directly from a quantitative evaluation of divergence obtained during sequencing of separate fragments of mtDNA is bound to serious bias (Hendry et al. 2000). Besides, material from the Lena River delta (*terra typica* of *L. s. bungei*) was not studied, and without that no clear answer can be given as to the status and precise western distribution border of *bungei*. Both points of view on genus composition are provided in Table 1, together with the main diagnostic characteristics and ranges (see also Fig. 1).

By the beginning of 21st century the taxonomy of true lemmings, at least in the Palearctic, had developed satisfactorily compared with other wide-ranging taxa. The following issues of the genus taxonomy require clarification in future. (1) The systematic position and taxonomic status of the Yellow-bellied Lemming (*L. s. chrysogaster* Allen, 1903) described from the northern coast of the Sea of Okhotsk (Gizhiginskaya Bay) and yet not studied karyologically. (2) The southern limits of distribution of all races listed above remain unclear. (3) The taxonomic status of lemmings from the Lena River delta (*terra typica* of *L. s. bungei*) requires further investigation, as no data from this region were available for mtDNA analysis. (4) The taxonomic status of lemmings from Novaya Zemlya is unknown. (5) Differentiation of true lemmings in North America is poorly investigated in comparison with the Palearctic. The taxonomic status of *L. nigripes* and some island taxa remain debateable. A full-scale taxonomic revision of Nearctic true lemmings requires new data on geographical variability of craniometrical characteristics and fur coloration, as well as analyses of mtDNA variability.

Table 1. Taxonomy of genus *Lemmus*.

Fredga et al. (1999)		**Abramson (1999b)**		**diagnostic characteristics**
Species	Subspecies	Species	Subspecies	after Fredga et al. (1999) with additions
L. lemmus L., 1758 **Norwegian Lemming** North of Norway, Finland, Kola Peninsula	Not described	*L. lemmus* L., 1758 **Norwegian Lemming** North of Norway, Finland, Kola Peninsula	Not described	Brightly coloured black and yellow. Characterized by a black patch on the head and anterior part of the back
L. sibiricus Kerr, 1792 **Siberian Lemming** Continental tundra from the eastern coast of the White Sea up to the Lena River delta	Not described	*L. sibiricus* Kerr, 1792 **Siberian Lemming** From the eastern coast of the White Sea to the western bank of the Kolyma River, including islands of the Arctic basin	*L. s. sibiricus* Continental tundra from the eastern coast of the White Sea up to the mouth of the Lena River	Rusty-brown back with longitudinal black stripe, ventral surface yellow or whitish, borderline between the dorsal and ventral parts quite distinct. Of average size. Black patch on rump is not well defined and, as a rule, is found only in old animals
L. bungei Vinogr., 1925 **Black-rumped Lemming** From the eastern coast of the Lena River up to the western bank of the Kolyma River, including islands of the Arctic basin and Kamchatka Peninsula	*L. b. bungei* Vinogr., 1925 From the Lena River up to the western bank of the Kolyma River		*L. s. bungei* Vinogr., 1925 From eastern coast of the Lena River up to western bank of the Kolyma River	Characterized by a black patch on the rump and by a contrasting rufous-coloured area around vibrissae and ears. The borderline between rusty-brown dorsal and light-grey ventral sides is distinct. Of average size
	L. b. novosibiricus Vinogr., 1925 New Siberian Islands		*L. s. novosibiricus* Vinogr., 1925 New Siberian Islands	Significantly larger than mainland forms. Distinguishable by dark grey coloration of ventral side.
	L. b. portenkoi Chernyavsky, 1980 Wrangel Island		*L. s. portenkoi* Chernyavsky, 1980 Wrangel Island	Similar to *L. s. novosibiricus* in size and coloration, but with more pronounced ash-grey tints.
	L .b. flavescens Brandt, 1845 Kamchatka Peninsula			Small sized, dorsal stripe not well defined, flanks yellow. Black patch on rump is small and less prominent than in other subspecies, back dark-brown
	*L. b. ognevi** Vinogr., 1933 Verkhoyanski Range			Single specimen is close to Amur and Kamchatka lemmings in size, colour intermediate between nominal *bungei* and *flavescens*
L. amurensis Vinogr., 1925 **Amur Lemming** South of Yakutia, Amur Region.	Not described	*L. amurensis* Vinogr., 1925 **Amur Lemming** South of Yakutia, Amur Region, Kamchatka Peninsula		The smallest lemming, dark, deep rusty-brown dorsal side with rufous flanks. Dorsal black stripe is distinct from head to tail.
			L. a. flavescens Brandt, 1845 Kamchatka peninsula	Small sized, dorsal stripe is less well-defined than in typical *L. amurensis*, flanks yellow.
L. trimucronatus Richardson, 1825 **Brown Lemming** North America and Chukotsky peninsula	Not described	*L. trimucronatus* Richardson, 1825 **Brown Lemming** To the east of the Kolyma River, Chukotka, North America	Not described	Compared with other forms, the coloration is more monochromatic, with prevailing rufous-brown tints on dorsal side. No dorsal stripe. Differs from all other forms by yellow-ochre ventral side.

