ARCTIC BIRDS

Newsletter of International Breeding Conditions Survey

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

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compiled by Mikhail Soloviev and Pavel Tomkovich

A WORD FROM THE COMPILERS

Breeding conditions for birds in the Arctic during summer 2001 are the focus of this issue of the annual newsletter of the International Arctic Birds Breeding Conditions Survey (ABBCS). Since publication of the previous issue of the newsletter we were not aiming to introduce conceptual improvements in the current survey setup or newsletter design, but rather concentrated on developing the reporting network. There was an increase in the total number of localities from which data became available in 2001 compared with 2000 (68 versus 51). In particular, better coverage was achieved for Alaska and such regions of Russia as the Kola Peninsula. No reports on breeding conditions in Fennoscandia were available. This is particularly unfortunate as there were rumours from various sources about increasing numbers of lemmings or even local peaks in northern Sweden and Norway in 2001, and some people even considered that it was an unprecedented phenomenon in the last 20 years. We very much hope that the situation in Fennoscandia in 2000-2001 will receive an appropriate reflection (perhaps, with some analysis) in the next newsletter.

Currently, much of the speculation about the breeding performance of various arctic bird populations is based on relating nest success to 3-year lemming cycles. However, the cycle period of various lemming populations often differs from three years, a phenomenon which, so far, has attracted insufficient attention from ornithologists. The papers by I.Travina and B.Sittler & T.Berg in this newsletter start a series of reviews of long-term rodent dynamics in different regions of the Arctic. The publication of 4 papers on rodent biology and count techniques in three previous newsletter issues could have made readers suspect that the "Arctic Birds" survey is gradually evolving into an "Arctic Birds and Rodents" one! Still, we believe that understanding regional fluctuations in one of the principal factors influencing bird breeding performance may be instrumental for drawing appropriate conclusions about bird adaptations to the environment. We seek contacts with researchers ready to make similar reviews for other Arctic regions for the 5th issue of the newsletter.

The linking of breeding success on the tundra with the proportion of juveniles on the wintering grounds, traditionally provided by Australian ornithologists for the East Asian-Austral asian flyway, has been expanded with information from the Middle East (Israel). Unlike stop-over sites and wintering grounds along the Atlantic coasts of Europe, this portion of the West Asia - African Flyway received little attention previously in respect of the annual variations in proportions of juvenile waders. We also hope that enthusiasts from the Wash Wader Ringing Group and other active bird ringing groups will contribute their data to increase the understanding of breeding success in the Arctic regions.

After four years of the survey's implementation at an international scale, we feel that the initial goal of establishing easily available and regularly updated source of information on bird breeding conditions in the Arctic generally has been achieved and new more specific goals need to be proposed. In the next few years, we plan to concentrate effort on collating data for the 15-year period, 1989-2003, with a view to reporting the results of analyses of available information on patterns in bird breeding conditions and performance in the main regions of the Arctic in a special publication, scheduled for 2005. Details of this project are yet to be worked out, but we hope that this first notification about immediate priorities will help potential contributors to get a clearer impression of the importance of their input and so stimulate further co-operation.

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For last-breaking information about the survey visit the website

http://www.arcticbirds.ru

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

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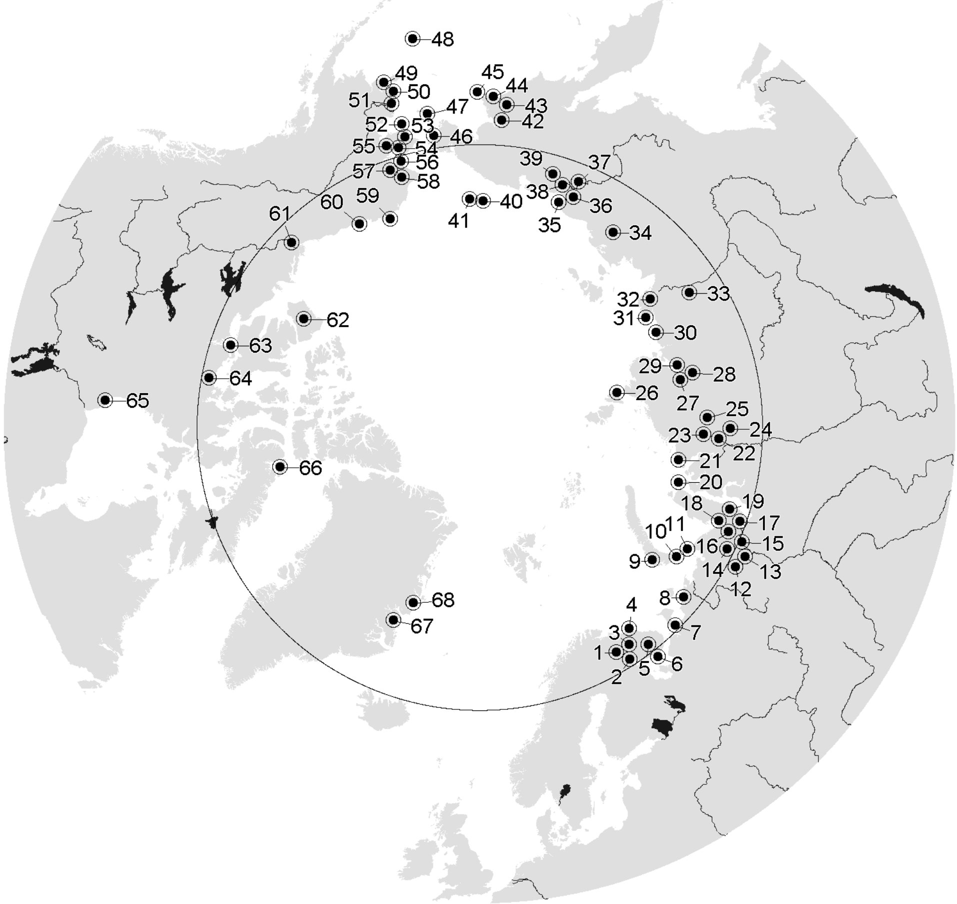

Figure. Arctic localities from which reports about bird breeding conditions became available

LOCALITY REPORTS

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

Little snow accumulated during the winter. Spring was relatively early (snow cover was reduced to 50% by 10 May in forested valleys and by 18 May in alpine tundra, above 240 m a.s.l.) with Whimbrel *Numenius phaeopus*, Eurasian Golden Plover *Pluvialis apricaria*, Meadow Pipit *Anthus pratensis* and Northern Wheatear *Oenanthe oenanthe* recorded in the mountains on 15 May. However, cold weather returned from 26 May, resulting in the appearance of fresh snow cover (lasting until 1 June) and average dates of phenological events. Summer was warm and dry.

Lemmings were not recorded. Small numbers of voles, which are supposed to peak in 2002.

Numbers of blood-sucking insects were the lowest in 26 years of observations, but this had no apparent impact on birds. Among avian predators Northern Goshawks *Accipiter gentilis* and Rough-legged Buzzards *Buteo lagopus* nested (the latter in small numbers), while Gyrfalcons *Falco rusticolus* and Northern hawk-owl *Surnia ulula* did not. The latter species has not breed since 1988, irrespective of vole numbers. We observed an invasion of crossbills, Waxwings *Bombycilla garrulus* and Great Spotted Woodpeckers *Picoides major* (White-winged Crossbill *Loxia leucoptera* started nesting in March). Numbers of Red Squirrels *Sciurus vulgaris*, Mountain Hares *Lepus timidus* and mustelids increased, and one brood of Wolves *Canis lupus* was found. Good yields of berries from dwarf shrubs and of spruce seed were recorded. All groups of birds had high reproductive success due to warm and dry weather in summer. This conclusion is also supported by results of counts of broods of boreal waterfowl and grouse.

A.S.Gilayzov

2. North-west of Kandalaksha Bay, White Sea, Russia (67°09'N; 32°20'E)

Dogs and Mink *Mustela vison* are common predators in the area.

Y.V.Krasnov

3. Khibiny Mountains, central Kola Peninsula, Russia (67°42'N, 33°40'E)

It was an early spring. June was warm and dry, with cooling at the end of the month, when maximum air temperatures ranged from +9.5°C to +14°C and the minimum temperature dropped to +2.5°C on 28 June. Many small streams and marshes dried up. The first three weeks of July were warm, with maximum temperatures +11-24°C and minimum temperature not dropping below +6.0°C (7 July). Heavy rain occurred on 2 and 3 July, and light showers occurred periodically during the rest of the month. Light winds predominated during the period of studies. Thus, weather conditions were favourable for birds in 2001.

Rodents were not recorded in the period from 25 June to 20 July.

In the study area with subalpine heath tundra birds are heavily affected by human activities, such as moving vehicles, tourist groups, recreation. Thus, some suitable nesting habitats were not used by birds, as they had to move into areas with less disturbance. Terrestrial predators are represented by wandering dogs, but they stay in the vicinity of settlements, and only occasionally destroy bird nests there.

V.D.Kokhanov

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

Lemmings, voles or signs of their activity were not recorded. Rough-legged Buzzards were not seen. Numbers of Common Eiders *Somateria mollissima* and their broods were similar to those in 1999-2000, while mean brood size decreased in 2001 (1.8) compared with 1999 (2.1) and 2000 (2.3). Reproduction of seabirds in a large, local colony was successful.

Y.I.Goryaev

5. Ponoi River middle reaches area, east-central Kola Peninsula, Russia (66°55'-67°30'N, 37°00'-38°55'E)

According to reports from local people, little snow accumulated during the winter. Spring was relatively cool, but with frequent periods of warm weather. There was little flooding due to the small amount of snow and the prolonged thaw. By the beginning of surveys on 8 June, rivers were already contained in their principal river-channels, and water was retreating rapidly. June was warm and relatively dry with mean air temperatures by day occasionally dropping to +2-+5°C, but not below freezing point. Temperatures and amount of precipitation were normal for the area in July. No events with an apparent negative impact on bird numbers and reproductive success were recorded.

No microtine rodents were recorded in this subarctic area with tundra, forest-tundra and extensive bogs.

Broad-billed Sandpiper *Limicola falcinellus* is rather common in the Ponoi depression, and a nest with 3 eggs was found on 17 June. The depression also supports a nesting population of White-tailed Eagle *Haliaeetus albicilla* of about 15 pairs (11 active nests were found). Weather was favourable during the breeding season, and predation pressure was unlikely to significantly affect breeding success.

S.A.Dyluk, Y.L.Gurkina

6. Chavanga settlement, Tersky Coast, south-eastern Kola Peninsula, Russia (66°01'-66°21'N; 37°35'-38°45'E)

According to reports from local people, a rise of temperature in late April and early May resulted in snowmelt, but June was cold. Due to early snowmelt in spring, the water level in inland water bodies was low, substantially lower than in 2000. July and August were warm, with few rainy days. Numbers and species diversity of gulls and waders feeding on the shore increased after a storm at sea at the end of July.

Numbers of rodents decreased in comparison with 2000, and they were almost absent. Common *Microtus arvalis* and Short-tailed voles *M. agrestis* were found in catches, other species of small rodents were identified from skulls in Snowy Owls' *Nyctea scandiaca* pellets (including pellets from 2000). Few tracks of Muskrat *Ondatra zibethicus* were seen.

Mammalian predators are rare in the area, and low numbers of rodents were unlikely to results in increased pressure of the former on nesting birds. Low abundance of rodents resulted in decreased numbers of birds of prey, owls and skuas, including even Merlin *Falco columbarius*, a species not specialising on rodents. The low water table could have caused a decrease in numbers of breeding ducks, but this could not be confirmed by comparison with other years' data. However, numbers of moulting Whooper Swans *Cygnus cygnus* notably decreased on the lakes. Breeding success for other birds was, probably, high, also due to low numbers of avian predators.

P.V.Kvartalnov, J.A.Ernandes Blanko, A.A.Fabrichnova, N.V.Grechanaya, E.M.Litvinova, N.V.Rogova, A.A.Tupikin

7. Yazhma River, south-western Kanin Peninsula, Russia (66°55'N, 44°31'E)

Spring was unusually early and warm. Ice broke on 29 April on the Mezen River. On 20-24 and 29 snowfalls occurred, but temperatures mainly did not fall below zero. There were no catastrophic returns of cold, and summer (to mid July) was without prolonged rains or rapid temperature declines.

Lemmings, voles and mammalian predators were present in small numbers. Low numbers of mammalian predators are probably typical for this area.

About 50,000 Brent Geese *Branta bernicla* were counted on migration along the coast from 18 May - 4 June. 18 broods of Bean Geese *Anser fabalis* were seen, as well as one nest and one brood of Whooper Swan.

Reproduction of ground-nesting birds was favoured by both weather conditions and low numbers of mammalian predators. Poaching and disturbance by fishermen and hunters are the most important negative factors affecting breeding waterfowl.

K.E.Litvin, E.N.Gurtovaya

8. Velt River, Malozemelskaya tundra, Russia (68°00'N, 50°12'E)

Weather was warm and sunny from 1-10 June. Snow melted on the plains by 31 May - 2 June, and in the valleys by 10 June. Ice was already absent from the river by 5 June. Summer was cold with frequent strong winds, and rain on average twice a week. Flowering of cloudberries was delayed by two weeks and their berries ripened in small numbers only in mid August. Most of the days were cloudy. Average air temperature was +3-5°C and ground frosts were recorded. In August fog, wind and rain alternated with sunny weather.

Reproduction of Arctic Foxes *Alopex lagopus* was poor due to the absence of lemmings. Most of the inspected dens were uninhabited, and only 2 and 3 pups were present in two dens that were checked in August. Wolves were abundant. Rough-legged Buzzards nested on the river floodplain and on wet hill slopes, covered with dwarf birch. Geese and Whooper Swans had complete clutches of 4-6 eggs. Among ducks only Pintail *Anas acuta* was, probably, successful, while broods of diving ducks were seen rarely. Broods of Red-breasted Merganser *Mergus serrator* were numerous in the lower reaches of the Velt River and its tributaries. Herring Gulls *Larus argentatus* nested, but many clutches perished, and brood cannibalism was widespread. Nesting of Glaucous Gulls *Larus hyperboreus* was more successful, but their chicks hatched 1-2 weeks later than Herring Gulls. Some Arctic Terns *Sterna paradisaea* were still incubating on 1-5 August, although juveniles of most birds had already fledged by that time.

Reproductive success of waders can be evaluated as below average. Cold weather could have affected, to some degree, the reproductive success of passerines and some species of waders.

Y.N.Mineev, O.Y.Mineev

9. Gusinaya Zemlya Peninsula, western Yuzhny Island, Novaya Zemlya, Russia (71°58'N, 52°22'E)

Peak numbers of lemmings were recorded.

G.V.Khakhin

10. Islets near the extreme south of the Yuzhny Island, Novaya Zemlya, Russia (70°30'N, 56°40'E)

Spring phenology and summer weather generally did not differ from average. The temperature occasionally dropped to freezing point before July and storm-force winds were not rare, but almost no rain was recorded.

According to observations, from 20 June – 25 July the numbers of lemmings, Arctic Foxes and Snowy Owls were minimal (1, 3 and 1 seen, respectively). Rough-legged Buzzards were not seen. Two nests of Great Skua *Stercorarius skua* were found, on Bolshoy Pynin and Zhongolevich islets, but other species of skuas were rare and did not nest.

Common Eider clutches averaged 4.21 eggs (n=189), which is large compared with 3.8 in 1994 (n=389) and 3.5 in 1995 (n=68). The current number of breeding Eiders is very low compared with at least 8,000 females nesting on the extreme south of Novaya Zemlya in 1940-1944 (Demme-Ryabtsova 1952), when numbers of predators were under strict control and artificial shelters protecting Eiders from gulls were erected in the principal colonies. Waterfowl reproduction was delayed in 2001 due to the prolonged presence of pack ice near many islands, and first broods of Bean Geese and Common Eiders were seen on 14 and 22 July, respectively (10 days later compared with the 5-year average determined for Eiders by Demme-Ryabtsova 1952). Many nests of waterfowl and gulls were depredated, primarily by Polar Bears *Ursus maritimus*. Almost all successful nests of Common Eiders and Barnacle Geese *Branta leucopsis* were placed on rocks inaccessible to terrestrial predators. A substantial fraction of nests, on a few very small islands not visited by bears, was predated by gulls, primarily Glaucous.

Two wader nests that were found included one of Little Stint *Calidris minuta* and one of Turnstone *Arenaria interpres*. Colonies of Arctic Terns bred successfully on Zharkov, Gagachy, Severny Krasny and Pynin islets. Five nests of Red-breasted Mergansers were found in tern colonies, which provided the first evidence of the species breeding on Novaya Zemlya.

V.P.Dudin, V.N.Kalyakin

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

A cold spring with periods of cold weather and snowfalls prevented the majority of Barnacle Geese from nesting. Summer was hot and dry.

Based on observations in August, both lemmings and voles were common. Arctic Foxes were common and bred, while Snowy Owls were common non-breeders. Rough-legged Buzzards were abundant breeders.

M.V.Glazov

12. Polar Urals, Russia (65°44'N, 62°26'E)

Spring was slightly earlier than normal, summer moderately cold and rainy. Extreme weather events were not observed in the period of surveys between 9 and 25 July. Early and late July were rainy, and temperatures decreased after 20 July. Autumn was warm and prolonged. Weather conditions were normal for breeding of most bird species.

Combined abundance of all vole species was 10 animals/100 trap-nights. No lemmings and Arctic Foxes were recorded.

Numbers of birds of prey were relatively high (Rough-legged Buzzards, Hen Harrier *Circus cyaneus*, Merlin, European Hobby *Falco subbuteo*, Common Kestrel *F. tinnunculus*), but their impact on birds was, probably, moderate. Successful reproduction of passerines, Willow Grouse *Lagopus lagopus* and Rock Ptarmigan *L. mutus*, as well as ducks in the mountain foothills, was confirmed by observations of broods. Among passerines Meadow Pipit had the highest density in the area, while Willow *Phylloscopus trochilus* and Arctic *Ph. borealis* warblers, Redpoll, Bluethroat *Luscinia svecica*, Wheatear and Little Bunting *Emberiza pusilla* were common. Waders generally occur in low numbers in the area, only Common Sandpiper *Actitis hypoleucos* was seen often, near the river. Three pairs of Golden Plovers nested on the plot of 31.3 km^2. Wood Sandpiper *Tringa glareola*, Greenshank *Tringa nebularia*, Pintail *Gallinago stenura* and Common *G. gallinago* snipes and Whimbrel were seen occasionally, mostly on the western slope. A flock of Dotterels *Eudromius morinellus* was recorded.