* – *L. b. ognevi* Vinogr., 1933 is known by a single subadult specimen, captured at the south of Verkhoyanski Range and initially described as subspecies of *L. amurensis*. In my view, the taxonomic position of this form can be clarified only after obtaining additional material from that region.

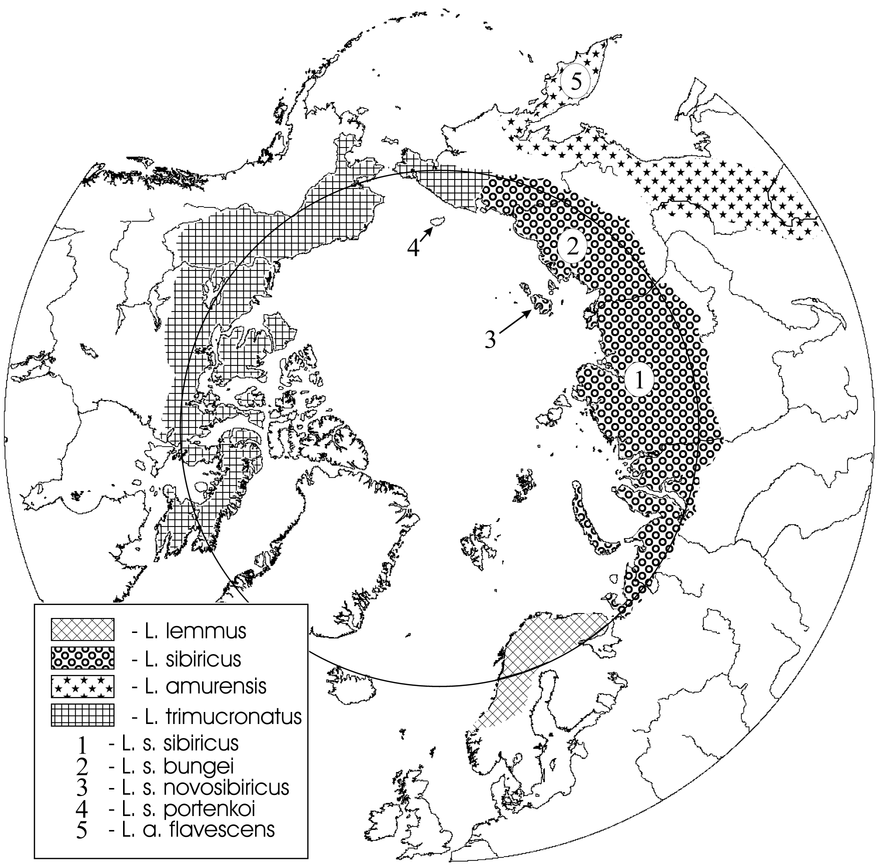

Figure 1. Range of genus *Lemmus*.

Taxonomy of *Dicrostonyx* genus: brief history and current state of the issue

Research of the taxonomy of collared lemmings followed the same logic as that for true lemmings in respect to there being three stages distinguishable, on the basis of the methods applied. An important difference is found in the contrasting lack of similarity between the two genera, both in the speed of evolution of the chewing surface of the molars and in the karyotype. While in true lemmings the pattern of the molar chewing surface is astonishingly stable both in space and time, in collared lemmings this character evolved at the highest rate among the Arvicolinae. True lemmings have a stable karyotype throughout their circumpolar range, the only difference between Eurasian and North American populations is the number of chromosome arms ($2n$ = 50, NF = 50 and 52, respectively). In contrast, collared lemmings are unusually polymorphic in respect to their chromosomes (Gileva 1983). This leads to a wider variation in the number of species distinguished within the genus, from 1 to 11. External characteristics and fur coloration are subject to pronounced seasonal and age changes in collared lemmings. Seasonal dimorphism of collared lemmings is well known as they acquire white fur colour in winter and enlarged and split third and fourth claws on the hind legs, which is reflected in the Russian species name, literally translated as “hoofed” lemming. The English name, collared lemming, originated from the presence in summer of a distinct collar. However, there is less variability in fur colouration geographically than seasonally, and collared lemmings from different areas of the circumpolar range are so close phenotypically that generally only one holarctic species has been distinguished within the genus, *D. torquatus* Pallas, 1778 (Ognev 1948, Corbet 1978), or one species for the Palearctic (*D. torquatus)* and another for the Nearctic (*D. groenlandicus* Traill, 1823) (Hall 1981). *D. hudsonius* Pallas, 1778, described from the Ungava Peninsula (north-east Canada) is often considered as a separate species, and it differs from other recent forms in having a primitive molar pattern, which is similar to that of the extinct *D. simplicior* from the mid Pleistocene.

Cytogenetic and hybridisation experiments indicate that *D. torquatus* is a holarctic superspecies, while the rank of the most cytologically-studied subspecies in the Nearctic was subsequently raised to species level (Corbet & Hill 1991, Musser & Carleton 1993). Cytogenetic and hybridisation studies of Palearctic collared lemmings gave unexpected results. Collared lemmings from Wrangel Island turned out to be karyologically very different from lemmings of continental populations, and attempts at hybridization always led to resorbtion of embryos (Chernyavski & Kozlovski 1980). This research allowed the distinction of lemmings from Wrangel Island as a separate species, Vinogradov’s Lemming *D. vinogradovi* Ognev, 1948.

Table 2. Principal current views on the composition of the genus *Dicrostonyx*.

Musser & Carleton (1993)	**Jarell & Fredga (1993)**	**Fedorov (1998)**
D. hudsonius Pallas, 1778 **Ungava Lemming** Labrador and north Quebec, Canada	*D. hudsonius* Pallas, 1778 **Ungava Lemming** Labrador and north Quebec, Canada	*D. hudsonius* Pallas, 1778 **Ungava Lemming** Labrador and north Quebec, Canada
D. groenlandicus Traill, 1823 **Greenland Lemming** North Greenland, St. Elizabeth Island, north-east Canada. Range borders undefined	*D. groenlandicus* Traill, 1823 **Greenland Lemming** North America, Bering Sea islands, Wrangel Island	*D. groenlandicus* Traill, 1823 **Greenland Lemming** Bering Sea islands, Wrangel Island, North Greenland, St. Elizabeth Island, north-east Canada
D. torquatus Pallas, 1778 **Collared Lemming** Arctic Eurasian tundra from eastern coast of the White Sea to Chukotsky Peninsula, Kamchatka, incl. Novaya Zemlya, Severnaya Zemlya and Newsiberian Island	*D. torquatus* Pallas, 1778 **Collared Lemming** Mainland tundra of Siberia	*D. torquatus* Pallas, 1778 **Collared Lemming** Mainland tundra of Siberia
D. richardsoni Merriam, 1900 Western coast of the Hudson Bay, Mackenzie River area, Canada		*D. richardsoni* Merriam, 1900 Western coast of the Hudson Bay, Mackenzie River area, Canada
D. exsul Allen, 1919 St. Lawrence Island		
D. kilangmiutak Anderson & Rand, 1945 Victoria and Banks Islands, adjacent mainland tundra of Canadian coast		
D. nelsoni Merriam, 1900 Western Alaska		
D. nunatakensis Youngman, 1967 Yukon, Canada		
D. rubricatus Richardson, 1889 Northern Alaska		
D. unalascensis Merriam, 1900 Aleutian Islands		
D. vinogradovi Ognev, 1948 **Vinogradov's Lemming** Wrangel Island		

It is noteworthy, that unlike the situation with true lemmings on the island, karyotype structure of *D. vinogradovi* is similar to that of collared lemmings from Alaska, and their hybridization, as believed by Jarrell & Fredga (1993), is likely to result in fertile hybrids. The latter authors consider *D. vinogradovi* along with other Nearctic forms as a subspecies of *D. groenlandicus* based on karyological data.

Additional cytogenetic studies of collared lemmings from new localities within the Palearctic range of the genus and analysis of mtDNA variability carried out in recent years showed the existence of four chromosomal races and five phylogeographic groups (Fredga et al. 1999). However, these findings did not stimulate alterations to the generic taxonomy. Similar studies of mtDNA of collared lemmings from the Nearctic support the distinction of three species: *D. groenlandicus, D. hudsonius* and *D. richardsoni* (Fedorov 1998), while mtDNA variability in *D. groenlandicus* indicated the presence of two phylogeographic groups with an approximate separation along the Mackenzie River (Ehrich et al. 2000). Current views of different researchers on the composition of the genus *Dicrostonyx* are provided in Table 2, with ranges shown in Fig. 2.

To conclude the review I would like to stress that unsolved issues are more numerous in the taxonomy of the *Dicrostonyx* genus compared with *Lemmus*. Karyotypes of collared lemmings from Kamchatka, Severnaya Zemlya, Newsiberian Islands and Novaya Zemlya are not known. At the current time variability of craniological characteristics have not been analysed for samples from the major part of the Palearctic generic range. Data on the number of subspecies are very controversial. An adequate taxonomic revision requires analysis of relationships between morphological variability, chromosomal races and phylogeographic groups, and whenever possible to collate these with well-traced paleontological history of the genus. This is the intended aim of further research.