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

See also: Golovatin, M.G. & Paskhalny, S.P. 2001. Notes on ornithological fauna of the southern Polar Urals. In: Ryabitsev, V.K. (ed.). Materials on bird distribution on the Urals, in Cis-Urals and Western Siberia. Ekaterinburg. P. 64-69. In Russian.

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

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

Snow accumulation was low, and it melted quickly and early (50% cover on 7 May). Ice-break was also slightly earlier than normal, and the water level in the Ob' River and in tundra lakes was lower than average. Greening of plants was very rapid.

Grey-sided Voles *Clethrionomys rufocannus* were recorded regularly, and *Microtus sp*. voles were seen near the hut. Lemmings and Arctic Fox are not typical inhabitants of the area and were not recorded.

Rapid snowmelt was favourable for the start of breeding by most species. However, low water levels in lakes and bogs may have adversely affected nesting of waterfowl on tundra lakes but, conversely, in the Ob' River floodplain this had a positive effect. Increased abundance of voles (compared with previous years) supported reproduction of mustelids and owls.

M.G.Golovatin

14. East of Bolshezemel'skaya tundra and Polar Urals, Russia (67°00-67°35'N, 64°00-65°15'E)

Snow accumulation was low during the winter, which resulted in the tundra surface becoming snow-free early, with snow remaining by June only under rocks, steep river banks and in ravines. Consequently, water levels rose little during the thaw and many rivers (in particular small ones) practically remained within their banks. Spring was early, but generally weather in June was cool, wet and cloudy. The total number of really warm days with day-time air temperatures over +15°C did not exceed 7 (in periods 8-10 and 14-17 June). Despite a cool June, plant vegetation and insect emergence took place 15-20 days earlier than normal. Strong, cold rain continued during half of a day on 20 June, but this did not adversely affect wader reproduction, as birds were still incubating at that time. July was in general quite cold and cloudy, with frequent rain, drizzle or fog, and day-time air temperatures usually not exceeding +16°C. However, a few days of hot and sunny weather with temperatures reaching +28°C by day, and +13-14°C at night, occurred from 12 to 17 July. Night frost occurred only on 21 July, when the temperature dropped to -4°C. Heavy rain started on 30 July and continued for 19 hours, which resulted in the river waters rising by 70-150 cm, the resulting flood level exceeding that observed in spring along mountain rivers. The first half of August was sunny, warm and quiet, with day-time temperatures up to +25-27°C.

Numbers of voles and, probably, lemmings were moderate in late winter and spring time, judging by the density of winter nests and nesting numbers of rodent-specialist predators. However, in late spring and early summer rodent numbers decreased, judging by a substantial decrease in the frequency of records of Narrow-skulled Voles *Microtus gregalis*. In late June and early July not a single vole was seen for several days. In the second half of July numbers of Narrow-skulled and Ruddy *Clethrionomys rutilus* voles and Siberian Lemmings *Lemmus sibiricus* began to increase quickly. The frequency of visual and acoustic records of rodents increased from July to August, including many juveniles. Some unconsumed bodies of rodents appeared in the nests of avian predators.

Numbers of mammalian predators were very low: no Arctic and Red foxes *Vulpes vulpes* were recorded, and all inspected dens of these species were uninhabited. Ermine *Mustela erminea* was seen once. Tracks of Brown Bears *Ursus arctos* (including fresh ones) were seen quite often in the mountains.

Owls were not found, while the nesting density of Long-tailed Skuas *Stercorarius longicaudus* was very low. In June many of the latter were wandering over the tundra in small flocks, which disappeared by July, and only breeding pairs remained, most being successful in raising chicks. Northern Harriers nested successfully at low density. Merlin and Peregrine*Falco peregrinus* Falcon had moderate nesting numbers for the area. Rough-legged Buzzards started to breed at moderate density, but clutch size was small, ranging from 1 to 5 eggs (mean 3.0, n=9). Chicks hatched in most nests, but many of the latter were deserted due to shortage of food in mid-summer, and chicks were eaten by siblings or adult birds. A few pairs that managed to maintain nests until mid July had successful reproduction, and later all chicks survived. Mean brood size was 2.0 (n=7).

Various birds arrived earlier than usual, and many species started to breed immediately. Consequently, hatching and fledging were earlier than in phenologically normal years. Hatching in most Ruff *Philomachus pugnax* and Common Snipe nests occurred in the early 20s of June, while chicks in the nests of Redwings *Turdus iliacus*, Little Buntings, and many pairs of Common Reed-Buntings *Emberiza schoeniclus* fledged around 25 June.

Among waders Golden Plover and Pintail Snipe, formerly common on tundra watersheds, occurred at very low density and were missing from large areas. Dotterel numbers were low in the mountain tundra of the Polar Urals. As usual, Ringed Plover *Charadrius hiaticula*, Terek Sandpiper *Xenus cinereus*, Temminck's Stint *Calidris temminckii*, Red-necked Phalarope *Phalaropus lobatus*, Common and Great snipes *Gallinago media*, and Jacksnipe *Lymnocryptes minimus* were common, while Whimbrel was rare. Common Sandpiper were at higher density than in most of the former study years, but Ruff and Wood Sandpiper were the most numerous. A substantial number of nests of the latter two species was found, and the survival of many nests could be determined. Despite apparently unfavourable weather conditions and high numbers of avian predators, in the context of low rodent abundance, nesting success in waders was high, with a single nest (Red-necked Phalarope) destroyed among 26 under surveillance. Based on numbers of broods and alarming adults, reproductive success is also evaluated as high in Ringed Plover, Terek Sandpiper, Red-necked Phalarope, Common Snipe and Wood Sandpiper. Reproductive success of Ruff was apparently moderate as the density of broods was notably lower than the number of birds recorded during incubation. Avian predators and cold rainy weather with heavy showers in June and July may have adversely affected Ruff productivity. Heavy rains in June coincided with hatching in most Ruff nests. In August juvenile Ruffs were very rare in comparison with juveniles of other waders.

V.V.Morozov

15. Labytnangi, lower Ob' River area, Russia (66°40'N, 66°30'E)

Ice broke on the Ob' River on 18-19 May, which is 11-12 days earlier than average and one day earlier than in 2000. The weather was unstable in May, with periods of cold weather alternating with warm ones. Average air temperature was close to normal for this month (-1.5°C). 1st and 12 May were rainy, and snowfalls were recorded up to 20 May. The weather changed quickly on 25 May, with the first thunderstorm and the start of mass migration of birds on 26 May. Snow cover reached 50% on 20-25 May. The end of the month was warm and rainy, and snow disappeared by the usual dates. In general, summer was moderately cool and moderately humid (average temperature slightly lower than in 2000). June was the coldest and wettest (av. temp. +7.3°C). July was relatively warm (av. temp. +13.3°C) with more frequent rains at the beginning and end of the month. August was moderately warm (mean temperature +10.9°C) and more rainy at the end, while September was warm and dry, with the first frosts occurring only after 20th. The first snow fell on 29 September, and snow settled from 10 October. Stormy, northern winds with rain continuing for at least one day occurred in early and mid June and in very late July. From 13 to 21 June it was rainy with only short intervals daily.

Vole numbers were high until autumn, especially in the Ob' River floodplain. Lemmings do not inhabit this part of the sub-arctic.

Arctic and Red foxes were not seen. Rough-legged Buzzard was common on migration in spring and rare in September in the floodplain, along with White-tailed Eagle, Northern Harrier and Short-eared Owl *Asio flammeus* which were common there in autumn. Numbers of gulls were usual, but skuas were not recorded.

Phenologically, spring was close to normal. Some of the local and early migrants appeared slightly earlier than average, but northern waders migrated at the usual time. Rough-legged Buzzard, Herring Gull and Fieldfare *Turdus pilaris* arrived on 1 May, Common Gull *Larus canus* and Brambling *Fringilla montifringilla* on 3 May, Chaffinch *F. coelebs* on 4 May, Pied Wagtail *Motacilla alba* on 6 May, Redwing on 12 May, Common Reed-Bunting, Meadow Pipit and Redstart *Phoenicurus phoenicurus* on 14 May, Common and Little *Larus minutus* gulls on 17 May, Wood Sandpiper, Willow Warbler and Bluethroat on 25 May, Little Bunting on 26 May, Red-throated Pipit *Anthus cervinus* on 27 May. Mass migration of waders and other birds started after 25 May, and was most active between 29 May and 1 June (Ringed Plover, Wood Sandpiper, Ruff, Temminck's and Little stints, Dunlin *Calidris alpina*, Curlew Sandpiper *C. ferruginea* and Whimbrel). Post-breeding migration of waders has mostly terminated in August.

Among waders Terek Sandpiper and Common Snipe were common breeders, while numbers of Wood Sandpiper, Whimbrel, Bar-tailed Godwit *Limosa lapponica* and Red-necked Phalarope were below average. In the tundra numbers of Long-tailed Ducks *Clangula hyemalis* were higher than in 2000 and Pintail, Common Gull and Arctic Tern were common there. In the floodplain Tufted Duck *Aythya fuligula*, Black-headed *Larus ridibundus* and Little gulls and Common Tern were common. Fieldfare nested in colonies.

Numerous records of juveniles in August indicated successful reproduction in pipits, Pied and Yellow *Motacilla flava* wagtails, Willow and Arctic warblers, Bluethroat, Brambling, Redpoll, Little Bunting and White-winged Crossbill. Active migration of waders was not observed, but in the second half of August snipes, Wood Sandpiper, Ruff, and Spotted Redshank *Tringa erythropus* were the most commonly seen waders, while Whimbrel, Bar-tailed Godwit and Dunlin were seen occasionally. Solitary records of waders (Spotted Redshank and Great Snipe) were made in September, when many passerines (pipits, buntings, redpolls), ducks, and, occasionally, geese, including Red-breasted *Branta ruficollis*, were passing by.

Although breeding conditions for birds were generally normal, many nests and juveniles could have perished in tundra zone, during rains and storms, especially during strong, northerlies.

S.P.Paskhalny

16. Schutchya River, upper reaches, Yamal Peninsula, Russia (67°29'N, 67°22'E)

While the season on southern Yamal was cold, adverse conditions should have been less pronounced in this relatively southern and more sheltered locality in comparison with the Baidaratskaya Gulf. Ripening of all berries was delayed by approximately one week. Although the storm on 29 July probably reached this area, the cloudberries were not frost-beaten. August was moderately warm and dry, without storms.

Voles and lemmings were common only in quarries and floodplains. Arctic Foxes were rare and there were no breeding records.

Owls, Pomarine Skua *Stercorarius pomarinus* and Northern Harriers were not seen in August, while Merlins were abundant as usual. Other skuas were rare, and crows were mostly seen near places of fishing on the Schutchya River. Rough-legged Buzzards were less common than usual, but bred. Water insects were unusually active, and gnats were reported to be numerous, but were suppressed by the storm on 29 July.

Wetland waders stayed long on the breeding areas, but no feeding aggregations were found on the lakes after 15 August. The only exception was Common Snipe, groups of which became common after 20 August. Red-necked Phalaropes and Whimbrels disappeared from the area by 15-17 August, while Golden Plovers remained on the watershed to the end of August. Information on breeding numbers and success is not available.

T.R.Andreeva

17. Southern Yamal, Russia (67°15'-67°40'N, 67°25'-69°05'E)

The weather in June was unstable, and cold periods (+3-6°C) often alternated with warm and sunny (+16-18°C) spells. July was very dry, but generally chilly, with a single week of hot weather (temperatures up to +29-30°C). The first half of August was dry with temperatures around the average. A strong storm with pelting rain and rapid cooling on 29-30 July had the most adverse impact on bird reproduction.

Collared Lemming *Dicrostonyx torquatus* was seen once and once more was found in Rough-legged Buzzard pellets. Ruddy Vole was found only in pellets, while Narrow-skulled Vole was periodically seen on excursions.

Only one den of Arctic Foxes with signs of recent digging was found, while foxes themselves were never observed. Predators' pressure on breeding birds was low, and successful reproduction was obvious in some species of waders and waterfowl. While the weather was favourable during most of the summer, the storm in late July resulted in a decrease in reproductive success: cases of deaths of nestlings in Peregrine Falcon and Merlin were recorded.

S.V.Rupasov

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

Summer was cold and very windy, with prevailing northern winds, including during the study period in the second half of July. Local people reported that Baidaratskaya Gulf was filled with ice during most of the summer. A severe storm with snow occurred on the coast and mountain foothills on 29 July, but the snow melted on 31 July.

Lemmings were rare, while voles were common. Arctic Foxes were not seen, and no active dens were found. A single Snowy Owl was recorded, while skuas were rare. Birds of prey were common, but mostly represented by Rough-legged Buzzards. About one-third of territorial buzzards were breeding, and their food remains and pellets contained almost exclusively rodents. A single pair of Peregrine Falcons was found in the area, but their chicks presumably died during the storm in late July. This storm, probably, had a much greater impact on birds of prey and passerines than on waders, although some of their broods with unfledged chicks are likely to have perished. Chicks of some wader species (Ringed Plover) already had been starting to fledge at the time of the storm.

Among breeding waders Ringed Plover, Temminck's Stint, Red-necked Phalarope, Ruff and Wood Sandpiper were present in high numbers, while Golden Plover was far less common.

T.R.Andreeva

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

Snow receded from 50% of the tundra surface on 1-3 June and had gone completely by 15-18 June. Ice broke on the rivers on 3-5 June. June and July were cold, with abundant precipitation, with the exception of mid July when air temperatures exceeded +30°C during the week from 8-16 July. A north-westerly storm with non-stop heavy rain continued from 29-31 July. This resulted in flooding of rivers and lakes, in particular river waters rose by approximately 2.5-3 m (the level of spring flood). The flood waters were slow to retreat and it took two weeks for water to stabilize at its previous level. August was dry and warm, with only 5 rainy days. September was also relatively warm and dry in the beginning, and snow melted quickly after two snowfalls in the second half of the month.

The slight increase in rodent numbers after the crash in 2000 was more pronounced in voles than in lemmings. Summer reproduction of the latter was not recorded.

We did not make special attempts to locate Arctic Fox dens, but hunting animals were seen on almost every excursion. Reproductive conditions for birds were about average in the beginning of the season in spite of fairly cold and rainy weather. The Number of active nests of Rough-legged Buzzards was rather small and decreasing during the season due to predation by Arctic Foxes or desertion because of food shortage, and none of them survived to fledging. Breeding skuas were not common, but many birds wandered in groups of 3-5, searching for food. Among them Arctic Skuas *Stercorarius parasiticus* made the most notable contribution to the loss of passerine and wader clutches. Numbers of Willow Grouse remained high for the second year, which could have contributed to decreased predation pressure on other birds.

The storm in late July had a substantial impact on bird populations, primarily birds of prey and water birds. All nests of Rough-legged Buzzards still active on the study plot (100 km^2) and chicks in two nests of Peregrine Falcon died during the adverse weather. Broods of geese did not suffer notably. Breeding conditions for most bird species were unfavourable, given the relatively cold and rainy summer, the storm in late July and low numbers of lemmings.

V.A.Sokolov, A.A.Sokolov

See also: Sokolov, V.A., Sokolov, A.A., Fisher S.V. & Ogarkov, A.E. 2001. New data bird on distribution in south-western Yamal. In: Ryabitsev, V.K. (ed.). Materials on bird distribution on the Urals, in Cis-Urals and Western Siberia. Ekaterinburg. P. 144-147. In Russian.
Sokolov V.A. 2001. An experience of bird counts in tundra. In: Bird counts on plots: specialization and unification of techniques, and results of its application. In: Bird counts on plots: specialization and unification of techniques, and results of its application. Materials of the conference. Tambov. In Russian.
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20. Gydan State Reserve, Russia (71°58'N, 74°27'E)

There was stormy weather in late July – early August but conditions improved later.

Lemmings were at their low in August, as a single juvenile Siberian Lemming was recorded and captured. Arctic Foxes were common and one den with large pups was found. Snowy Owls were also common and possibly bred somewhere in the area, because dark-plumaged young birds were seen among them. No breeding of Rough-legged Buzzard was recorded, while a nest of Peregrine Falcon with young was found. Among skuas only occasional wandering Long-tailed were seen. It is worth noting that Rock Ptarmigans were numerous with successfully fledged young among them. Numerous waders and ducks also fledged successfully.

I.V.Pokrovskaya

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

Upon arrival on 5 June, a large part (>80%) of the study area was still covered with snow. Also the snow layer was much thicker than the year before. Because June was much warmer than normal the snow melted rapidly and reached the 50% level on 11 June and the 10% level on 16 June. The Medusa River started flowing on 11 June. June was warm with a mean air temperature of +4°C and a maximum temperature up to +15°C. Most of the days were sunny with constant, often strong, winds from the north-east. On two days it rained for long periods. Snow was recorded only on one day in June. The first half of July was also warm, but thereafter temperatures dropped. Rain was recorded on many days and especially the last week of July and the first days of August were very wet. Compared with 2000 the season was much wetter in general.

Lemmings were almost absent: in the whole season only two Siberian Lemmings were seen.

Due to thick snow cover early June the season was expected to be late, but the warm start of June made the snow disappear fast resulting in an average phenology. The peak in arthropod abundance occurred in the second and third weeks of July.

An Arctic Fox visited the area regularly at night only. Several Rough-legged Buzzard pairs started breeding but either abandoned their clutch or their nests were depredated; chicks hatched successfully only in one nest, but it is not known whether they fledged. Due to the fact that nests were hardly ever scent-marked, it took until the first nocturnal fox observation before we realised that probably most predation of nests was caused by a fox and not only by skuas as we had assumed. Long-tailed Skua bred and hatched successfully on the mainland.