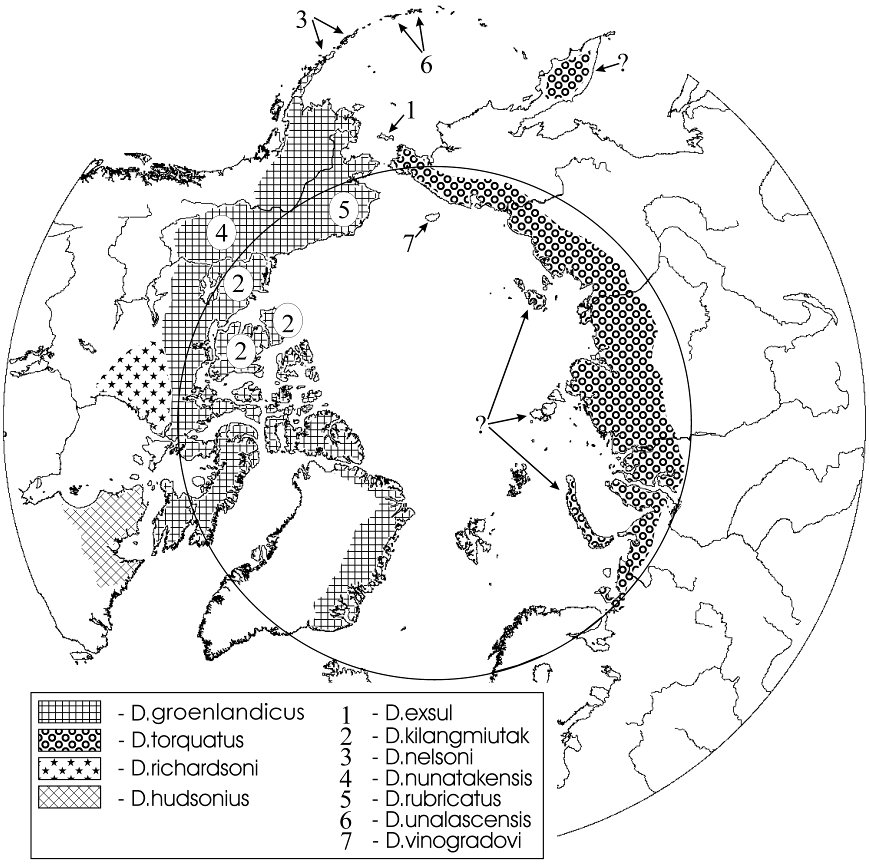

Figure 2. Range of genus *Dicrostonyx*. Numbers denote species following Musser and Carleton (1993), as in table 2 in the text. Question marks indicate areas from which collared lemmings were not studied caryologically, and hence have unclear taxonomic status.

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INDICATIONS OF YEAR 2000 ARCTIC BREEDING SUCCESS BASED ON THE PERCENTAGE OF FIRST YEAR BIRDS IN AUSTRALIA IN THE 2000/01 AUSTRAL SUMMER.

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The Victorian Wader Study Group and the Australasian Wader Studies Group have been attempting over the last 20 years to monitor the annual breeding success of migratory waders by measuring, in each austral summer, the proportion of juvenile/first year birds in the wader populations in south-east Australia (SEA) and north-west Australia (NWA) respectively. The results for the last year (i.e., estimated 1999 breeding success) were published in Issue Number 2 of the Arctic Birds Newsletter in April 2000.

The attached tables (Tables 1 & 2) show the results for the Arctic breeding year 2000 as measured during the 2000/01 austral summer. The figures for the previous year are also shown for comparison. Note that the number of catches which make up each species' total are also included, giving some indication of the spread of the sampling.

Overall the proportion of first year birds in wader populations in both SEA and NWA was lower in the 2000/01 austral summer than in the 1999/2000 summer. Specifically, for species where comparisons between the two years can be made, six out of eight species in SEA appeared to fare worse and five out of six species in NWA.

Based on the broad criteria given in the previous report Sanderling, Bar-tailed Godwit (Alaskan breeding population), Great Knot (but note small sample size), Curlew Sandpiper and Ruddy Turnstone which visit SEA had a poor (0-10% juveniles) breeding season in 2000. Red-necked Stint and Sharp-tailed Sandpiper appear to have had rather better, but still only moderate, breeding success with only Red Knot performing well (52% first year birds, i.e. exceptionally well). Although the Red Knot figure was based on just a single catch it was made at a principal site for this species without "twinkling" (which can cause the more experienced adults to leave the area) and significant numbers of other medium/large size waders were also present, all of which had low proportions of first year birds.

In NW Australia catches the percentage of first year birds was generally a little higher than in SE Australia. Bar-tailed Godwit (North Siberian breeding population) still fall in the "poor" category, as did Terek Sandpiper, Red Knot and Oriental Pratincole. The Red Knots in NW Australia are thought to be from the New Siberian Islands whereas those occurring in SE Australia come from further east (Chukotka) so it is not impossible that the two populations could have had markedly different breeding outcomes in 2000. Most other species were in the moderate (11-20%) range – Curlew Sandpiper, Red-necked Stint (at 15%, very close to the 14% in SEA), Grey-tailed Tattler and Great Knot. It was particularly good to see that Great Knot, in their prime non-breeding area, seem to have a reasonable proportion (18%) of young given that they have had several bad breeding years recently (only 4.4% the previous year). As in 1999, Greater Sand Plover – breeding much further south of course – appear to have had good breeding success.

The reader is referred to the earlier note on this subject (in Arctic Birds Newsletter No. 2) for potential biases and inaccuracies in this data and precautions taken to minimise these. But overall the figures are considered to be a reasonable indication of breeding success – especially when a number of different independent catches have contributed to the total – and certainly year on year comparisons are a fair measure of annual variations.

The Red-necked Stint situation is now at a particularly interesting stage. Instead of the "traditional" good, bad, moderate three year cycle they have had good, good, moderate breeding success over the last three years. The net result is that populations in the non-breeding season in Australia in the last two years have been at very high levels – record levels at some locations. This has, inter alia, caused a significant numbers of birds to occupy habitats (such as ocean shores) where they are normally absent or only present in very small numbers. One would expect a correction in numbers in due course – what are the odds on a poor-breeding season in 2001? It will be fascinating to see what happens to this species in the next two or three years (when of course large numbers of first time breeders will also be returning to the Arctic to contribute).

Table 1. Proportion of first year birds in wader catches in SE Australia in 2000/2001 compared with 1999/2000.

Species	**2000/2001 Dec. to 10th March**			**1999/2000 mid Nov. to mid March**
	Total birds caught (catches)	Number of first year birds	% first year	% first year
Red-necked Stint	5815 (25)	790	14.0	25.0
Curlew Sandpiper	381 (13)	26	6.8	23.0
Sanderling	243 (2)	7	2.9	13.0
Ruddy Turnstone*	181 (6)	19	10.0	21.0
Red Knot	119 (1)	62	52.0	38.0
Bar-tailed Godwit	83 (1)	3	3.6	19.0
Sharp-tailed Sandpiper	32 (7)	5	16.0	10.0
Great Knot	27 (1)	1	3.7	7.5

* The Ruddy Turnstone figures exclude a catch of 42 juveniles in a total of 98 birds caught on 11th December because the sample contained many juveniles still on migration (fat), (one subsequently recovered in New Zealand later the same month. The figures would be 250 (6), 57, 23% if this catch was included).

Table 2. Proportion of first year birds in wader catches in NW Australia in 2000/2001 compared with 1999/2000.

Species	**2000/2001 Nov. to 10th March**			**1999/2000 Nov. to March**
	Total birds caught (catches)	Number of first year birds	% first year	% first year
Great Knot	645 (14)	116	18.0	4.4
Bar-tailed Godwit	330 (11)	16	4.8	7.7
Grey-tailed Tattler	276 (9)	46	17.0	
Red-necked Stint	113 (6)	17	15.0	46.0
Curlew Sandpiper	112 (14)	12	11.0	24.0
Red Knot	73 (10)	7	9.6	15.0
Terek Sandpiper	176 (9)	15	8.5	
Oriental Pratincole	47 (3)	3	6.4	
Greater Sand Plover	212 (11)	47	22.0	33.0

INFORMATION

THE PAN-ARCTIC SHOREBIRD RESEARCH NETWORK (PASRN)

This international network is made up of scientists, individuals and/or scientific programs that are, or have been for several years, involved in the research or monitoring of one or more Arctic shorebird species. We are particularly interested in including researchers (or programs) with current or planned long-term studies which collect data that can be used in future collaborative studies on the effects of global climate change (GCC) on population dynamics, distribution, breeding phenology, or other aspects of shorebird ecology. We also welcome persons with expertise in GCC effects on, or long-term monitoring of, terrestrial animals.

Background for this list:

In 1999, a project "Long-term Pan-Arctic Shorebird Monitoring Program: Synthesis and Workshop" planned by E. Pierce (Norwegian Polar Inst.) and D. Schamel (Univ. of Alaska, Fairbanks) proposed to initiate work to

◊ establish an internationally coordinated, long-term pan-Arctic monitoring program for Arctic shorebirds, which will collect data on population and breeding biology variables and relate these to trends in climatic, entomological, and hydrological variables. The program would have a uniform research design and methods, designated study sites, and one or more designated responsible scientists for each Arctic area (country) represented;

◊ through international researcher collaboration, investigate effects of global climate change on Arctic shorebird reproductive ecology, population dynamics, and distribution; and

◊ to organize an international workshop for a small group of invited researchers and experts.

At the CAFF/AMAP Workshop on a Circumpolar Biodiversity Monitoring Program (ReykjavÌk, Feb. 2000), potential biotic elements of a monitoring network were discussed. The workshop agreed to focus initially on creating voluntary networks of experts dealing with a number of key species/elements, among those, Arctic shorebird species. Hans Meltofte (National Environmental Research Institute, Denmark) was asked by CAFF to establish and coordinate this species group in collaboration with E. Pierce.

By establishing such a network, we hope to:

◊ investigate the possibilities of synthesizing data collected on shorebirds during past and present long-term studies conducted by various researchers throughout the Arctic, attempt to relate these data to global climate changes, and collectively publish the results internationally;

◊ design and implement a common, long-term, pan-Arctic shorebird monitoring program to collect data on population and breeding biology variables and relate these to trends in climatic, entomological, and hydrological variables. The program should have a uniform research design and methods, and one or more designated responsible scientists for each Arctic area (country) represented;

◊ define common future priorities in terms of research and publishing results, and investigate possibilities for international collaborative grant proposals for project funding;

◊ establish strong international collaboration between scientists from institutions world-wide who conduct, or plan to conduct, research on breeding arctic shorebirds, by creating a project web site and subscriber e-mail bulletin; and

◊ organise at least one international research workshop.