At the nearby rivers Efremova, Maximovka and Lemberova, Peregrine Falcons bred and hatched successfully, and a few pairs of Red-breasted Geese and White-fronted Geese bred in their vicinity. Some of the White-fronted Geese *Anser albifrons* hatched successfully on the mainland, and presumably, fledged. No hatching of Brent Geese was observed on the mainland. Taimyr Gulls, Glaucous Gulls and Arctic Terns bred on the nearby islands and hatched successfully. Among nests of White-fronted Geese, Brent Geese and one Red-breasted Goose pair on the islands, most failed due to predation, egg and down collecting, but still some nests of Brent Goose probably hatched and fledged (not confirmed though).

Waders were present in comparable numbers to previous years. The species community differed from other years in that there were more different species breeding in the area: Pectoral Sandpiper *Calidris melanotos* (>12 nests). Grey Phalarope *Phalaropus fulicarius* (3), Ruff (>3) and Dotterel (2). Unusual for this study area was the high occurrence of Pectoral Sandpipers. Red-throated Pipits were much more abundant than before. For all birds breeding success was low, but still higher than in 2000. Although special care was taken in approaching and marking nests (using GPS), we are convinced that field activities influenced predation rates. Apart from predation by Arctic Foxes, skuas and Snowy Owls, a passing herd of 1000 Reindeer *Rangifer tarandus* (within the 4 km^2 area) also caused some nest losses (either by predation or desertion after trampling). Hatching probabilities (using the Mayfield method) were: Pacific Golden Plover *Pluvialis fulva* 8% (n=25); Ringed Plover 76% (n=3); Dotterel 2% (n=2); Turnstone 6% (n=7); Grey Phalarope 58% (n=4); Little Stint 18% (n=93); Temminck's Stint 99% (n=2); Pectoral Sandpiper 32% (n=12); Dunlin 24% (n=25); Curlew Sandpiper 9% (n=19); Ruff 0,5% (n=2). Dunlins, Ringed Plovers and Pacific Golden Plovers laid replacement clutches, Curlew Sandpipers and Pectoral Sandpipers did not.

In late July/early August a large number of fledged young Little Stints, Dunlins, Pectoral and Curlew sandpipers passed through the area.

I.Tulp, M.Berezin, A.Bublichenko, S.P.Kharitonov, T.Kirikova, O.Langevoord, L.Peters, H.Schekkerman

See also: Kharitonov, S.P. 2002. An overview of the main studies of waders and other birds at the Willem Barents Station, north-western Taimyr. In: Tomkovich, P.S. & A.O. Shubin (eds.). Information materials of the Working Group on Waders (CIS). Moscow. P. 25-28. In Russian.

22. Nizhnaya Agapa River, upper reaches, Nyapan ridge, Russia (70°04'N, 87°36'E)

The first half of July was dry with one or two showers only. From 10 to 19 July clear and windless weather established, and air temperatures exceeded +30°C on some days. Water levels in the lakes decreased by over 10 cm. From 20 July to 5 August rains occurred almost daily, and snowfall on 22 July lasted for 5 hours, but the snow melted the same day. From 5 to 15 August clear cool weather with day-time air temperatures at about +5-7°C established. The weather became warmer and winds lighter from 15 August to the end of month (+12-15°C in day-time).

Lemmings were rare, and neither voles, nor Arctic Foxes have been recorded. Snowy Owls and Rough-legged Buzzards were rare, and the latter bred successfully. The presence of fledged broods of waders, ducks, grouse, gulls and passerines indicated a rather successful breeding season for tundra birds.

A.V.Sokolov

23. Typical tundra of western and central Taimyr, Russia (71°30'N, 88°00'E)

In late June - early July aerial surveys of wild reindeer breeding grounds were carried out. During the surveys, records of Snowy Owls were sporadic and occupied dens of Arctic Foxes were observed as singles only. Thus, the numbers of rodents are likely to have been below average.

Y.I.Kokorev

24. Pyasino Lake, north-east coast, Taimyr, Russia (69°56'N, 88°00'E)

In general the breeding season was warm and dry. It was also very warm, with air temperatures reaching +30°C, in the study period at the beginning of the second half of July. The weather changed rapidly by 20 July, when strong northerly winds with rain, hail and snow resulted in the temperature falling to +3-4°C. However, this cooling continued for 3 days only and had no adverse impact on the birds.

From 15-25 July, 3 North Siberian Voles *Microtus hyperboreus* (including 2 juveniles) were caught per 150 cone/nights, installed in the best rodent habitats. A single Collared Lemming was seen. No signs of activities of small mammals were seen on excursions of over 30 km in total length.

Virtually no rodent-specialist avian predators bred, but wandered over the tundra. Only one pair of Long-tailed Skuas behaved as though breeding. Numbers and reproductive performance of waders can be evaluated as average. Numbers of geese and ducks were low and their broods were not seen on lakes, which could be due to disturbance, as 3 derricks were operating within 6-10 km. Passerines were dominated by Bluethroat, Common Redpoll *Acanthis flammea*, Little Bunting and Red-throated Pipit. Waders, grouse and passerines hatched successfully and at least passerines fledged.

Y.I.Kokorev

25. Dudypta River, middle and lower reaches, Taimyr, Russia (70°52'-71°39'N; 89°55'-94°40'E)

It was a warm and dry season. Lemmings or signs of their activities were not seen on excursions.

Inhabited dens of Arctic Foxes were not discovered, and Snowy Owls were not seen. One nesting pair of Peregrine Falcons and one pair of Rough-legged Buzzards were recorded along 320 km of the middle and lower reaches of the Dudypta River from 2-15 August. Herring Gulls and skuas wandered over the tundra. Weather conditions during the breeding season were favourable for breeding waders, passerines, divers and some other waterfowl species. However, numbers of waterfowl on the river were clearly lower than normal, due to permanent disturbance by humans whose camps are spaced at 15-20 km along the river. Six broods of White-fronted Geese were seen farther upstream, and geologists visiting the upper reaches of the Dudypta River confirmed that there were substantially higher numbers of moulting geese and goose broods. Four White-billed Divers *Gavia adamsii* were seen in the middle reaches which is indicative of relatively high abundance of this species. Waders and passerines fledged successfully.

Y.I.Kokorev

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

Snow was 0.7-0.8 m thick by the start of spring. Air temperatures rose above freezing point from 6 June, and snow-free patches appeared on 10 June. Summer was cold. In July air temperatures around +1-2°C were common, and non-melting patches of snow were unusually abundant.

Lemmings were not seen, and Arctic Foxes were rare. Snowy Owls were not recorded, while in 2000 they were common. Glaucous Gulls arrived on 26 April, Kittiwakes *Rissa trydactyla* on 4 June, Brent Geese on 5 June and Snow Buntings *Plectrophenax nivalis* on 29 April. Numbers of Brent Geese were higher than in 2000 and they bred.

O.L.Makarova

27. Malaya Balakhnya River, lower reaches, Taimyr, Russia (72°48'N, 105°02'E)

The middle of July was very warm, with air temperatures reaching +27.6°C and soil surface temperatures reached +40°C. The weather in late July and August was typical for the area, with mean air temperatures of +7-12°C and the first frost on 10 August. By 7 July snow remained only in the deepest cloughs and completely melted even there by 20 July. Ice-break in Khatanga was 5-10 days earlier than average. July and August were rainy, and precipitation occurred on 20 days in the period from 7 July to 25 August, occasionally reaching over 20 mm per day. Thunderstorms were experienced 2-3 times a day during 4 days in early August. Strong wind (exceeding 10 m/s) was infrequent and occurred on 10 days during the observation period.

Lemmings were rather common during the whole study period, with 50 animals captured per 300 total trap/nights (data of M.P.Telesnin and M.N.Korolyova). Interestingly, the abundance of Siberian and Collared lemmings was approximately equal. Lemming numbers declined slightly in August.

Arctic Foxes were seen on only 6 occasions during the whole period of observations. None of the 40 examined dens was inhabited, and no more than 10% of this number carried signs of fox digging. According to reports of local hunters Arctic Foxes breed in this area only in years with peak lemming numbers. Rough-legged Buzzards were common and nested successfully (3-5 chicks per brood), with approximately half the chicks already hatched in most nests by the date of the expedition's arrival (7 July). Few instances of cannibalism were recorded in August among chicks of similar size, presumably stimulated by the decline in numbers of lemmings. One nest of Peregrine Falcon (2 chicks) was found, and Merlins were seen a number of times. Snowy Owls were seen only twice. Numbers of reindeer were also very low, and in total 9 animals were seen.

The abundance of most species of waterfowl and waders was not high. Among waders Red-necked Phalarope and Little Stint were the most abundant, Pacific Golden Plover, Ringed Plover, Grey Phalarope, Ruff and, locally, Spotted Redshank were common. Skuas and gulls were relatively uncommon, with the exception of Arctic Tern for which breeding density along the Malaya Balaknya River reached 1 pair per 1.5 km. Ross's Gull *Rhodostethia rosea* was found nesting in the Malaya Bakhnya River valley. Bewick's Swans *Cygnus bewickii* were seen occasionally along the Khatanga River. Among geese White-fronted were common and bred, but aggregations of moulting birds were not found. Two nesting pairs of Red-breasted Geese successfully hatched 5 chicks each. Bean Goose was seen only once. Among breeding ducks Long-tailed Duck was the most abundant, while King Eider *Somateria spectabilis* was very rare. Lapland Bunting *Calcarius lapponicus* and Shorelark *Eremophila alpestris* were the most common tundra passerines, while Bluethroat and Redpoll dominated in shrubs, with nests occasionally being only 10 m apart.

Mass fledging of passerines occurred between 15-20 July. The first brood of White-fronted Goose was seen on 14 July, and a brood of Red-breasted Goose was seen on 17 July. Juvenile Rock Ptarmigan and Willow Grouse fledged on 30 July and 2 August, respectively. Juvenile Ruffs fledged on 5 August, Pacific Golden Plovers on 6 August, Ringed Plovers on 10 August and Spotted Redshanks on 19 August. Juveniles of ducks, geese and divers had not fledged by 25 August.

Nesting of most bird species was successful due to the low pressure of predators and favourable weather conditions. Predation was confirmed for a single nest (Arctic Tern) among those checked.

I.N.Pospelov

28. Lukunskaya River, lower reaches, Taimyr, Russia (72°31'N, 105°03'E)

Two Ruddy Voles were captured per 20 traps installed for 12 hours.

Broods of Greater Scaup *Aythya marila* were abundant on the Lukunskaya River (one brood on average per 1 km of the river).

I.N.Pospelov

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

Since the start of recording on 9 June, air temperature followed the steepest pattern of rise in comparison with all previous years of observations (1994-2000). Accordingly, temperatures were lower than in 1995 and 1999 (two early and warm years) before about 14 June, but then up to mid July the period was the hottest in comparison with other years. In the period from 14-26 June no precipitation occurred, which in combination with hot weather resulted in an unprecedented drying of the tundra and marshes. July was moderately wet, but habitats remained much dryer than normal. Dates of plant and insect development were the earliest in a series with the next closest 1997 and 1999 still several days later.

After complete melting of snow, on 12 June, lemming winter nests were counted on a transect 4.6 km long and 10 m wide, located principally within flat-hillock marsh - the dominant habitat in the study area. On this transect, 7 winter nests were recorded which is a pronounced decrease compared with 33 nests on the same transect in 2000. Only 22 lemmings (all Siberian) were recorded visually in June-July 2001 by four observers, which exceeds only the numbers recorded in 1995 and 1998 (9 and 10, respectively), and represents an apparent depression in comparison with the outbreak in 2000 (587 records) and growth stage in 1999 (94 records). After infrequent observations in June, no lemmings were seen between 8 and 20 July, but then a few records of juveniles were made.

A pair of Arctic Foxes inhabited a den on the southern border of the main study plot with the floodplain, and produced pups by the end of June. On 29 July an adult fox was seen carrying 4 lemmings at a time to 3 juvenile foxes, waiting near the den, which is indicative of the tolerable situation with regard to food supply at this time. Among skuas, Pomarine did not breed, while Long-tailed and Arctic nested successfully in their usual low numbers. A nest of Rough-legged Buzzard with one egg was found on 14 July.

The warm spring resulted in very few breeding Little Stints (0.8 nest/km^2), while unusually dry nesting habitats led to very low numbers of Grey Phalaropes (4.0 nest/km^2), and, probably, a decreased density of Ruffs (7.1 nest/km^2). The density of Pectoral Sandpipers (20.6 nest/km^2), while higher than in other seasons of low numbers (1994, 1998, 2000), was still closer to their range of values (10.3-16.7 nest/km^2) than to that of "good" seasons (27.0-47.6 nest/km^2 in 1995-97, 1999). A decrease in numbers of Lapland Bunting continued for the third year starting from 1998, and their density reached a minimum of 10.3 nest/km^2. As a result the total bird density in 2001 decreased to a minimum for the period of studies (74.6 nest/km^2), with the previous minimum record of 94.4 nest/km^2 in 1994.

Despite low lemming numbers, fox pressure on tundra birds was low, and nest success of common waders on the study plots was high to moderate: 69% in Dunlin (n=13), 61% in Pectoral Sandpiper (n=23), 56% in Ruff (n=9), 60% in Grey Phalarope (n=5). Chicks hatched in all (n=13) observed nests of Lapland Bunting, and fledged from most of them. Accordingly, breeding performance of birds was high for the third year in a row.

A nest of Skylark *Alauda arvensis* with 3 chicks was found on 7 July on the study plot on terrace, which is the northernmost breeding record for the species. The chicks left the nest on 9 July.

M.Y.Soloviev, V.V.Fedorov, V.V.Golovnyuk, E.N.Rakhimberdiev

30. Terpyai-Tumsa Peninsula, lakes Elgeen and Boganitka, Yukutia, Russia (73°30’N, 118°10’E)

The weather was mostly warm in the period of observations (10-18 July), although maximum air temperatures fluctuated between +5°C and +24°C. Precipitation was not abundant, and ice was melting rapidly on the lakes.

Lemming numbers were low, and Collared Lemmings were rarely seen at low lake shores and in hummock tundra.

Birds of prey and Arctic Foxes were not seen, while a Snowy Owl was once observed close to the sea. In the period of observations wild reindeers were migrating to their summer quarters in huge numbers, with about 20,000 animals in an area of 280 km^2, which could adversely affect the nesting success of birds.

Nesting was confirmed for Black-throated Diver *Gavia arctica*, King and Steller's *Polysticta stelleri* eiders, Grey Plover *Pluvialis squatarola* , Little Stint and Lapland Bunting. Species seen on excursions included Bean Goose, Greater Scaup, Long-tailed Duck, Willow Grouse, Turnstone, Grey and Red-necked phalaropes, Ruff, Curlew Sandpiper, Dunlin, Arctic, Long-tailed and Pomarine skuas, Herring and Glaucous gulls, Arctic Tern, Shorelark, Snow Bunting.

F.G.Yakovlev

31. Babaryna-Belkeye and nearby islands, Lena Delta, Yakutia, Russia (73°34'N, 123°17'E)

During surveys in the second half of July a single track of Arctic Fox was seen on an island shore, and inhabited dens were not found. Numbers of terrestrial (Arctic Fox) and avian predators (Arctic Skua only) were low because of low numbers of lemmings after an outbreak a year before. Nesting success was high in colonies of Herring and Sabine's *Xema sabini* gulls. Hatching was also successful in Arctic Terns, Glaucous Gulls, Little Stint and Grey Plovers, which are abundant there. Behaviour also indicated the presence of chicks of Ringed Plovers and Turnstones.

Y.N.Sofronov

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

Spring was average in timing. According to data from the "Stolb" weather station at the delta south, mean daily air temperatures became consistently positive after 6 June. Rapid warming from 6-9 June (with mean daily temperature on 7 June +7.8°C) resulted in complete snow-melt on the plains by 9 June. Timing of ice-break (11-18 June on different channels of the delta) was average, likewise the level of water. Bykovskaya channel in its middle reaches (south-eastern part of the delta) became ice-free on 13 June, and Bolshaya Trofimovskaya channel in its mouth (eastern part of delta) - on 18 June. A cooling between 14 and 16 June was characterized by negative mean daily air temperatures, but falling snow was melting during daytime and had no adverse effect on bird nesting. The weather was very warm and dry from 28 June to 5 August, with average July air temperature +14.1°C. Afterwards August was colder than usual, with strong winds and frequent, although short-term, rains and snow-spells.

Lemming numbers were low, after the peak in 2000, but local patches of higher densities on some delta islands were capable of supporting breeding by isolated pairs of Pomarine Skua. Arctic Skuas nested as well in their usual numbers, while breeding of Long-tailed Skuas, common as wanderers, was not confirmed. Arctic Foxes were rarely seen, although their tracks and evidence of predation on clutches were fairly common. The lower than expected abundance of foxes after a peak lemming year could have been due to their dying during winter, which was confirmed by findings of carcasses of several animals in winter fur. Inhabited dens were not discovered. Adult ermines were seen repeatedly, but never juveniles. Snowy Owls did not breed; the only bird seen during the whole season was a female staying between 30 June and 4 July on an island with a nesting pair of Pomarine Skuas. Rough-legged Buzzards were common, but nested in small numbers mostly in the southern parts of the delta, while numbers of breeding Peregrine Falcons did not change in comparison with 2000. Four Ravens *Corvus corax*, including at least 2 juveniles, were seen in the south-eastern part of the delta on the Bykovskaya channel in late July.

Waterfowl nesting success differed among islands depending on the presence of Arctic Foxes. When present, Arctic Foxes destroyed 80-90% of nests of Brent Geese and King Eiders, and up to 20-30% of nests of Herring and Glaucous gulls in mixed colonies. Only nests in the central, most densely populated parts of colonies could survive. Hatching of these species was successful on islands which were free of Arctic Foxes. Steller's Eiders and Bewick's Swans were present in lower numbers than in 1999-2000. More than a half of the eider clutches were destroyed by the middle of incubation, while reproductive success of swans was high, judging by the size of broods in the second half of August.

Predation of clutches of Ross' s and Sabine's gulls was not recorded even on islands with foxes. In late June-early July flocks of Ruffs, Pectoral Sandpipers, Little and Temminck's stints were seen. Presumably, these comprised failed breeders. The proportion of males in flocks of Grey Phalaropes was higher than in favourable years, according to visual evaluation. Nests, broods or juveniles were seen in Grey Phalaropes, Ringed, Grey and Pacific Golden plovers, Turnstones, Ruffs, Curlew Sandpipers, Dunlins, Little and Temminck's stints. Flocks of 10-20 Spotted Redshanks were seen on 24 August on shallow channels in the eastern part of the delta, although they had not bred there. Feeding flocks of 40-300 Brent Geese were seen in the lower reaches of the Bolshaya Trofimovskaya channel at the east of delta, but the proportion of juveniles in these flocks was not determined. At the same site, pre-migration aggregations of up to 2000 Pintail were recorded. Pintails departed on 25-29 August in flocks of 100-500 birds.