The "PASRN" list is currently an announcement list/ newsletter, *not a discussion group*. Only the owners can post to the list, as a tool to broadcast information to interested Arctic shorebird researchers. *Messages from subscribers are very welcome*, but will go through the owner(s).

If you are currently involved in the type work outlined above and would like to join, send a blank E-mail to: PASRN-subscribe@igc.topica.com New subscriptions to the "PASRN" require the owner's approval.

To read about this list on the web, visit the following web-site: http://igc.topica.com/lists/PASRN

If you have any questions about (or problems accessing) the list, you can contact the list owner at elin.pierce@npolar.no, for instructions and a user's manual.

With best wishes for fruitful collaboration,

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NWT/NUNAVUT BIRD CHECKLIST SURVEY

Vicky Johnston

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The Northwest Territories/Nunavut Bird Checklist Survey was initiated by the Canadian Wildlife Service as a standardised, volunteer-based, monitoring program to gather data on bird distribution, abundance and breeding status. Checklist surveys are recommended for remote areas where it might not be feasible to organise more standardised surveys. The Survey is supported by the International Wader Study Group as a means of getting more information on arctic shorebird populations. The design of NWT/Nunavut Survey follows the guidelines recommended by the Canadian Landbird Monitoring Strategy.

The main goal of most monitoring programs is to detect population trends. However, in NWT/Nunavut the lack of information on birds means that any information on species diversity, ranges, timing of migration etc. is useful. Currently, the NWT/Nunavut Checklist Survey is the only standardised, annual survey for birds in the territories. For many parts of the NWT/Nunavut it provides the only source of information on birds that has been obtained from a personal visit to the area in question.

In the first years of the NWT/Nunavut Survey coordinators contacted individual members of the public, government employees, tourism operators and researchers to determine their interest in participating. Other participants have been recruited over the years through telephone surveys, word of mouth and by marketing with partner organisations and on the Survey website. Potential participants can join through the website (http://www.pnr-rpn.ec.gc.ca/checklist) or by contacting the CWS office. All participants receive feedback through the website and an annual newsletter. Since 1996, historical data from selected ornithological studies dating back to 1970 have been added to the database as time and money permitted.

ARCTIC SHOREBIRD MONITORING PROGRAM

Vicky Johnston

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We are concerned about the populations of shorebirds that breed in the North American Arctic. Recently, studies that count these birds on their migration routes have found that numbers of most species are declining. No one is sure why this is happening, though some possible causes are loss of habitat in countries where the birds spend the winter, human developments at their migration stopping points, climate change, and toxic substances on their wintering grounds.

Our knowledge of the size of shorebird populations is not very good, and some of the species that breed in the Arctic are difficult to monitor on their migration routes. We want to monitor the birds on their breeding grounds because we will get better estimates of their true population sizes. American and Canadian biologists are developing a method to monitor the population size of shorebird species that breed in the Arctic. We want to use this method to keep track of shorebird populations over the years. We can use this information to detect problems with the shorebird populations, and then to try to figure out what is causing the problem.

American biologists have designed a method that works well on the North Slope of Alaska, and in the summers of 2001 and 2002 we will test it in the Canadian Arctic, before beginning the monitoring program in 2003.

RECOMMENDED READIND ON ARCTIC BIRDS:

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**(3): 289-305.

MAP COLLECTION

A set of 4 maps below is provided to highlight various aspects of bird breeding conditions in the Arctic in 2000.

Each of the figures 1 and 2 represent overlay of the map layers reflecting two different kinds of information. The first one is the deviation of mean June/July temperature in 2000 from mean June/July temperature averaged for the period 1994-2000. This deviation indicates whether respective month in 2000 was warmer (positive value) or colder (negative value) than average. Colour of the points at study sites reflects subjective evaluation by respondents of the spring as being early, average, or late (Fig. 1), and the summer as warm, average or cold (Fig. 2). Please note, that also referring to roughly 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. 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 overlay of Arctic boundaries, as defined by CAFF and AMAP, plus 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 qualified 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 compilers.