Generally, reproductive success of birds can be evaluated as moderate.

V.I.Pozdnyakov

33. Molodo River, Yakutia, Russia (69°25'N, 122°30'E)

Spring was early, and phenological events occurred 2-3 weeks earlier than normal. Ice had melted on water bodies in the floodplain by the start of observations on 10 June, but not on large watershed lakes. Mass blossom of forbs in the river floodplain and on south-facing slopes started in mid June. Flowering of *Pulsatilla flavescens* was over by that time, and seeds started to drop *en masse* in plants of the *Solicaeae* family. Summer was unusually warm, with a prolonged period when air temperatures reached +29-30°C.

Numbers of microtine rodents were high. In the first half of July, the abundance of Middendorf's and *Microtus middendorffi* Tundra *M. oeconomus* voles was 23 animal per 100 cone/nights, while the abundance of Grey-sided and Ruddy voles and Wood Lemming *Myopus schisticolor* was 0.5 per 100 trap/nights. In the second half of the summer their numbers increased to 55.5 and 1.1 per 100 trap/nights, respectively. Numbers of hares were moderate, while Northern Pikas *Ochotona hyperborea* were very rare.

Rough-legged Buzzards nested in large numbers, and their inhabited nests on river-bank cliffs were spaced at 2-3 km. Other species of birds of prey and owls were not seen.

Bird reproduction was early. Many broods of Willow Grouse appeared in in the last 5 days of June. Fledged juveniles of Indian Tree Pipit *Anthus hodgsoni* and Dusky Trush *Turdus eunomus* were seen on 30 June, 5-7-day old chicks of Common Gull on 2 July, hatching in a nest of Common Tern *Sterna hirundo* on 3 July, independently feeding juveniles of Yellow and Pied wagtails on 10 July, and a brood of Raven on 10 July. House Martin *Delicon urbica* juveniles left nests in late July.

Z.Z.Borisov

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

Ice broke on the Indigirka River near Chokurdakh on 30 May, thin snow cover reduced to 50% on 2 June and had gone completely from level areas on 10 June. Spring was early, but very few birds occurred from 3 to 5 June, when cold weather returned, with strong northerly wind and the last snowstorm. Migration of waders and eiders resumed on 6 June. Summer was very warm and dry, conditions similar to those noted in 1991, according to reports of local people. In late June air temperatures reached +25°C in the shade, and mass emergence of insects took place. Generally, weather conditions were favourable for birds.

Both lemmings and voles were common, but lower than in 2000 when they had been very abundant. Arctic Foxes were also common and bred. Short-eared Owls were seen in small numbers without signs of breeding, while no Snowy Owls were recorded. All three species of Skuas were common and bred successfully.

Although only a small amount of snow accumulated in the winter, the strength and direction of wind in spring was different from those in other years. Accordingly, nesting habitats of some species were still under thick cover of snow by the start of breeding, which made them move to other sites. Thus, the eastern slopes of hills and lake banks were filled with snow, and two nests of Rough-legged Buzzards were found in unusual places in an open polygonal marsh: one on the small hillock 0.7 m high, another on the patch of dwarf birch 50 m away from a last year's nest of Sandhill Crane *Grus canadensis*. Peregrine Falcons nested 1.5 km from the previous year's nest site. Two pairs of Siberian Cranes *Grus leucogeranus* made their nests on the easternmost portions of their territories, where snow-free patches were available on downwind slopes. Open water became abundant after quick warming on 7-8 June. Many migrant Steller's Eiders in flocks of 10-30 birds used this water for a week's stopover, but did not stay to nest. In comparison with previous years, Grey Phalaropes and Ruffs were present in higher numbers. Ruffs established new leks, and numbers of displaying males reached 60-70 birds at a lek.

Bird reproduction was successful, and chicks of various wader species started to hatch almost simultaneously: e.g. on 4 July in Ruff and Spotted Redshank, on 8 July in Grey Plover. Hatching in other species started on 3 July in Ross's Gull, on 6 July in Peregrine Falcon, on 7 July in Long-tailed Skua and on 25 June in Siberian Crane. Although rodents were not numerous, predation of clutches by Arctic Foxes and large gulls was not recorded.

S.M.Sleptsov, N.N.Egorov

35. Chukochy Cape, Yakutia, Russia (70°10'N, 160°00'E)

It was warm and dry summer, but ended with passage of a cyclone from 27-29 August, which was accompanied by snowfall which settled for 3-4 days. This weather anomaly could affect birds concentrating in the mouth of the Bolshaya Kuropatochya River before departure southwards. Lemmings, voles and Arctic Foxes were common, geese were abundant, but no Willow Grouse were recorded. Owls and skuas were rare.

S.V.Gubin

36. Yakutskoe Lake, Yakutia, Russia (69°20'N, 159°20'E)

A hot and dry summer ended with cyclones with rain and snow from 15 August.

Lemmings, voles, Rough-legged Buzzards and Arctic Foxes were common, breeding of the latter was confirmed. Skuas were abundant. Divers were less common than in other years.

S.V.Gubin

37. Evseika River valley, tributary of the Kolyma River, Yakutia, Russia (68°36'N, 158°14'E)

Snow melted on about 10 June. Summer was warm, in particular during its first half. Forest fires happened in July-August.

Neither lemmings nor Arctic Foxes were recorded in mid July. However, voles were common. Three broods of Whimbrels and two broods of Willow Grouse were recorded per 17 km of a trip on 15 July.

S.V.Gubin

38. Akhmelo lake vicinity, Kolyma lowland, Russia (68°50'N, 161°01'E)

Spring was very early with snow melted by the end of April and ice broke on the rivers in late May. Clear weather and rains alternated in June, while July was warm and dry. August was rather warm with rains; September was cold. Autumn was early, and patchy snow cover established on 23 September. Small rivers and lakes froze in the last third of September, and the Kolyma River froze on 2 October.

Lemming were abundant in the area, while voles, Arctic Foxes, Owls and Willow Grouse were common. Owls bred and successfully hatched chicks.

D.G.Fedorov-Davydov

39. Cherskiy settlement, Yakutia, Russia (68°46'N, 161°21'E)

The summer was hot and dry. Rains were observed after 15 June.

Numbers of Willow Grouse increased rapidly after several years of low abundance caused by high floodwaters in 1999. Numbers of geese in the Kolyma River floodplain decreased. Intensive fishing by local people in the settlement vicinity attracts gulls to the area. Current difficulties with boats and fuel supply resulted in reduced disturbance elsewhere. No microtine rodents or foxes were recorded.

S.V.Gubin

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

Winter 2000/2001 was windy and little snow had accumulated by the end of May: 10-20 cm on flat areas, which made the topography easily recognizable. Snow cover was still 100% almost everywhere by the end of the third week of May, while air temperatures ranged from –15-17°C at night to –7-8°C by day. In the last week of May air temperatures increased 15 degrees in two days, and snow melted rapidly. Unusually warm weather in late May – early June resulted in rapid snow-melt on the main Snow Goose *Anser caerulescens* colony, before the geese had arrived.

The rapid increase in temperature and the associated snow-melt caused increased surface activity of lemmings. High numbers of lemming ventilation holes in the snow (541 per 16 km) and the high abundance of Pomarine Skuas created an impression of very high rodent abundance. However, lemming numbers in the area of the main goose colony were visually evaluated as moderate after snow melt. Lemmings inhabited northern (Tundra of Academia) and western (Gusinaya River valley) parts of the island in low numbers, and some areas in central and southern parts in high numbers.

The arrival and start of breeding by geese were delayed one week compared with the progression of spring weather events. Egg-laying in the main-colony started when the air temperature reached +11.5°C, while mass arrival of geese to the colony (normally takes place on the date of stable rising of air temperatures above freezing) and mass nesting occurred at maximum temperatures of +15.5°C. Such a situation has never before been recorded on Wrangel Island in the last 30 years.

Relatively high lemming numbers in some areas favoured nesting of Snowy Owls, and related to the later expansion of Snow Goose nesting range. Approximately 2,000 geese pairs nested outside the main colony in 2001, principally stimulated by owls concentrating in traditional areas in the upper reaches of the Neizvestnaya River and valley of the Mamontovaya River in its middle reaches.

Around 24,000 nests were initiated in the Tundrovaya River colony. Despite participation in reproduction by young birds of 2-4 years old, cuckoldry and egg-laying outside nests was almost never observed, due to there being plenty of space suitable for nesting. A substantial fraction of young birds among breeders and the difficult spring migration were, probably, responsible for some insignificant decrease in mean clutch size.

Weather conditions were favourable during the first half of incubation, but one week before hatching the air temperatures dropped and night frosts were recorded. Hatching and departing of broods from the colony coincided with the period of maximum summer temperatures and very dry weather. Approximately 90% of broods left the colony and headed north, to the Tundra of Academy along the Tundrovaya River in very dry conditions, when rivers became shallow and many streams dried out.

Five pairs of Arctic Foxes bred in the main colony and its vicinity, but the level of their predatory activity in the colony and impact on geese was low, and on some days none would appear during 6-8 hours of observations. Death of adult birds from diseases was recorded on the colony, and many bodies remained intact for a long time, which also indicated a low level of predators' activities. Brood-rearing in geese was favourable: neither predators, nor weather affected them adversely. Geese departure from the island was early, following early cold weather which marked the end of the summer.

V.V.Baranyuk, Y.S.Podobedova

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

Spring was average in timing with a very rapid transition in late May from a cold period (–8-10°C) to a warm period (+9-12°C). The snow melted in 11 days, with 50% cover by 4 June and completely cleared by 8 June, by the start of the breeding season for most bird species. Rivers started to flow on 1 June. Extreme weather events were not recorded. Freezing air temperatures at night were more common than usual during this summer, which affected the abundance and activity of insects. Wet and cold weather dominated the first 10 days in August.

The anticipated peak of lemming numbers did not occur, and their abundance was moderate. Rodent distribution was patchy, with areas of high and low density. Siberian Lemmings dominated the numbers of rodents. Eight ventilation holes per 1 km (at 6 km transect) were recorded at the start of snow melt; 2-3 tens of animals could be seen at a time during intensive melting, and the density of winter nests was close to the average, 6 per 1 km (at 11 km transect). Mean numbers of lemmings in a Snowy Owl nest was 0.76 per one visit (n=78). According to these data lemming numbers did not differ markedly from the previous summer season. High numbers and densities of young Siberian Lemmings were observed in Ushakovskoe settlement (71°00'N, 178°47'W) in late August.

Arctic Fox numbers were moderate, and some young non-breeding animals were holding territories. Among 46 surveyed dens 45.7% had young. Fox density was 0.15 pair/km^2 in the permanent study plot of 46 km^2, and 57%

of pairs bred. Mean litter size was 8.67 (n=6) in August, which did not differ significantly from the value in 2000. Fox numbers were below average on the northern plain of the island, the principal moulting area of Snow Geese.

Snowy Owl numbers were moderate, and density on the study plot equalled 0.20 nest/km^2 (in total 83 nests were found on the island). The average size of brood at fledging was 3.31 (n=16, range 0-5). Breeding success on the plot was slightly higher than in 2000.

Long-tailed Skuas and Common Eiders started egg-laying 10 days earlier than usual. Density of the former was 0.30 nest/km^2 (n=14). Reproduction was successful in 14% of pairs only, which is unusually low. About 30 Pomarine Skuas stayed in pairs in the plot in the first half of June, but then they left, have abandoned breeding. Pomarine Skuas were almost never seen inland in July and August.

Predation pressure on birds was moderate or even lower. Lemmings comprised 82% of the diet of Snowy Owls, and birds formed the rest 18% (n=72), which is lower than in 2000. Remains of the following birds were found in owl nests: wader chicks (3%), passerine chicks (7%), Common Eider adults and chicks (6%), Long-tailed Skua chicks (3%).

Nesting of Snow Geese in small colonies near nests of Snowy Owls was successful. In mountain areas geese nested near 56% of Snowy Owl nests (n=43), with the exception of the Centralnye Mountains where breeding geese were not found. Mean clutch size of Snow Geese in small colonies was 3.99 (n=172). Deserted eggs were almost never found, and nest predation on the study plot was about 14% (n=400). Mean brood size of Snowy Geese was 3.48 after hatching (n=144) and 3.17 after fledging (n=24). Common Eiders did not form large colonies, but predation was low (8%) and mean clutch size was 5.95 (n=22). Only 2 nests of Brent Geese were found, and a single Canada Goose *Branta canadensis* was seen in a small colony. Wader broods were seen regularly on excursions in August. Generally, breeding conditions were favourable for birds.

I.E.Menyushina

42. Velikaya River lower and middle reaches, Chukotka, Russia (64°00'-64°40'N, 175°40'-176°40'E)

The winter was warm with a large amount of snow accumulated. Pronounced warming followed by icing on 20 December 2000 resulted in mass deaths of both Willow Grouse and Rock Ptarmigans. Snow-melt was delayed 5-9 days compared with average years. Ice started to break on the Velikaya River 100 km from the mouth on 24 May and on eastern tributaries in the lower reaches after 4-5 June. Flood level was insignificantly higher than average, but remained high until 15-20 June, which together with the late appearance of snow-free patches and melt-water was the main factor adversely affecting the numbers of nesting birds and nesting success. Prolonged, but not heavy, rain continued from 29 June to 4 July with air temperatures in the range of +5.0-14.9°C. Summer was warm and dry, and from 5 July to early August very hot weather established with minimum air temperatures ranging from +7.3-14.0°C and maximum temperatures from +13.5-28.5°C. Many marshes and small water bodies dried out in July. Weather conditions in summer were rather favourable for breeding by most species of birds.

Lemming numbers were extremely low, and in total only two Siberian Lemmings were seen on 1 June, although signs of their winter activities were numerous. Ruddy Voles were rarely seen in isolated patches near huts, in depressions and along river-banks. Small colonies of Arctic Ground-Squirrels *Citellus parryi* were found in several localities along river-banks.

Ermines, Red Foxes, Wolves and Brown Bears were common in and near to some floodplain localities, while elsewhere they were rare. Arctic Foxes were not seen. Red Foxes did not breed as 6 inspected dens were uninhabited, although tracks of fox visits were discovered. Numbers of territorial and wandering Long-tailed and Arctic skuas were moderate or above locally until mid June, but afterwards they decreased and reached a low level in late June. Less than 10% of Long-tailed and Arctic skuas started to breed. Pomarine Skuas were not seen in the period of surveys from late May to early August. Herring and Common gulls and Arctic and Common terns were common as wandering birds, while only 10-30% of adults bred. Rough-legged Buzzards were seen only in spring. Golden Eagles *Aquila chrysaetos*, Peregrine Falcons, Merlins and Short-eared Owls were rare in the surveyed area of the Velikaya River, but Northern Harriers were rather common. White-tailed Eagles were seen every 10-30 km along the Velikaya River. Ravens and Black-billed Magpies *Pica pica* were not numerous but nested successfully.

We observed predation of clutches of Willow Grouse and Herring Gulls by Brown Bears, while nests of ducks and waders suffered from Red Foxes. Substantial or major fractions of populations of Whooper Swans, White-fronted Geese, Sandhill Cranes and Willow Grouse did not nest. Among waterfowl, reproduction was most successful (close to average) in ducks. Wood Sandpipers, Ruffs, Red-necked Phalarope and Common Snipe occurred in the highest numbers and had better reproductive performance compared with other species of waders, namely, Pacific Golden Plovers, Whimbrels, Dunlins, Terek Sandpipers, Temminck's Stints, Bar-tailed Godwits and Long-billed Dowitchers *Limnodromus scolopaceus*. Among passerines Pechora Pipits *Anthus gustavi* and Pied Wagtails were present in very low numbers, while Yellow Wagtails were very abundant (200-300 nests/km^2). Common and Arctic *Acanthis hornemanni* Redpolls were numerous, but most of them did not breed. The rest of the small passerines were substantially less common or even rare, and their breeding success was below moderate.

A.I.Artyukhov

43. Meynypilgyn lake-river system, southern Chukotka, Russia (62°26-63°06'N; 175°41'-177°55'E)

Snow started to melt earlier than usual, and water levels did not rise much in spring. It was a warm and dry season. There was a small amount of precipitation in June and July, which resulted in lower levels of water in rivers and streams compared with the 4 previous years, and some water bodies dried out completely. Extreme weather events were not noted during incubation and hatching periods. The first rains, causing summer floods, occurred in mid August.

According to reports of local people, White-fronted Geese dispersed across the tundra and started nesting immediately after arrival. Despite the dry summer, observations of broods of geese, Pintail, Teal *Anas crecca*, Common Eider, Ringed and Lesser Sand Plovers *Charadrius mongolus*, Red-necked Stint *Calidris ruficollis*, Spoon-billed Sandpiper *Eurynorhynchus pygmeus*, Dunlin, Herring Gull and other birds, indicated successful reproduction.

Voles had decreased in numbers since the previous year, but were still common. The presence of spawning Capelin *Mallotus villotus* in large numbers near the sea coast in 2000-2001 drew most of the non-breeding and immature Herring and Slaty-backed *Larus schistisagus* gulls away from coastal tundra until the last third of July, which positively affected bird reproductive success. The latter is also dependent on the activities of Brown Bears, due to their high numbers. Before the start of salmon spawning in mid July bears wander in tundra and destroy bird clutches, especially in colonies of gulls and eiders. In August 2001 bear females with young of this and the previous year were seen on spawning rivers more often than usual, including 3 records of bears with 3 cubs.

Snowy Owl was seen twice hunting Arctic Ground-Squirrels in 2001 near the shore of Pekulneiskoe Lake, and 8 White-tailed Eagles (mostly young) were seen in mid August in the mouth of the Kakanaut and Kautayam rivers. This gives the impression that numbers of birds of prey increased in the second half of summer 2001 compared with 1997-2000. Birds may have arrived from continental parts of Chukotka beyond Meinypylginsky Ridge to southwest, where the dry summer resulted in fires.

E.V.Golub, A.P.Golub

44. Kaypilgin Lake vicinity, southern Chukotka, Russia (62°34'N, 177°38'E)

Snow melted completely in early June, and ice broke in the Kaypilgin channel on 13 June. In general June was cold and cloudy, with permanent fog on the coast and visibility below 500 m. Air temperatures did not exceed +9°C and were on average +4-5°C with permanent drizzle or rain. Temperatures reached +20°C in July, usually ranging from +9°C to 12°C. July was sunny, but rains were common, while strong wind was not recorded.

Very few lemmings and voles were seen. Arctic Foxes were common, but there were no signs of breeding.

Weather conditions were unlikely to adversely affect breeding performance of most wader species. Ducks and geese suffered from predation by Arctic and Red foxes and Brown Bears. In particular, bears were active in colonies of Herring Gulls *Larus vegae*. Geese nests under study apparently suffered from predation, while others were predated by foxes to a lesser extent. Breeding success of Common Eiders was very low.

A.V.Kondratyev

45. Gavriil Bay, Chesma Cape and Meynypilgyn lake-river system, southern Chukotka, Russia (62°20'-63°00'N, 176°30'-179°15'E)

Ice broke on the Vaamochka River on 10 June (on 13 June at the mouth). Small lakes became free of ice on 15 June, while on large lakes the ice broke on about 17 June. June was rainy, but July sunny and dry. Weather conditions were generally favourable for the reproduction of birds. Lemmings were rare, voles common, Arctic Foxes rare, Red Foxes common.

Breeding success of birds was evaluated as being moderate to high in waders and low to moderate in geese. Predation was due to Arctic Foxes on the coast, Red Foxes in shrubs, Brown Bears everywhere, gulls and skuas. Breeding conditions were especially favourable for waders in the village vicinity, despite disturbance and the presence of dogs.

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

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

Spring was late, with a resulting delay to snow melt and development of vegetation in river valleys and cloughs. June was colder than usual, and the amount of precipitation was somewhat higher. Snowfall and frost occurred once in mid-June. July temperatures were relatively high: monthly average air temperature was +11°C, while the long-term average is +9.1°C and in 2000 the July average was +5.6°C. However, average humidity of the upper soil layer did not drop below 50%, with the most dry period extending from 20 July to 10 August. Weather characteristics in August were close to the long-term norm. Maximum seasonal permafrost soil thawing and its dynamics did not differ between 2000 and 2001. Wind strength exceeded 7 m/s on 4 days during summer, which is also normal.

Lemmings were practically absent in summer, which contrasted with the 2000 situation when they were common. Owls and Arctic Foxes were not seen.

D.G.Zamolodchikov

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

Huge snowbanks under coastal cliffs melted completely only by August, which is indicative of the substantial snow accumulation during this winter compared with the previous year. The period from 25 June to 15 July was colder and more rainy than in 2000, while the period from 15 July to 2 September was, probably, slightly warmer than in the previous year. Emergence of mosquitoes occurred in the middle of July which is a week later than in 2000.

Voles were generally less abundant in the tundra than in 2000, but they were still common, in particular Cletrionomys sp. in coastal stony talus and on the shore. As in the previous year, Snowy Owls and Rough-legged Buzzards were never seen during the period of studies. Long-tailed Skuas were notably less abundant than in 2000, but wandering Arctic and Pomarine skuas were common in June-July, while in 2000 the two latter species were not recorded. Arctic Foxes, Ravens, Glaucous and Herring gulls were common predators in the coastal area (coast, stony talus and sea-side tundra).

First chicks of Thick-billed *Uria lomvia* and Common *U. aalge* murres appeared on 25 and 29 July, respectively, which was not much different from the 2000 dates. Hatching in Crested *Aethia cristatella* and Least *A. pusilla* auklets was recorded on 28 and 26 July, 2 and 4 days respectively earlier than in 2000. Reproduction in Thick-billed and Common murres and in Crested and Least auklets was successful. In contrast, breeding conditions were extremely unfavourable for Kittiwakes, which nested in very low numbers, and hatching was recorded only in a single nest on 14 August.

V.A.Zubakin

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

A mild winter without much snow falling (similar to most of south Alaska) resulted in an almost complete absence of snow cover after late February (in late April we found snow only in hill-side depressions) and an extremely dry spring. The maritime climate is responsible for only slight variations in air temperatures: according to information from the local Weather Station they fluctuated between –6.1 and +5.0°C and –4.4 and +8.3°C in April and the first 20 days of May, respectively. Average day temperatures were below 0°C during fourteen days in April and 5 days in May.

The Pribilof Island Shrew *Sorex pribilofensis* is the only species of small mammal known to inhabit St. Paul I., while Brown Lemming *Lemmus trimucronatus* inhabits St. George I. Neither of these mammals appears to have a strong influence on the abundance of Arctic Foxes, which rely mostly on food from the littoral zone and therefore are concentrated along the coast. Accordingly, large-scale fluctuations in breeding success of inland birds, due to short-term annual variation in numbers of Arctic Foxes, are unlikely.

The first inland aerial displays of Rock Sandpipers *Calidris ptilocnemis*, the main breeding wader species, were recorded on 21 April. However, most of these waders were flocking on sea shores, and only a few inland spots were occupied by birds in the last days of April. Gradually more and more territorial sandpipers could be found inland and the diversity of other waders and waterfowl was increasing in early May. The start of incubation in Rock Sandpipers seemed to peak in the third week of May when Snow Buntings also showed signs of nesting and an incomplete clutch of Pintail was found.

P.S.Tomkovich, M.N.Dementiev, R.E.Gill, Jr., L.Tibbitts

49. Yukon Delta, Alaska, USA (60°48'N, 165°00'W)

Extreme weather events were not recorded.

The season was very unfavourable for birds, the worst for the period of observations in the delta, according to reports from local ornithologists. Peak vole numbers in 2000 were followed by the deepest depression of rodents combined with very high numbers of Arctic Foxes. Before the start of bird reproduction 4 Arctic Foxes were found dead, presumably due to starvation. Brent Geese, eiders, waders and large gulls suffered the most from predation pressure. Reproductive success of Spectacled Eiders was the lowest ever recorded, and only 3% of nests survived to hatching.

D.V.Solovieva

See also: Bowman, T., Stehn, R. & Walters, G. 2001. Population size and Production of Geese and Eiders nesting on the Yukon-Kuskokwim Delta, Alaska, in 2001. Field Report.

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

Rare Tundra Voles were observed during ground surveys. Aerial surveys using video strip transects were conducted during mid-incubation at five localities in the south-west delta (Tutakoke River, Kokechik Bay, Kigigak Island, Baird Inlet Island and Baird Inlet Peninsula). The total estimated population of Brent Geese breeding in 2001 was the lowest since 1993. Based on observations of empty nest bowls and tracks in the mud near the nest, I assume that Arctic Foxes were the primary predator of Brant nests this year. This is consistent with observations of a permanent field crew at the Tutakoke River Brant colony and general observations by field crews working in the central portion of the Yukon-Kuskowkim Delta. Baird Inlet Island was heavily egged by humans in 2001 (estimated 500-800 eggs taken) but is very low, cut by numerous small sloughs, and has little cover for foxes. Kokechik Bay, which had better success than all colonies except Baird Inlet Island in 2001, is near three villages and, as a result, receives heavy hunting and trapping of foxes in winter and spring. At Kigigak Island, many Brant nest on islands in large lakes, which may reduce their vulnerability to foxes; also because it is an island fewer foxes have access to the area than at Tutakoke River and Baird Inlet Peninsula. Possible factors affecting productivity in past years have been flood tides during incubation at Baird Inlet Island and parts of Tutakoke River in 1997, egging by humans at Kokechik Bay and Baird Inlet Island in 1999, and the effects of El Nino (1997) on eelgrass in wintering areas, resulting in poorer condition of females nesting at all colonies in 1998.

R.M.Anthony

See also: U.S. Fish and Wildlife Service. 2001. Waterfowl population status, 2001. U.S. Department of the Interior, Washington, D.C. 50 pp.

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

Spring break-up in 2001 was delayed a week relative to 2000, and was considerably later than the long-term average.

In 2000, arvicoline rodent numbers reached a cyclic high on the Yukon-Kuskokwim Delta, and apparently led to very high productivity in Arctic Foxes. Subsequently, a mild winter in 2000/01 resulted in high over-winter fox survival. As a result, fox numbers were very high along the outer coast of the Delta in spring 2001. The combination of a late spring and high levels of fox predation led to a widespread failure among nesting waterfowl in the coastal zone of the Delta.

Our work in 2001 again focused on Western Sandpipers *Calidris mauri*, which initiated nesting significantly later in 2001 than in 1999 or 2000. The first egg of the season was not recorded until 25 May, in contrast to first egg dates of 19 and 20 May in 1999 and 2000, respectively. Nesting densities of 3.06 pairs/ha, however, were similar to those recorded in 1999 (2.95 pairs/ha) and 2000 (3.01 pairs/ha). In contrast to waterfowl along the coast, upland nesting Western Sandpipers did not experience complete nesting failure, but still had low rates of nest success (Mayfield nest success = 0.21; n = 55). Among clutches which hatched, fledging success, defined as a clutch fledging one or more young, was 58% (14 of 24 hatched nests). Brood attendance averaged 12.0 days for males (n = 14) and 7.4 days in females (n = 14); both sexes exhibited significant seasonal declines in parental attendance.

We expanded the scope of our work at Kanaryaraq in 2001 to include a pilot study on the implementation of a large-scale shorebird survey methodology. Under the auspices of PRISM (Program for Regional and International Shorebird Monitoring), we sampled 29 randomly selected plots within a 24 km^2 study area centred on the Kanaryarmiut Field Station. The study area included approximately 17 km^2 of upland heath tundra and 7 km^2 of low sedge meadows. Overall shorebird density was estimated to be 250 birds/km^2. Estimated densities (in birds/km^2) for the 4 most frequently detected species were: Western Sandpiper - 74.9, Red-necked Phalarope - 74.2, Rock Sandpiper - 34.0, and Dunlin - 25.2. We plan to expand the survey area in 2002 to include 2,850 km^2 of the central Yukon-Kuskokwim Delta.

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

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

Spring 2001 was one of the latest ever recorded on the Seward Peninsula. On the flight from Kotzebue to Nome (3 June), I observed almost 100% snow cover over the entire route. The same situation prevailed northward from Kotzebue. I conducted ground searches for Golden Plovers (both *Pluvialis dominica* and *P. fulva* marked in previous years) from 3-12 June along the extensive road system emanating from Nome. Almost everywhere, I found massive accumulations of snow which in many cases covered known plover territories and the birds were absent. Substantial melting occurred during my stay, but extensive areas which in past years contained breeding Golden Plovers remained snow-covered and without birds through to 12 June. Since Golden Plovers normally appear in this region around mid-May, the birds must have been confronted with almost no available habitat on arrival. Presumably, they were forced to move elsewhere but we have no knowledge of their behaviour under these circumstances. During the study period, I found almost no Golden Plovers (perhaps 10% of normal numbers), and very few other birds of any kind. Only a few Golden Plover display flights were heard. After much searching, I located two nests of *P. dominica*, but none of *P. fulva*. Whether birds appeared later and nested after my departure is unknown. It is notable that a knowledgeable observer on Midway Atoll in the Hawaiian Archipelago reported to me that large numbers of *P. fulva* returned to the atoll during the summer. This early migration suggests breeding failure.

I saw almost no evidence of lemmings.

O.W.Johnson

53. Seward Peninsula, central and south-central, Alaska, USA (65°00'-65°30'N, 164°40'-165°00'W)

Much snow accumulated in the winter and a combination of late March storms and unusually low temperatures in April-May produced one of the latest breakups on record. Snow lingered in valleys into late June, almost 3 weeks longer than normal.

During our visit to the area on 26-29 June small rodents were not seen and breeding Rough-legged Buzzards were not recorded. However, some Golden Eagle, Northern Harrier, Merlin, Gyrfalcon, Long-tailed Skua and Raven were present. Peregrine Falcon was breeding. Among terrestrial predators we saw a Wolverine *Gulo gulo*.

High numbers of Willow Ptarmigans were characteristic for the season, but numbers of breeding Bar-tailed Godwits were reduced substantially, and nesting Red-throated Divers *Gavia stellata* were not found at their usual places. For the first time in 14 years the hatch of Bristle-thighed Curlews *Numenius tahitiensis* did not begin until early July.

R.E.Gill, Jr., M.N.Dementiev, L.Tibbitts, P.S.Tomkovich

54. Kougarok River, Seward Peninsula, Alaska, USA (65°26'N, 164°39'W)

On 1 June about 60% of the watershed surface was free from snow, which melted almost completely there by 15 June. Mass greening of *Betula* and *Salix spp*. started on 11 June, mass growth of leaves and flowering of sedges and herbs on 17-19 June. Average wind speed in June – August did not differ from the long-term average. The last night frost occurred on 17 June, and the first on 21 August. A single summer snowfall happened on 14 June, but snow melted on the same day. Storm-force wind with rain lasting for approximately 24 hours was observed on 16-17 July and 7-8 August, heavy showers on 8 August (15 mm) and on 13 August (32 mm). Generally, June and July were colder than average, and June also drier.

Lemmings and voles were not seen. According to trapping data of zoologists, low density of small rodents is typical for the area. American Ground-Squirrels were seen only in the foothills, but Snowshoe Hares *Lepus americanus* were common in July – August (2-3 per 10 km).

Snowy Owls and Arctic Foxes were not seen, while Red Fox was observed only once. Reindeers and Elks *Alces alces* were common in the river valley in June. From mid June to early July and then in late July and mid August a herd of musk oxen *Ovibos moschatus* was present in the area. Brown bears were seen rarely in the river valley. Long-tailed Skuas were common on the tundra, and were holding territories there. Two pairs of Ravens and a pair of Rough-legged Buzzards were resident in the area of observations, but breeding was not confirmed. A pair of Canada Geese bred in the area, and Pintails were frequently seen on small lakes and rivers. Sandhill Cranes were common and bred. On 4 August the first flock of 4 passing cranes was observed. Bluethroats, Arctic and Yellow warblers, Grey-cheeked Thrushes *Catharus minimus*, American Tree *Spizella arborea* and White-crowned *Zonotrichia leucophrys* sparrows were common breeders in riverine willow scrub, while Arctic Redpolls were numerous. Lapland Buntings were common on watersheds. Willow Grouse were abundant breeders. The first grouse brood was seen on 6 July, and afterwards they were seen at a density 4-5 broods per 10 km. Mass fledging of passerines started on 7-9 July.

Waders were uncommon in the area. The first displaying Pectoral Sandpipers appeared on 6-7 June. Among records of other waders, a Bristle-thighed Curlew, a pair of Semipalmated Plovers *Charadrius semipalmatus* and 3 Dotterels were noted.

Generally, weather conditions and pressure of potential predators were, probably, within the norm for breeding insectivorous and phytivorous birds.

D.V.Karelin

55. Kuzitrin Lake, Seward Peninsula, Alaska, USA (65°23'N, 163°16'W)

In late July numbers of lemmings, Tundra and Ruddy voles were very low, contrasting with abundance of droppings and patches of destroyed grass from the previous year. The only locality checked on the Seward Peninsula with relatively high numbers of shrews was the river valley in Serpentine Hot Springs (65°51'N, 164°42'W) in early August, while numbers of voles and Collared Lemmings were low there.

We saw American Ground-Squirrels, hares, reindeers and wolves. Among birds Willow Grouse were common. Duck broods were present on small lakes.

N.E.Dokuchaev

56. Espenberg Cape, Alaska, USA (66°30'N, 163°45'W)

Local villagers indicated that it was the latest spring in many years. Nests of divers were not initiated until the second week of June. Large lakes in this coastal area still contained substantial ice on June 20.

Lemmings or voles were not recorded during the study period between 10 June and 15 August, while Ground Squirrels were abundant. Arctic Foxes were seen more commonly (almost daily) than in 2000, however, no fox dens were found. As a result nest predation was very high. Nest survival of divers was below 5%, compared with approximately 25% in 2000 in the same area.

J.A.Schmutz

57. Kotzebue, Seward Peninsula, Alaska, USA (66°54'N, 162°35'W)

During brief visits to the settlement and its close vicinity in the period from 28 May to 1 June and from 10-12 June we found that spring came late and proceeded slowly because of the large amount of accumulated snow and the regular cooling effect of wind and fog from the Chukchi Sea. Migration of waterfowl and waders continued during the first third of June. The few signs of presence of microtine rodents were from the previous year(s). Willow Grouse were common on hills with bushes in late May, but their numbers decreased considerably by mid June, probably due to hunting. On 10 June complete clutches of fresh eggs were found in Semipalmated Sandpipers and Savannah Sparrow *Passerculus sandwichensis*.

P.S.Tomkovich

58. Cape Krusenstern National Monument uplands, NW Alaska, USA (67°08'-67°40'N, 163°07'-163°47'W)

Snow cover on hills and low mountains in study sites of the region reduced from about 40-50% to 10-20% during the survey period from 1 to 10 June, although some areas were still over 50% snow covered. This rapid thaw was due to warm sunny weather, although night temperatures were normally below freezing. By 10 June snow remained mostly on north facing slopes and in creek valleys.

Microtine rodents were not seen in June, but their abundant winter nests, droppings and patches of completely destroyed vegetation at some sites indicated high numbers in 2000. Rodent numbers were possibly high locally in two northernmost sites in June, but from 10-22 July microtine rodents (Collared Lemming, Tundra, Singing *Microtus miurus* and Ruddy voles) and shrews were very rare everywhere based on catching. Ground Squirrels were uncommon.

Arctic Foxes were not recorded, while Red Foxes were seen several times and one den with pups was found. Brown Bear, the only other terrestrial predator, was recorded once. Long-tailed Skua, Raven, Northern Harrier, Rough-legged Buzzards, and Short-eared Owls were the most common avian predators, and Arctic Skua, Peregrine Falcon, Gyrfalcon, and Golden Eagle were also seen; among these species only Long-tailed Skua, Rough-legged Buzzard and Gyrfalcon were confirmed breeders in the areas. Avian predators possibly relied mostly on Willow Grouse and Rock Ptarmigans. Taking into account the favourable weather, high numbers of ptarmigans (alternative food for predators), low densities of other birds and low to moderate densities of predators, nesting success of most bird species could be expected to have been moderate to high.