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

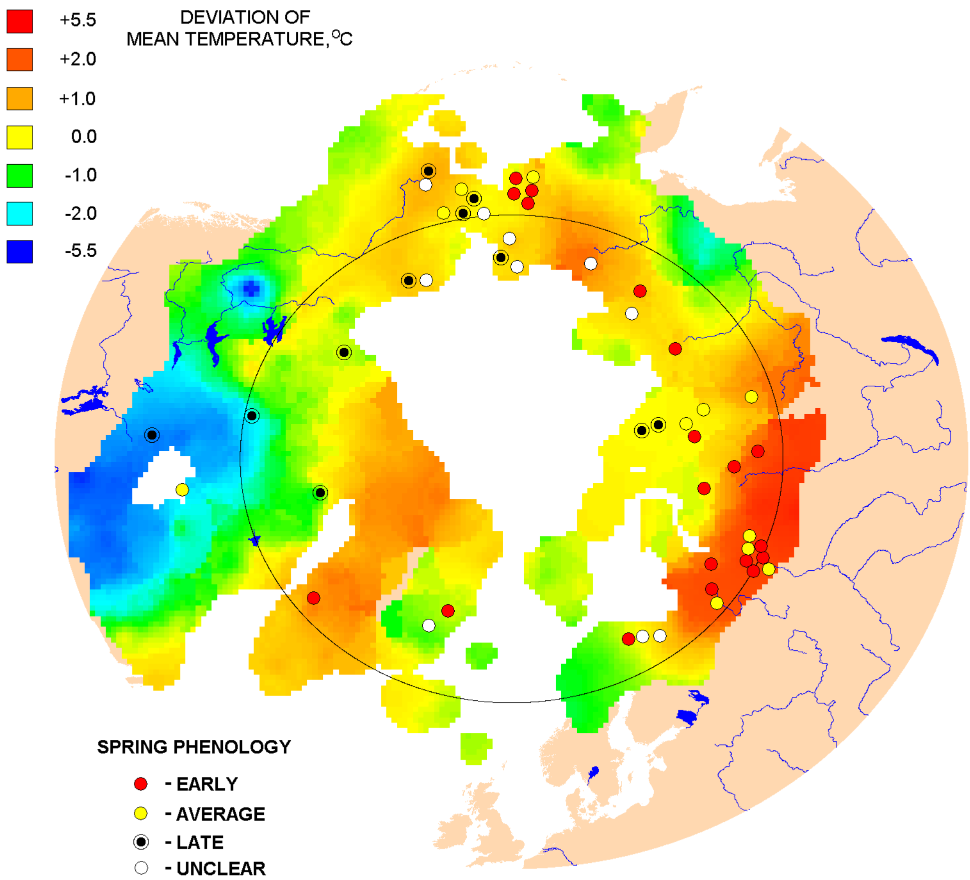

Figure 1. Temperature and phenological characteristics of early summer in the Arctic in 2000. See text above for legend.

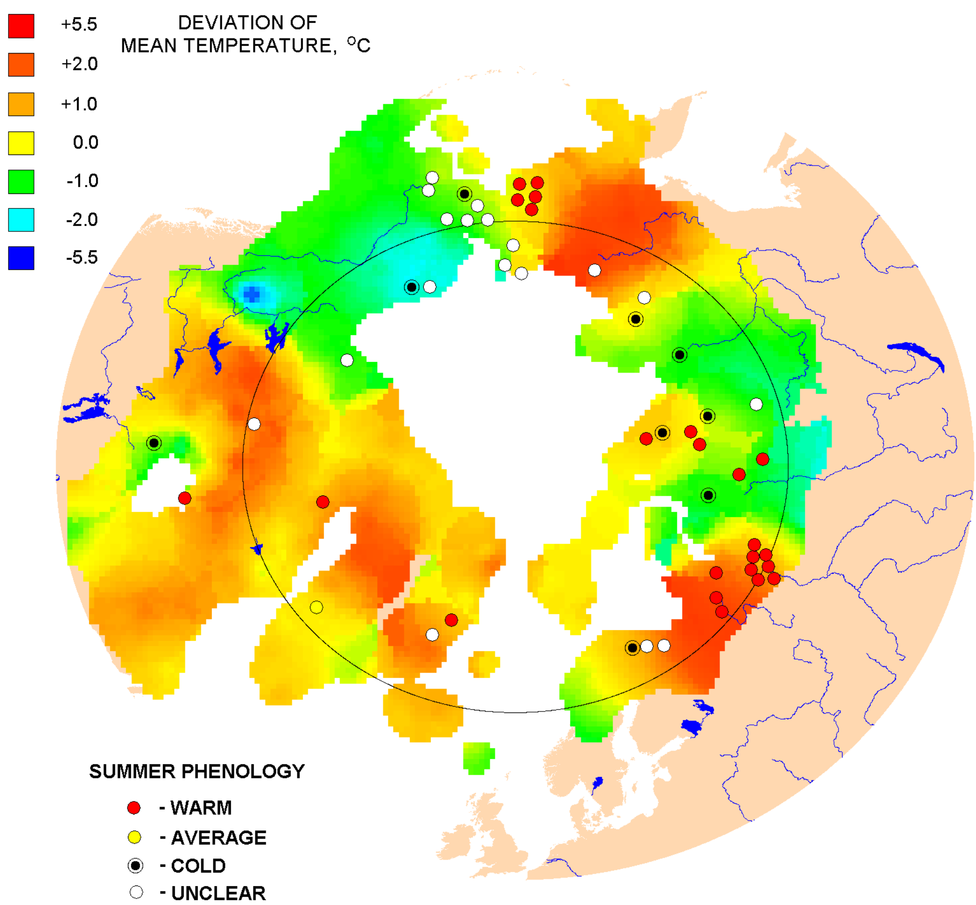

Figure 2. Temperature and phenological characteristics of mid summer in the Arctic in 2000. See text above for legend.