In the first days of June waders, ptarmigans and passerines were actively displaying and in pairs. First clutches of Lapland Buntings were found on 4 June, and first complete clutches of waders (Whimbrel and American Golden-Plover) were found on 6 June, however many birds were still egg-laying at the end of this period. There were very few waterfowl in the area. No comparative data are available for the area to judge bird numbers, but numbers of both Willow Grouse and Rock Ptarmigan were probably at a peak. Densities of Whimbrel also appeared high.

R.E.Gill, Jr., N.E.Dokuchaev, P.S.Tomkovich

See also: Gill, R.E., Jr., Tibbits, T.L., Handel, C.M. & Brann, D.L. 2002. Inventory of montane-nesting birds in National Parks of Northwest Alaska: the spring 2001 field effort. Progress report. Alaska Sci. Center, U. S. Geological Survey. 26 p.

59. Barrow, Alaska, USA (71°20'N, 156°40'W)

Locals have reported a cold June which resulted in slow snow thawing, although not much snow was accumulated during the winter. This possibly resulted in decreased breeding densities of some bird species and late breeding of some pairs (in early July fresh eggs were found in some Dunlin and Lapland Bunting). In late June and early July the weather improved dramatically, and mass emergence of Diptera flies (Chironomidae, Tipulidae) as well as hatching of wader chicks occurred in early July.

During our wader banding activity from 2-6 July many signs of the former presence of lemmings could be seen everywhere, including a moderate number of under-snow nests. Only three live lemmings were seen during this period, by 7 people.

Arctic Foxes were seen twice; Snowy Owls were also present in small number, while numbers of non-breeding Long-tailed Skuas were high with increasing flock size through early July. Arctic Skua did not breed, and only one pair of Pomarine Skua nested (clutch of one egg). All these observations indicate an obvious decline in populations of rodents after their peak numbers in the previous two years. Rodent numbers were probably high enough locally in early June to induce some Pomarine Skuas to nest, and in early July lemming numbers were not yet at their low.

During the hatching period, the density of successfully breeding Dunlins was similar in 2000 and 2001, while the density of Pectoral Sandpipers in 2001 was rather low. The density of Semipalmated Sandpipers also was possibly reduced. Low breeding numbers of American Golden-Plover, Semipalmated Plover, Turnstone and Western Sandpiper are probably typical for this area. A general impression is that nesting success of most tundra birds in the surveyed area was average or even above average in spite of rodent decline.

P.S.Tomkovich, M.N.Dementiev, R.E.Gill, Jr., M.Kashiwagi, T.Mano, Y.Shigeta

60. Bodfish Island, Prudhoe Bay, Alaska, USA (70°32'N, 149°16'W)

It was a late season, but warmer than the previous two summers with no major storms. Minerals Management Services has funded the placement of 4 meteorological stations that run 24 hours/day and send information via satellite to Anchorage (this data can be accessed at the following web site: http://www.resdat.com/mms/). Snow cover reached 50% level on 20 June but had gone completely by July.

About 6 Collared Lemmings were found under our tents. Abundance increased later in summer. Arctic Foxes were common, however breeding was not recorded.

The number of breeding Common Eiders on the coastal barrier islands was lower in 2001 relative to 2000. This is probably due to a large storm in August 2000 which changed the distribution of driftwood used by the birds for nesting. Predation rates by Arctic foxes were also higher in 2001 relative to 2000, and foxes cleared most of the barrier islands from Harrison Bay to Katovik, only two islands in the middle (Stump and Egg islands) had any productivity. Willow Grouse were common and some hatched young.

R.B.Lanctot

See also:

http://www.absc.usgs.gov/research/sis_summaries/waterfowl_sis/Beaufort_Sea_ducks.htm

Lanctot, R. B., J. Reed, D. Lacroix, P. Flint, J. C. Franson, T. Hollmen, M. D. Howell, J. B. Grand. 2001. Monitoring Beaufort Sea waterfowl and marine birds, 2001 Annual Progress Report. Report for Minerals Management Service by U. S. Geological Survey

61. Mackenzie Delta region, Canada (68°13'N, 134°24'W)

In the Mackenzie Delta region, which probably is the most important breeding area for Tundra Swans *Cygnus columbianus* in Canada, a low percentage of the pairs produced broods and the productivity was very low this past year. This area accounts for perhaps 1/3 of the eastern population, so a further decline might be expected in this year's wintering counts. Also, because of the late spring elsewhere in the Canadian Arctic, breeding conditions were poor throughout most of the range of the eastern population.

J.E.Hines, p. 24 in: Canadian Wildlife Service Waterfowl Committee. 2001. Population Status of Migratory Game Birds in Canada: November 2001. CWS Migr. Birds Regul. Rep. No. 4. http://www.cws-scf.ec.gc.ca/canbird/status/nov01/nov2001_e.pdf

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

Spring was very late on Banks Island. Lesser Snow Goose nesting was delayed and a larger than normal proportion of the birds were non-breeders.

D.Caswell and J.E.Hines, p. 17 in: Canadian Wildlife Service Waterfowl Committee. 2001. Population Status of Migratory Game Birds in Canada: November 2001. CWS Migr. Birds Regul. Rep. No. 4. http://www.cws-scf.ec.gc.ca/canbird/status/nov01/nov2001_e.pdf

63. Walker Bay, Kent Peninsula, Nunavut, Canada (68°21'N, 108°05'W)

The season was a few days late, judging from conditions in Cambridge Bay. No major snowfalls occurred during the survey period from 20 to 28 June, though snow/sleet/rain squalls occurred almost daily, and this period was also more windy than usual.

We observed lots of evidence of winter lemming activity, but very few live lemmings were seen. Arctic Foxes, Snowy Owls, Long-tailed, Arctic and Pomarine Skuas and Rough-legged Buzzards were rare, but Artcic Foxes bred.

V.Johnston

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

The timing of spring thaw was average with 50% snow cover on 31 May and complete clearance by mid June; ice break-up on major rivers took place on 5 June. Strong winds, low air temperatures, and more precipitation on average experienced in June resulted in abandonment of nests by geese (Lesser Snow and Ross's) and lower than average breeding success.

Lemmings and voles were relatively abundant in 2001 with 2.2 small-mammals per 100 trap-nights in 2001 compared to 3.5 small-mammals per 100 trap-nights in 2000 (the small-mammal index in 2000 was the highest recorded at Karrak Lake since the start of monitoring small-mammal abundance in 1994).

Arctic Foxes were also relatively abundant in 2001 with 7.5 foxes seen per 100 km travelled in 2001 compared with 3.3 foxes seen per 100 km travelled in 2000. Arctic Fox reproduction appeared to be moderate in 2001 with 3 reproducing dens per 100 km^2 in 2001 compared with 6 reproducing dens per 100 km^2 in 2000. There was a higher density of reproducing dens in the goose colony than there was outside the colony: 8 dens per 100 km^2 compared to 4 dens per 100 km^2 in 2000 and 4 dens per 100 km^2 compared to 2 dens per 100 km^2 in 2001, respectively. The majority of food taken by Arctic Foxes at Karrak Lake were eggs (87%) whereas lemmings, goose-carcasses, and unknown foods made up only a small portion of the food taken (13%). Arctic Foxes took, on average, 15 eggs per hour during the nesting season in 2000 and 14 eggs per hour during the nesting season in 2001. Most of these eggs (93%) were cached for later use whereas most lemmings (86%) were brought back to den sites (only 14% of the lemmings were cached).

Mean nest initiation date for geese in 2001 was average. Nest success was 66% in 2001, 12% lower than the ten-year average for Snow and Ross's *Anser rossii* geese, probably due to poor weather conditions during incubation, but King Eider nest success was about average. Due to the large size and synchronous nesting of the colony, depredation by Arctic Foxes, gulls and skuas on geese was minimal, and this factor does not appear to fluctuate much annually.

D.Kellet, R.Alisauskas, G.Samelius

See also: http://www.usask.ca/biology/fox/result.html

Alisauskas, R.T. 2001. Nutritional ecology and population biology of Ross's Geese, 2001. Unpublished report of the Canadian Wildlife Service.

65. Churchill, Manitoba, Canada (58°45’N, 94°04’W)

The spring of 2001 was very early, and above-average temperatures prevailed for most of the period from the beginning of May to October. Snow disappeared long before my arrival (June 7), and the break-up on the Churchill River occurred in the last days of May – one of the earliest dates remembered by the local residents. Atypically high temperatures reaching +30°C were recorded in the last days of May and the first days of June. This was followed by the more seasonable weather (average June to early July), with short spell of snow cover on June 26, and close to freezing temperatures in the first days of July – not atypical for this place.

This was the second year of very low lemming numbers; no lemmings were caught at Churchill nor 50 km farther south (J.DuBois, Manitoba Museum of Man and Nature, Winnipeg, pers. comm.), and no lemmings were seen during field work.

Several dens of an Arctic Fox were active in the area, and the Arctic Skuas and Herring Gulls bred in regular numbers in the same areas. Territories of Rough-legged Hawk, Merlin, and Northern Harrier, known to me, were vacant, but birds of the two latter species were occasionally seen in the area.

There were usual numbers of geese, and they were doing well (clutches didn't seem to be smaller than usual and fledging success appeared to be good, too – tremendous difference with the last year, when we saw large goslings very rarely, and usually only 1 or 2 of them with parents). Spring hunting was allowed (and encouraged) in order to reduce the numbers of geese that are devastating habitat in the nearby colony at La Perouse Bay, and to a lesser extent also at Churchill. However, this pressure didn't diminish numbers of nesting pairs in any substantial way, if at all. Breeding of Tundra Swans, Sandhill Cranes, and Little Gulls was confirmed (are known to breed in some years). Cranes were common as non-breeders, and bred very rarely.

American Golden Plovers nested in half the numbers of the year before: in an area of about 12 km^2, where in 2000 18 nests were found, in 2001 only 9 were known. Lesser Yellowlegs *Tringa flavipes* also nested in the lower numbers than the year before. Conversely, Killdeers *Charadrius vociferus* and Whimbrels, which bred in very low numbers in 2000, in 2001 bred in their highest numbers of the last 3 years. High numbers of Whimbrels coincided with the high abundance of last-year’s berries still present in the spring, and the birds were often seen feeding on these berries. Although no formal surveys of Short-billed Dowitcher *Limnodromus griseus* were done, unusually many nests were found by chance. Lapland Bunting – one of the commonest passerines in at least the last six decades did not breed for the first time (there were still two pairs last year), and only one pair of Smith's Longspur *Calcarius pictus*, also a common breeder in the past, was seen.

The onset of nesting was very early, and so the hatching dates were the earliest on record for several species (Short-billed Dowitcher: 17 June, American Golden-Plover and Hudsonian Godwit *Limosa haemastica*: 26 June). For comparison, hatching of Golden-Plover anticipated on 20 July 2000 were among the latest reported.

Nesting success was recorded only for Golden-Plovers, where all of 11 nests for which the outcome was known hatched successfully. This was the highest hatching success on record for this species. Hatching occurred over a period of 13 days (26 June - 8 July), thus synchrony was similar to the other warm season of 1999, and was lower than in the cold year of 2000, when all nests hatched within 7 days. The mean hatching date was 2 July, and the distribution was approximately normal. Clutch size was typical for this place (3.93).

As lemmings are never plentiful in the area, even during the 'best' years (Erica Nol, pers. comm.), high nest success of waders in a year of very low rodent numbers can be related to specialization of Arctic Foxes and Arctic Skuas on other abundant prey (geese eggs and passerines, respectively).

J.Klima

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

For the third consecutive year, breeding conditions were unfavourable for Greater Snow Geese on Bylot Island. In 2001, snow cover was the heaviest recorded since studies began in 1989. The timing of nesting was near normal. However, both nesting effort and mean clutch size were below average. Nest success was also below average (52%), due mainly to predation by Arctic Foxes and avian predators which was relatively high despite an abundance of lemmings. The reduced reproductive effort and high predation pressure are expected to result in below average production of young (but much higher than the record low of 1999). Nonetheless, due to their high population level, a large fall flight is expected.

J.Hughes, p. 15 in: Canadian Wildlife Service Waterfowl Committee. 2001. Population Status of Migratory Game Birds in Canada: November 2001. CWS Migr. Birds Regul. Rep. No. 4. http://www.cws-scf.ec.gc.ca/canbird/status/nov01/nov2001_e.pdf

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

The snow melt pattern was in the average range.

The routine surveys of the lemming winter nests revealed a continuation of the low, even a slight recovery was apparent when compared to the deep depression recorded in 2000. The low abundance of lemmings as also inferred from trapping efforts throughout the summer (only two animals caught!) was reflected in the response of predators.

Snowy Owls were absent, and if there were any breeding attempts among Long-tailed Skuas they were not recorded. Only one Arctic Fox den (in the whole valley) was occupied by a family with cubs. Regarding Stoats, the record of predation of winter nests has shown that few individuals must have been present in early winter 2000/2001 but indications provided by trapping in summer suggested that they were then pushed to the edge of local extinction. These observations remain in line with the general trend suggesting a delayed response of the Stoats to the lemming fluctuations.

Tundra breeding birds like King Eiders and Long-tailed Ducks suffered from the increased predation pressure, and the scarcity of Ptarmigans may also have been related to a shift to alternate prey. Apparently waders were also affected judging from the very few juveniles observed in early August. Based on the long-term patterns becoming apparent in this system, we expect an outbreak of the lemming during the present winter 2001/2002.

B.Sittler

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

The breeding season for waders at Zackenberg Research Station in Northeast Greenland started with close to average conditions, i.e. moderate snow cover and sunny 24-hour days. So, the birds prepared for egg-laying in mid-June with the first Sanderling *Calidris alba* clutch initiated on 10 June as the very earliest found. But from 13 to 21 June poor weather prevailed culminating in a genuine snowstorm on 16 June. The ground was covered with about 10 cm of new snow that took 1-2 days to melt in the lowland, but about a week on the higher slopes, where the cover may have been considerably thicker.

The result was devastating for the waders. Many birds gathered in flocks on the few snow free feeding sites, and several eggs were found scattered on the ground – many more may have been found by foxes and skuas. One Dunlin was found dead, but again the skuas may have "cleared the ground" before we had a chance to find anything. Out of a total of 43 clutches and broods found during the season – the lowest number since the very first year – only one Common Ringed Plover, three Sanderling, one Dunlin and one Ruddy Turnstone clutch had been initiated before or during the snowstorm, and some of these held reduced clutches of down to one and two eggs. The others were either initiated shortly after the storm or (most) were replacement clutches initiated 6-12 days after the loss of the original clutch. A Ruddy Turnstone clutch initiated around the storm was incubated for about 32 days and held no embryos.

Apparently, most Sanderlings and Dunlins produced replacement clutches, while only about one third of the Ruddy Turnstones apparently did so. To what extent the Red Knots *Calidris canutus* relaid is unknown, but this was the species with most birds seen in flocks (up to 33 in one group) during the inclement weather period.

As expected, numbers of lemmings were building up this year; 10 individuals were seen by one observer.

At least 19 pairs of Long-tailed Skuas and two pairs of Snowy Owls produced eggs, and three Arctic Fox dens inside the valley held pups. Predation on wader nests was at least 30%, which is at the upper end of the range found so far. This doesn't include nests depredated before being found. So, our data do not support the "alternative prey theory", i.e. that waders and other tundra nesting birds escape nest and young predation in lemming rich years. Foxes seem to search for and eat whatever they find edible, and predation on bird nests is more likely to be primarily a function of "fox effort" per area square, and hence, the variation in nest and young predation a result of fluctuating fox numbers and reproduction.

In spite of all this, the numbers of juvenile waders recorded during counts in the deltas at the coast every third day during August pointed to a good breeding season in central high Arctic Greenland. Even Ruddy Turnstones appeared in good numbers, so the snowstorm may not have had the same effect in other parts of the region.

H.Meltofte

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

Meltofte, H. 2001. Wader Population Censuses in the Arctic: Getting the Timing Right. Arctic. **54**: 367-376.

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

BIRD BREEDING CONDITIONS IN THE ARCTIC IN 2001

Pavel S. Tomkovich & Mikhail Y. Soloviev

Reproductive performance of birds everywhere depends on multiple factors. However, in the Arctic and Subarctic, where biodiversity is reduced and abiotic conditions are extreme compared with temperate regions, reproductive success shows annual fluctuations of high amplitude, depending primarily on predation pressure on eggs and chicks, as well as on the weather regime. Information received from 68 localities (see above) allowed us to assess the breeding conditions of birds in the Arctic circumpolar region in 2001. The data available for analysis differed in completeness and had an irregular geographical distribution. Factors affecting bird reproduction and the pattern of breeding success could be revealed most clearly for those regions from which many complementary reports were received, and in which intensive quantitative studies of nesting success were undertaken, at least for some bird species. Such an optimal combination of circumstances occurred within large regions of the south of Yamal, part of Taimyr, Wrangel Island in Russia and the west of Alaska in America. Reliable information on local conditions was available from other regions, but it could not be considered representative of a wider area. The geographic distribution and season-specific factors affecting bird reproductive success in the Arctic in 2001 are discussed below.

Weather and other abiotic factors

The map of deviations of monthly mean air temperatures for June 2001 from the average over the last 8 years (Fig. 1 on page 47) clearly shows a prevalence of high temperatures in the Arctic at the beginning of the breeding season. These conditions occurred in Europe, Western and Central Siberia, the north of the Russian Far East, the south and north-west of Alaska, around Hudson Bay in Canada and in most of Greenland. Low June temperatures occurred only on part of the territory of Yakutia (between the Lena and Kolyma rivers) in Eurasia, in western Alaska (in particular, on the Seward Peninsula) and in most of the north of Canada (from Alaska to Baffin Island).

Evaluation of spring phenology by respondents generally agreed with the descriptions above of the distribution of air temperature deviations in June. Thus, an unusually late and cold spring was reported from most of Alaska and the north of Canada, while spring was evaluated as early or average almost everywhere in Eurasia. Evaluation by respondents was undoubtedly affected not only by prevailing temperatures, but also by the amount of snow accumulated by spring, as speed of thaw also contributes to the spring timing. For example, spring was late on the Chukotsky Peninsula because of deep snow and despite high June temperatures. In contrast, the small amount of snow in the Indigirka River area (Yakutia) resulted in an early spring despite decreased air temperatures in June. Notably small amounts of snow remained until spring across much of northern European Russia, and was also recorded in eastern Yakutia (Indigirka and Kolyma rivers), Pribilof Islands, and the north Alaska. Also, low water table or absence of flood in spring were reported from these regions. In contrast, unusually deep snow on the Seward Peninsula in Alaska and on Bylot Island in Canada was the main reason for the extremely late thaw and, perhaps, for low air temperatures in June. In some regions (Kola Peninsula, southern Alaska, the south of Hudson Bay), spring starts in May or even in late April, rather than in June, which could potentially contribute to the discrepancy between the June temperature map and phenological reports from respondents.

The map of deviations of monthly mean air temperatures for July 2001 from the average over the last 8 years (Fig. 2 on page 47) indicates the prevalence of a warm or even hot summer in the Arctic. The cold July weather in western Siberia and the north-eastern North America (most of Alaska and the lower reaches of the Mackenzie River) stood out against the general pattern. The locality reports generally agreed well with the above picture, and summer 2001 was evaluated either as warm and, most often dry, or as cold, while intermediate grades were almost absent.

Extreme events were reported from some regions, which affected or could affect the reproductive performance of birds. The above-mentioned unusually late spring in western Alaska caused pronounced decrease of numbers and, probably abandonment of nesting by some species of birds (plovers, Bar-tailed Godwits and divers), as well as delayed reproduction in others. In the Zackenberg area of north-east Greenland, the return of cold weather and winter conditions in mid-June after the start of wader breeding resulted in most clutches perishing and then birds re-nesting. Reproduction by some species (Turnstone, Knot) was, probably, entirely disrupted by this event. Adverse weather in the Karrak Lake area in Canada caused abandonment of nests by geese and relatively low breeding success. Sudden and prolonged cooling and stormy weather at the end of July on Yamal and western Taimyr had a pronounced negative impact on the survival of chicks in many species. Death of chicks was documented in Peregrine Falcons, Merlins and Rough-legged Buzzards on Yamal. Cold rains in late June in Bolshezemelskaya Tundra (north-eastern Europe) occurred during the main hatching period for some wader species and could adversely affect their breeding success.

Rodent abundance

Predation pressure on eggs and chicks of ground-nesting birds is often believed to depend on the abundance of rodents (lemmings and voles), as alternative prey for predators. Fig. 3 on page 48 demonstrates the prevalence of low rodent numbers in the Arctic in 2001. Lemmings peaked locally at only a few sites: on Novaya Zemlya, south Wrangel Island and one point in the lower reaches of the Kolyma River. Information about high numbers of Norwegian Lemmings (*Lemmus lemmus*) in some localities in Scandinavia remained unconfirmed. Average lemming numbers, sometimes reflecting just the local situation, were reported from many sites: Vaigach Island, eastern Taimyr, Lena River delta, Indigirka River, lower reaches of the Kolyma River, Wrangel Island, northern Alaska, Karrak Lake area and Bylot Island (Canada) and

Greenland. Populations were low or decreasing on eastern Taimyr, in the Lena delta, Indigirka, eastern Chukotsky Peninsula, Barrow area (north Alaska) and Kent Peninsula in Canada. In contrast, an increasing trend was reported from Bolshezemelskaya Tundra, one site on southern Yamal and north-east Greenland.

Rodent numbers reached high or average levels for different species of voles in various southern-most localities: Yamal, lower reaches of the Lena and Kolyma rivers, the south Chukotsky Peninsula and Karrak Lake (Fig. 3 on page 48). Vole numbers increased to different degrees on the Kola Peninsula, Bolshezemelskaya Tundra and southern Yamal. Widespread decreases of vole populations were apparent in the west Alaska and on the south Chukotsky Peninsula, after having peaked for two previous years.

Predators

The distribution, numbers and breeding of predators, as in previous years, was closely related to the abundance of rodents. Arctic Fox is among the most important predator affecting the reproductive performance of tundra birds. Large-scale breeding of Arctic Foxes was not recorded anywhere in 2001, with the exception of St. Paul Island where Arctic Foxes rely mostly on food from the littoral zone, while rodents are absent (Fig. 1 on page 24). Regular sightings of breeding animals or average levels of occupation of fox dens were noted in the regions with high or average numbers of lemmings, and sometimes also voles: Vaigach Island, one site on southern Yamal, Indigirka and Kolyma rivers, Wrangel Island (Russia), Karrak Lake (Canada) and Zackenberg area (Greenland). Sporadically, Arctic Foxes bred in regions with low or even very low lemming numbers. However, breeding of Arctic Foxes is uncommon in the regions with low rodent populations, and even in those sub-arctic regions with high numbers of voles. Non-breeding Arctic Foxes were numerous only in western Alaska, where lemming and vole populations crashed across the board. Elsewhere, Arctic Foxes were common, rare or not recorded. Arctic Fox mortality during winter was reported from the deltas of the Lena and Yukon-Kuskokwim rivers, i.e. regions of decreasing to low rodent populations.

Owls were seen in most localities, among which southern sites usually yielded records of Short-eared Owls, and northern sites Snowy Owls. Snowy Owls definitely bred in 2001 only on Wrangel Island and in north-eastern Greenland, and allegedly on the north Gydan Peninsula (western Siberia), while Short-eared Owls bred in the regions of high vole density in the lower reaches of the Ob' River. Owl species breeding on the Kanin Peninsula and in the lower reaches of the Kolyma River were not determined. Non-breeding owls were common on Vaigach Island (Snowy) and in the lower reaches of the Ob' River (Short-eared), while elsewhere observations of owls were sporadic (Fig. 2 on page 25).

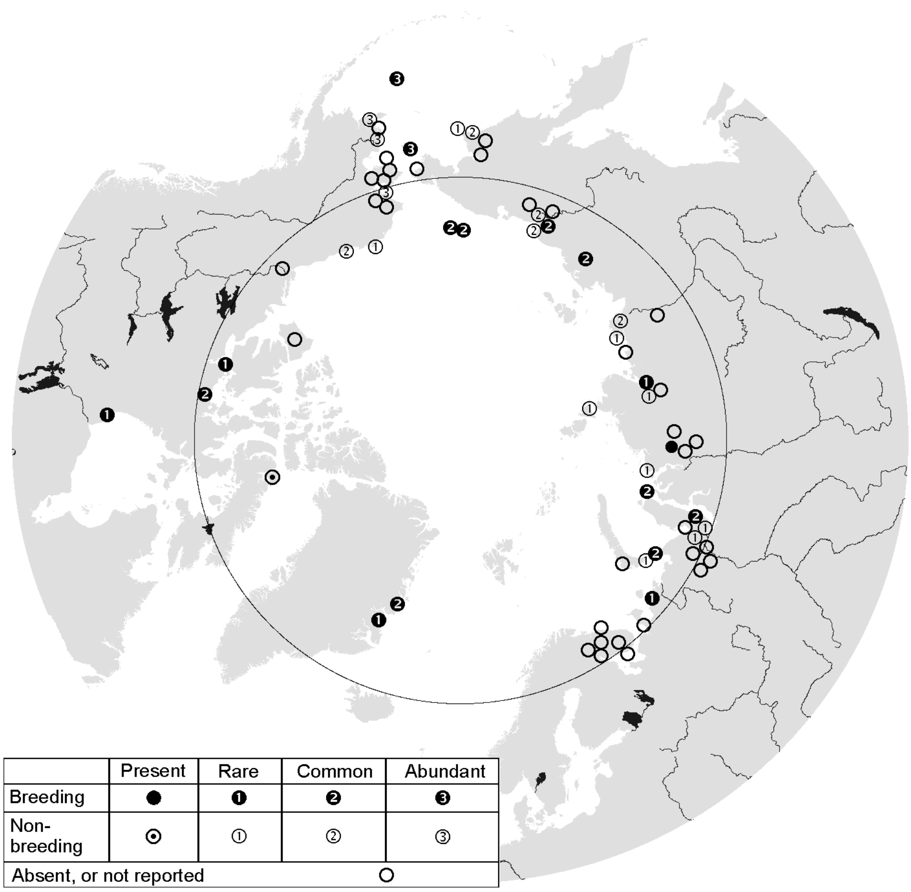

Figure 1. Abundance of Arctic Foxes in the Arctic in 2001

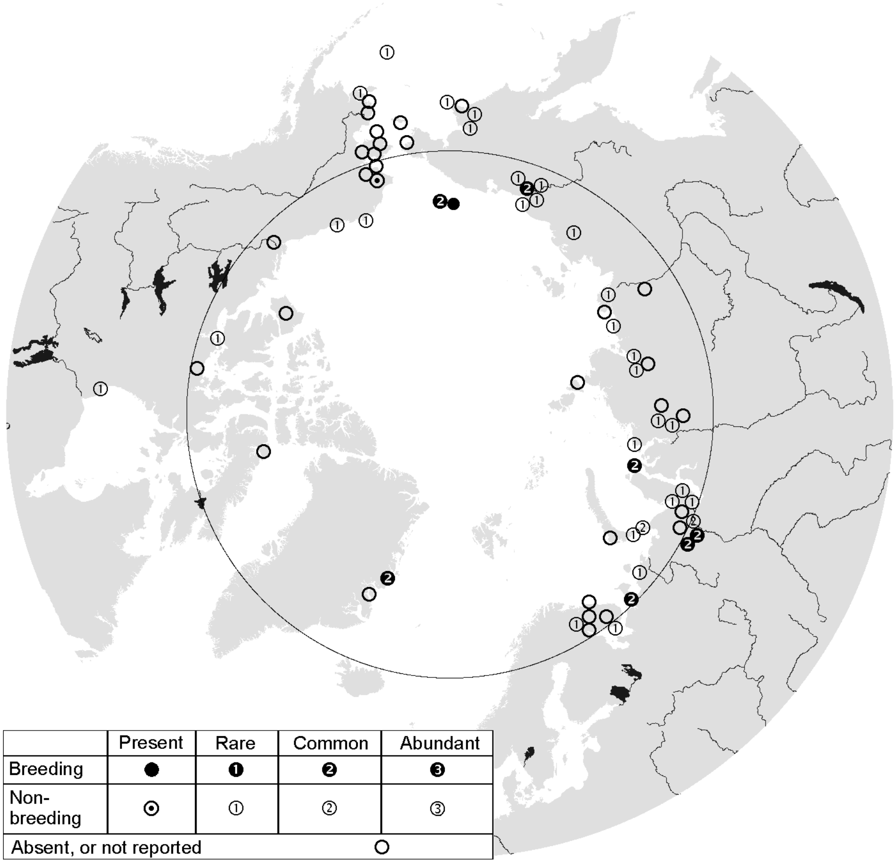

Figure 2. Abundance of owls in the Arctic in 2001

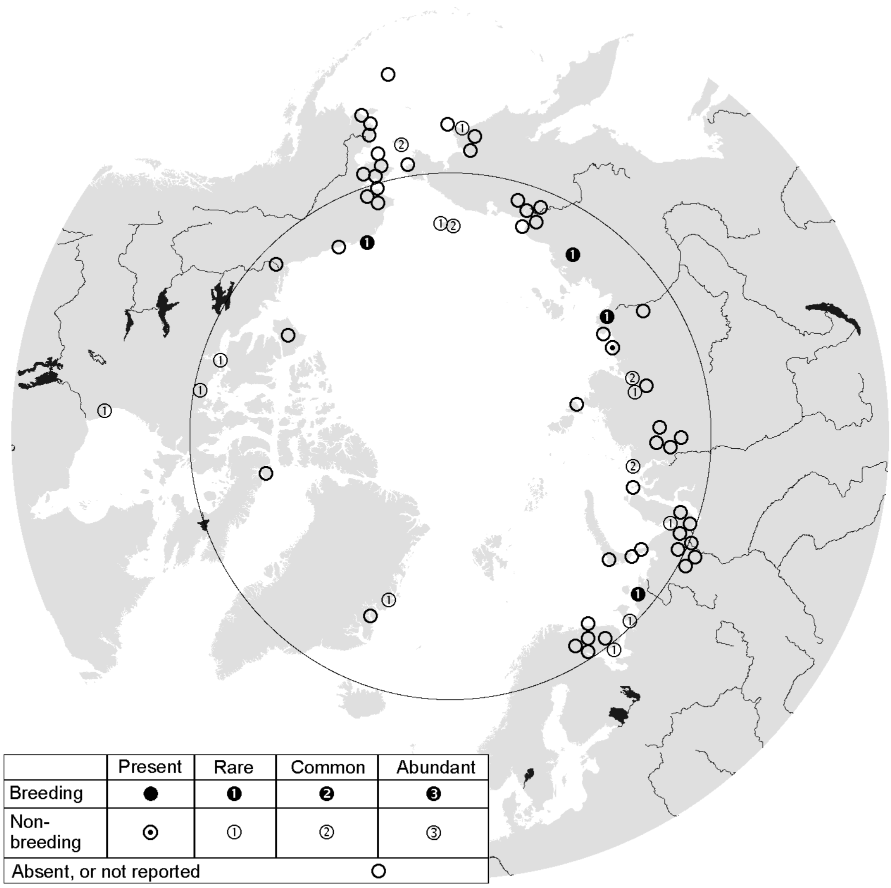

Figure 3. Abundance of Pomarine Skuas in the Arctic in 2001

The Pomarine Skua is a rodent-specialist, like the Snowy Owl. Judging by the map of species status, Pomarine Skuas did not breed across most of their range in 2001 (Fig. 3 on page 25). Solitary nesting was reported, at just 4 sites: Lena delta, Indigirka, Cape Barrow and Malozemelskaya Tundra. Locally moderate lemming numbers were maintained at the 3 former sites, while there was no compelling evidence of breeding at the latter site. Pomarine Skuas prepared to breed on Wrangel Island, but gave up before egg-laying. Non-breeding Pomarine Skuas are mostly sea-bound and normally rare in the tundra, where numbers at best can be subject to short-term increases. It is notabe that some areas with average or low rodent populations were used for breeding by Snowy Owls, but not by Pomarine Skuas, and vice versa. Apparently the two tundra predators with the most pronounced specialization on rodents respond differently to changes in rodent numbers.

High numbers of Long-tailed Skuas and Rough-legged Buzzards were also typical in 2001 in those areas with increased rodent abundance, namely one site on southern Yamal and the lower reaches of the Kolyma, in the case of skuas, and Vaigach Island and the lower Lena River, in the case of buzzards. Both species were reported as being common at many sites, but the status of skuas remained unknown in most cases. Rough-legged Buzzards were common and bred in localities with high, average and even low rodent numbers, but the latter option resulted in the apparent shortage of food and high mortality of chicks in nests (e.g. in Bolshezemelskaya Tundra and north-western Taimyr). Usually, breeding was initiated by only a small proportion of the Rough-legged Buzzard's population when food resources were insufficient (e.g. in the Lena River delta).

Ermines were reported from 4 localities. Polar Bears destroyed clutches in geese, eider and gull colonies on islands in parts of Novaya Zemlya, and predation by abundant Brown Bears presumably led to substantial decrease of reproductive success in eider and gull colonies on the south Chukotsky Peninsula. Red Foxes, rather than Arctic Foxes, were the principal terrestrial predators in some subarctic sites. Breeding Red Foxes were apparently absent from the Velikaya River area on the Chukotsky Peninsula, where rodents were at low levels.

Distribution and numbers of tundra birds

The numbers, distribution and population structure of tundra birds can change, depending on the conditions during the breeding season. An early thaw and warm weather stimulated nesting of Snow Geese on Wrangel Island in higher than usual numbers, including a high proporttion of first-breeders. Early and warm spring weather in the Eurasian tundra could have been expected to allow some bird species to nest farther north than normal, and instances of this were reported. For the first time, breeding by Skylark was recorded on Taimyr, as well as nesting in considerable numbers by Ruffs and Pectoral Sandpipers on the extreme north-western Taimyr. Ruffs, Wood and Common sandpipers penetrated into Bolshezemelskaya Tundra in higher than usual numbers to nest. Golden Plovers were rare in Bolshezemelskaya Tundra and on southern Yamal, which is difficult to explain given increases in the abundance of most waders there. The decrease in numbers of breeding Common Eiders on the coastal barrier islands of the Beaufort Sea was probably due to an autumn storm and the following change in distribution of driftwood used by the birds for nesting. The decreasing trend in nesting colonies of Brent Geese in the Yukon-Kuskokwim Delta was, probably, contributed to by a variety of factors, such as egging by humans, predation and flooding of nest sites in mid June.

Populations of Willow Grouse and Rock Ptarmigan are known to exhibit cyclical fluctuations of a large amplitude. Increased numbers of grouse in many regions of the circumpolar range in 2001 is of notable interest. In particular, a high abundance of Willow Grouse was reported from the Kanin Peninsula, two sites in western Siberia, the lower reaches of the Lena River and Kolyma River, some sites on the Chukotsky Peninsula, sites on the Seward Peninsula and to the north of it. The species numbers were evaluated as average in many localities. Rock Ptarmigans were numerous on the north Gydan and the north-western Taimyr, while the population in north-eastern Greenland was at a low.

Breeding success

Figure 4 on page 48 shows bird breeding success based on explicit evaluation by respondents and/or inference from their unambiguous data. High values prevailed in Eurasia (14 of 25 sites with assigned breeding success), while average (7/25) and low (4/25) combined accounted for only half of the total. All four sites with low success are in western Eurasia, but nearly half of the sites with good success (6/14) also are concentrated there, making the difference between the western and eastern Russian Arctic less pronounced. Good reproductive performance by tundra birds in eastern Siberia is also confirmed by the unusually high juvenile ratios in some wader species on their wintering grounds in Australia (see paper by Minton et. al. in this issue).

The unanimous evaluation of bird reproductive success in western Alaska as low is in accordance with reports about a crash in rodent populations and a marked increase in predation pressure, in combination with a late spring. Respondents also reported low reproductive success in north-west and north Canada, and related it to unfavourable weather conditions and high predation. In particular, goose productivity was substantially reduced by predators on Bylot Island, despite an abundance of lemmings. This was, probably, due to the inability of lemming populations, decreasing after having peaked in 2000, to satisfy the demands of the still numerous predators. Bird reproductive success was not high in the surveyed localities of north-east Greenland due to substantial predation on eggs, but numbers of juvenile waders in autumn concentrations indicated better reproduction elsewhere in Greenland.