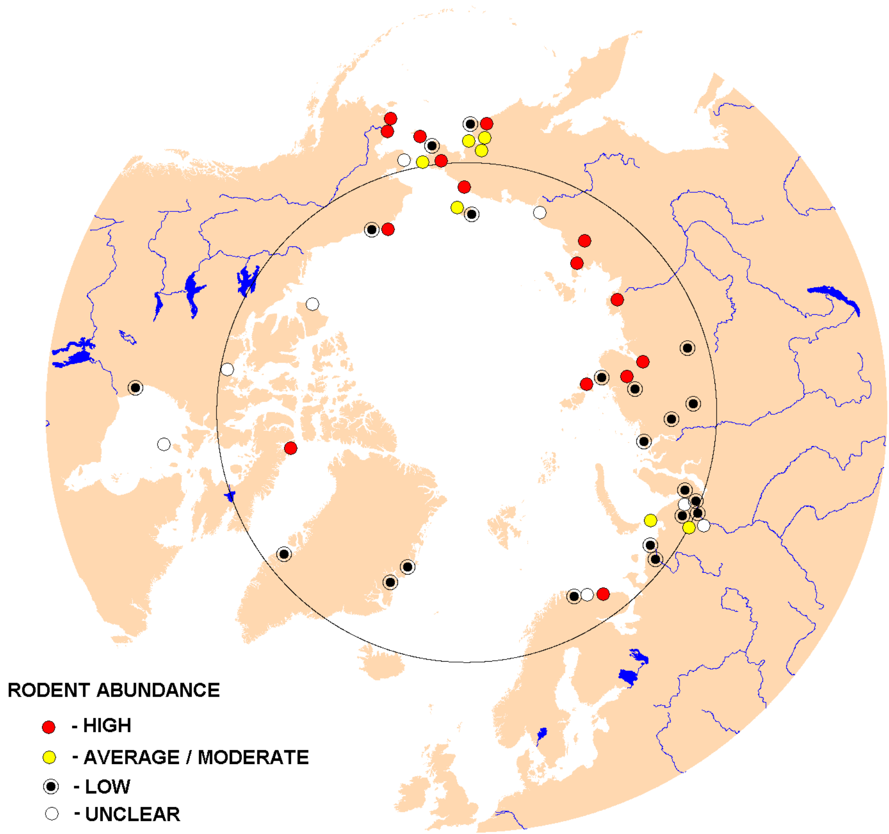

Figure 3. Rodent abundance in the Arctic in 2000.

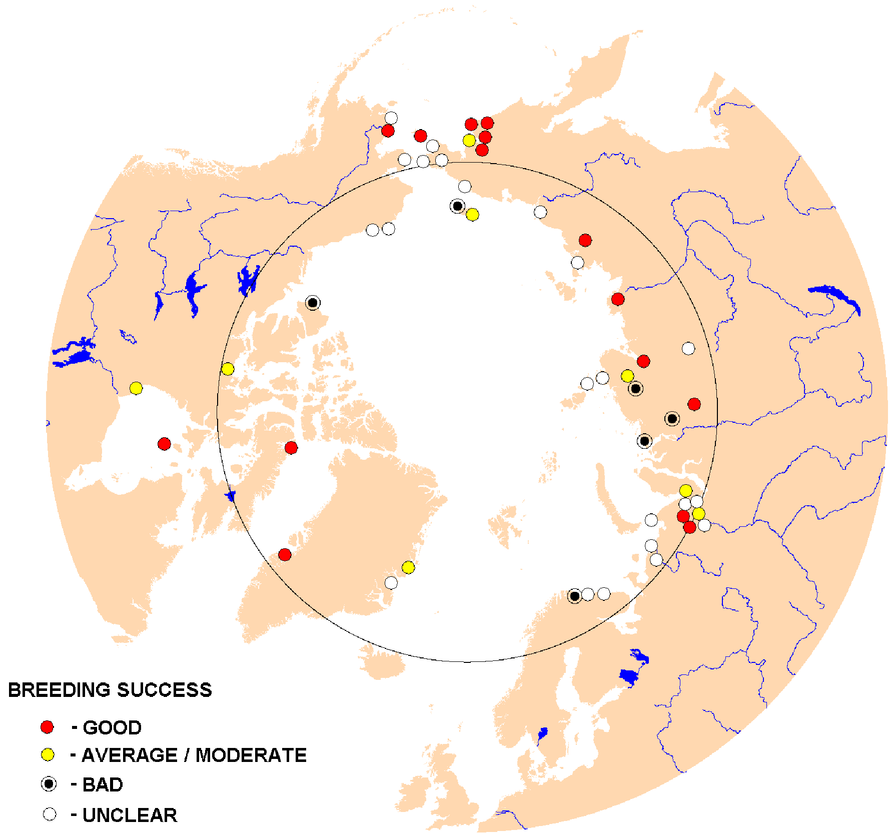

Figure 4. Bird breeding success in the Arctic in 2000.