Comparison with predictions for 2001

Predictions of bird reproductive success in the Arctic (see “Arctic Birds”, p.22) involved a presumption of 3-year periodicity in cycling lemming populations and related fluctuations in predation pressure. While this system is, probably, correct for Taimyr, rodent cyclicity can be different elsewhere in the Arctic. Thus predictions for 2001 were realized only partly. In the western part of Eurasia (to central Taimyr) local increases in rodent populations were reported for voles, but not for lemmings (possibly, except for Fennoscandia). As predicted, corresponding low numbers of Arctic Foxes allowed successful reproduction by birds, which to some extent was adversely affected by unfavourable weather, in particular in the northern parts of western Siberia.

In the eastern part of Eurasia (from eastern Taimyr to the Bering Strait) lemming populations were expected to crash, with the expected consequence of predators switching to eggs, and low reproductive performance of birds as a result. Lemming numbers actually decreased, but a widespread and rapid crash was not observed. As a result, the distribution of Arctic Foxes and other rodent-specialist predators changed, so that in most areas they found sufficient food resources without having a catastrophic impact on breeding birds. Good reproductive performance of birds followed, particularly for some species, based on Australian data on juvenile ratios. Thus, predictions for this part of the Arctic were not confirmed.

Prediction of a low stage in lemming and vole populations in western Alaska and the associated heavy predation on eggs was fully realized. Being aggravated by a late spring, this scenario resulted in reports of poor reproductive success from breeding grounds in Alaska and in catch data for Bar-tailed Godwits in south-east Australia. The more successful reproduction of waders observed near Barrow in northern Alaska deviated from the general pattern, for unknown reasons.

Numbers of Collared Lemmings started to increase in north-east Greenland as expected, while Ermines dropped to their low. However, numbers of Arctic Foxes were substantial and sufficient to cause a notabe decrease in bird reproductive success there. Observed breeding productivity was lower than expected, but may have been higher elsewhere in the region.

Predictions for summer 2002

Legitimate predictions for summer 2002 are possible for those regions for which there is available information on the dynamics of rodent numbers and related reactions by predators. Based on the assumption of a 3-year cycle, lemming populations can be expected to increase notably, if not to peak, on western Taimyr. Indications of increasing population trends were found in lemmings on Yamal and in Bolshezemelskaya Tundra, where there is also the potential for the area of high vole numbers to spread. Assuming that Arctic Foxes will not increase in abundance, rodent-specialist predators will have sufficient food without impacting heavily on the reproduction of tundra birds throughout an extensive area from north-eastern Europe to western Taimyr. So, good breeding by birds is likely to occur there.

Farther east, in Yakutia, lemming populations will, probably, reach their lowest stage in the cycle. The expected high abundance of Arctic Foxes and their devastating impact on birds in 2001, probably has been delayed to summer 2002. Thus, the chances of good breeding performance by birds in eastern Siberia are poor, and reproductive success may be very low. A protracted, but subdued peak, of lemming numbers on Wrangel Island during the last 3 years should give way to a decrease with the associated increase in bird predation by Arctic Foxes and impairment of nesting success.

Given low populations of small rodents in western Alaska in summer 2002, numbers of Arctic and, probably, Red foxes should decrease rapidly as a result of increased mortality and emigration. This will reduce predation pressure on breeding birds, and they will perform better during the 2002 breeding season than in 2001. Although unclear, it is possible that there will be increased winter mortality of Arctic Foxes on the North Slope in Alaska, followed by fairly good bird reproduction.

In line with the 4-year cyclicity of lemmings in north-east Greenland, rodent numbers will continue to increase and may show local peaks. Arctic Foxes and Ermines will have an abundant supply of food, so their adverse impact on birds will be relaxed and reproduction of the latter will be successful.

The above regional predictions may be modified by poor weather, which usually has a negative effect on bird reproductive success. Summing up, we can expect an average or high proportion of juvenile birds among Arctic migrants on the East Atlantic Flyway and the flyways used by breeders from Alaska in autumn 2002. In contrast, the juvenile ratio will be low on the East Asian-Australasian Flyway, which gathers birds, primarily, from eastern Siberia.

The most simple and informal model of the processes in Arctic biota was employed to produce the above, generalized conclusions. Weather effects cannot be predicted, while the forthcoming stage of the rodent cycle and the associated reaction by predators sometimes are difficult to assess, even in localities with long-term data series available. The remaining sources of variation in the accuracy of the predictions depends on the accuracy and geographical coverage of the underlying data.

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LONG-TERM DYNAMICS OF LEMMING NUMBERS ON WRANGEL ISLAND

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Wrangel Island is one of the largest islands in the eastern part of the Russian Arctic (7,673 km^2), and is situated at 71^{o}N. Two thirds of the island is occupied by mountain ridges up to a maximimum elevation of 1096 m asl, extending east to west between the plains to the north and south. Pronounced ruggedness of relief and interception of the prevailing cold winds by the mountains determine substantial differences in local climatic conditions in different parts of the island. For instance, the mean July temperature is +2.4°C on the southern coast of the island, while the temperature in inland localities is significantly higher at +8 to +10°C (Alexandrova 1977). It is noteworthy that surface glaciation is almost entirely absent due to the generally continental climate (Petrovsky & Yurtsev 1970, Stishov et al. 1986).

Vegetation on Wrangel Island belongs to a separate Wrangel sub-type of arctic tundra, characterized by unique floristic richness and high diversity of plant communities for such a high latitude, including relict communities of tundra-steppe and steppe types (Alexandrova 1977, Yurtsev et al. 1978, Yurtsev 1981, Petrovsky 1988). Many peculiar features of the island biota along with its diverse conditions are explained by its development within the vast Beringian land, which was not affected by surface glaciation, and by periodic island isolation. Final separation of the island from the continent happened in the early Holocene when Pleistocene landscapes started to transform into tundra landscapes of the present type. According to the opinion of V.V.Petrovsky and B.A.Yurtsev (1970) the present insular landscape of Wrangel is most similar to landscapes prevailing in the late Pleistocene on the drained continental shelf.

Two species of lemmings, Vinogradov's Lemming *Dicrostonyx vinogradovi* and Siberian Lemming *Lemmus sibiricus portenkoi*, are the only rodents inhabiting the natural habitats on Wrangel Island. Vinogradov's and Siberian lemmings on Wrangel Island are reproductively isolated from respective continental forms of the Chukotsky Peninsula and differ significantly from them karyologically (Chernyavsky & Kozlovski 1980, Pokrovsky et al. 1984). Colonization of Wrangel Island by lemmings, probably, occurred by different routes and at different times. Certain important characteristics of Vinogradov's Lemmings are apparently similar to those of "north-American" type, and according to the hypothesis of Chernyavsky & Kozlovsky (1980), their ancestors could have come to the island through the northern part of the continental shelf from Alaska, skipping the Chukotsky Peninsula. According to morphological and cytogenetic criteria, the local subspecies of the Siberian Lemming has a Palearctic origin and colonized the island from the west, approximately at the same time as Siberian Lemmings colonized the New Siberian Islands (Chernyavsky et al. 1993).

In the snow-free period, Vinogradov's Lemmings inhabit dry scree slopes of hills and river and stream terraces with rather sparse but species-rich plant communities dominated by shrubs (*Salix* and *Dryas* genera), grasses and herbs. Siberian Lemmings prefer habitats characterized by moderate or excessive wetting and relatively dense vegetation, necessarily including lush feedstuff – grasses and herbs. However, spatial segregation of two lemming species on the island is not complete, and a wide range of habitats is inhabited by both species.

Rodent-specialist predators on the island are represented by Arctic Fox *Alopex lagopus,* Snowy Owl *Nyctea scandiaca,* Pomarine *Stercorarius pomarinus* and Long-tailed *St. longicaudus* skuas (Dorogoi 1987).

Dynamics of lemming numbers

Periodic pronounced fluctuations of lemming numbers on Wrangel Island, determining to large extent the state of populations of other inhabitants of the tundra, became apparent to the first researchers on the island. The earliest known allusion to extremely high peaks of lemming numbers on the island was made by Mineev (1946). He noted that during the 5 years of his stay on the island (1929-1933), the abundance of lemmings allowed owls to winter only in 1931/1932, while «in summer numerous lemmings were trampled by people when walking in tundra». Judging by the high numbers and successful nesting of Snowy Owls on the island in 1938-1939 (Portenko 1972), lemming abundance in these years was average or high. S.M.Uspensky found that many owls nested on the island in 1959, but in 1960 they abandoned breeding due to low lemming numbers (citation in Portenko 1972).

Reasonably complete recording of lemming dynamics on Wrangel Island was started from mid 1960s. Numbers of the two lemming species were average in 1964 (Chernyavsky 1969). This author reported the density of inhabited burrows of Vinogradov's Lemming to be 2-6/ha, and of Siberian Lemming as 8-11/ha. Flint (1977) also characterized lemming numbers as average in 1964, and noted little change in 1965. But 1966 was "rich with lemmings" (Belayev & Shamurin 1967). Catching of Vinogradov's Lemmings after digging out burrows yielded densities of 22 to 50 animals/ha, while total density of the two lemming species in the most favorable habitats could reach 150-180 animals/ha.

Data on the state of lemming populations in 1967 and 1968 are not present in the literature, but lemming numbers in these years can be considered low based on the further dynamics. E.V.Syroechkovsky (pers. comm.) used visual evaluation to characterize numbers in 1969 as not exceeding the average, while the very high peak in 1970 was followed by a decrease to the average level in 1971. Noteworthy is a different point of view, accrediting the peak of lemming populations not to 1970, but to 1971 (Kretchmar & Dorogoi 1981). This conclusion was based on comparison of visual evaluations of lemming numbers during periods of snow melt between 1970 and 1971.

However, long-term analysis of reproductive parameters of Snowy Owls on the island (Litvin & Baranyuk 1989) indicated that food supply for owls in summer 1971 was inferior compared with 1970 and typical for a period of average lemming numbers and the start of the decreasing phase of the population. Accordingly, 1970 should be considered the peak year.

Large-scale studies of various features of lemming biology, including regular counts of numbers as a principal component, were carried out on Wrangel Island in 1972-1980 under the leadership of F.B.Chernyavsky, as part of the zoological expedition of the Institute of Biological Problems of the North (Far-East Science Center of the USSR Academy of Sciences). Results were summarized and thoroughly analyzed in a well-known monograph (Chernyavsky & Tkachev 1982). Counts of relative lemming numbers using lines of snap-traps was the principal survey technique. Snap-traps with platforms were installed near burrow holes and on paths at a distance of 5 m. Every line was exposed for two days, and traps were checked daily. In addition, counts of lemmings were conducted using excessive numbers of traps on naturally enclosed patches of tundra. The same techniques were employed in 1981-82 by Dorogoi (1987) during studies of the impact of rodent-specialist predators on the dynamics of lemming numbers. Figure 1, shows the relative numbers of lemming populations in 1972-1982, based on maximum values of relative numbers provided in the above-mentioned publications.

The State Reserve "Wrangel Island" was designated in 1976 and included the whole island. Counts of relative lemming numbers were carried out from 1982 to 1985 as part of the reserve's "Archives of nature" program. Judging by the raw data available in the reserve's archive, the counts did not represent a simple continuation of the previous studies as the technique employed (study terms and regions, line exposure duration) was slightly different. However, we decided to present the results of the 1982-85 studies in Fig. 1 along with the 1972-82 series, using maximum values of relative lemming numbers published by Denisenko (1986) and submitted by the same author to "Archives of nature" (1985). Visual evaluation of lemming numbers along with observations of breeding success of rodent-specialist predators (Litvin & Baranyuk 1989, Litvin & Ovsyannikov 1990) generally agree with count results, with a single discrepancy related to 1983-84. The latter research indicated that numbers were low in 1984, while counts indicated the lowest numbers to have occurred in 1983 with an increase starting in 1984 (Denisenko 1986). The most likely explanation for this apparent contradiction is the start of lemming population growth from late summer 1984, too late to influence the breeding conditions of rodent-specialist predators.

Direct counts of rodent numbers on the island were not fulfilled in 1986 due to the absence of a dedicated researcher, but visual observations indicated peak populations ("Archives of nature" (1986)). However, the distribution of nesting Snowy Owls indicated that there were pronounced differences in food supply in different parts of the island (Litvin & Baranyuk 1989). The highest nesting density and clutch size of Snowy Owls were observed in the south-west of the island, and the lowest in the north-east. In contrast, high numbers of lemmings and related high productivity of owls were recorded in 1987 in the north and north-east of the island, decreasing elsewhere (Litvin & Baranyuk 1989). According to visual observations by A.P.Strelkov, in the area of high lemming numbers average density of Vinogradov's Lemming in 1987 was 26 animals/ha, and of Siberian Lemming 24 animals/ha ("Archives of nature" 1987). Unfortunately the counting method is not described in the text.

Direct counts of lemmings were not carried out on the island in 1988. Evaluation of the state of populations based on visual observations and breeding success of rodent-specialist predators differed significantly among researchers. V.V.Baranyuk reported that lemming numbers decreased almost everywhere after the thaw, remaining high until the end of the summer in a few localities in the south and centre of the island ("Archives of nature" 1988). According to the opinion of Menyushina and Ovsyannikov (1991), lemming numbers peaked in 1988 and reached a level comparable with the peaks in 1976 and 1986. However, this opinion is not supported by either the general pattern of lemming numbers in previous and subsequent years or by the later publication in which Ovsyannikov (1993) characterized numbers as low, typical for the trough of a lemming cycle.

Our own research of lemming biology on Wrangel Island was carried out from 1989 to 1998. Considering counting with snap-traps to be inappropriate in the reserve we obtained data on lemming numbers primarily using mark-recapture methods on plots and counting along lines of live-traps. Bait was not put in the specially constructed live-traps that were used for trapping (Schipanov 1987). Traps were placed near burrow holes and on paths between holes at a distance of 10 m on plots and 5 m apart along transect lines. Traps on plots and lines were checked 5-6 and 3 times a day, respectively. My experience indicates that this density of traps allowed us to catch nearly all resident lemmings during three days. Visual evaluation of lemming numbers using a 5-rank scale (Travina 2001) was employed in addition to catches to assess the situation in different regions of the island.

In 1989 the population of lemmings was low across the whole island. Lemming numbers in subsequent years are illustrated in Fig. 2, based on the results obtained from two permanent plots, occupying different habitats and inhabited primarily by Vinogradov's Lemmings (plot A, 2 ha) and Siberian Lemmings (plot B, 1 ha), respectively. The index of lemming numbers on a plot is derived by summing the number of residents and average number of migrants, crossing a plot daily. The data refer to the period of time with the most stable lemming population, between the end of spring movements of animals and the emergence on the surface of young from summer broods.

Maximum values of relative lemming numbers in 1993-1998 obtained using stationary lines of live-traps are plotted on Fig. 1 to allow comparison, although to some extent restricted, with the available data for 1972-1985. Indices of relative lemming numbers obtained using live-traps may be overestimates compared with snap-trap data due to the frequent checking of live-traps.

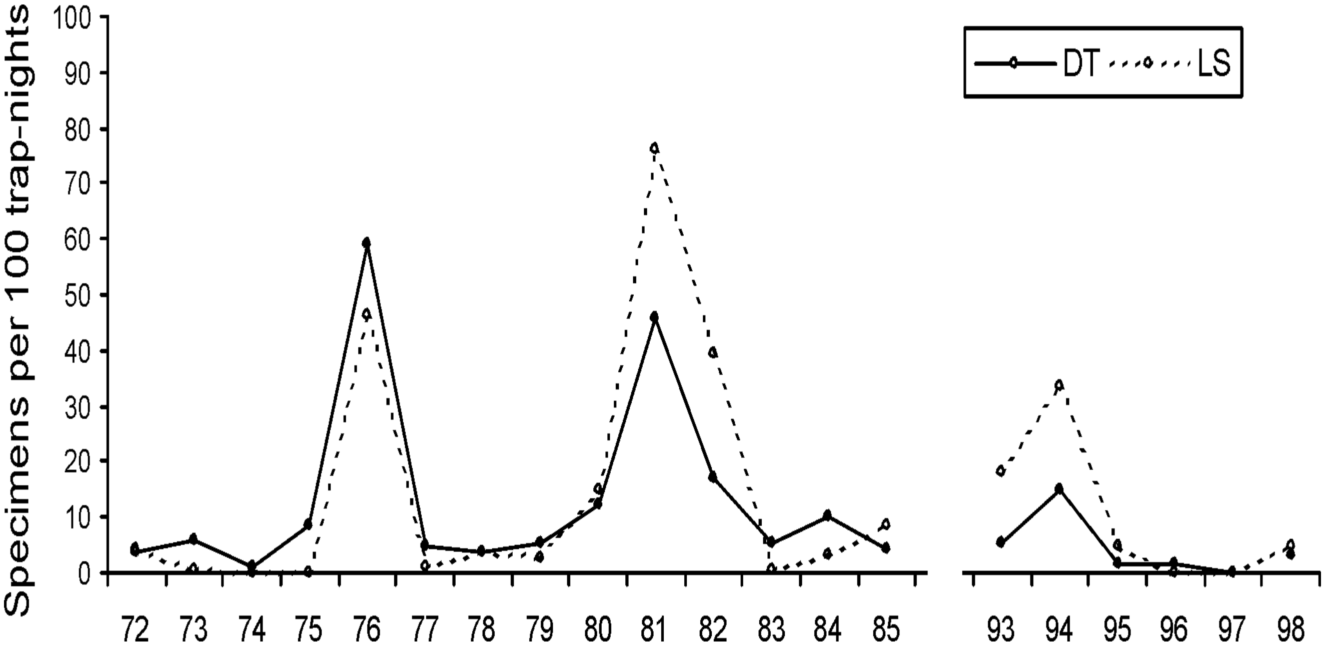

Figure 1. Dynamics of relative numbers of lemmings *D. vinogradovi* (DT) and *L. sibiricus* (LS) in 1972-85 and 1993-98, based on data of different researchers (details in the text).

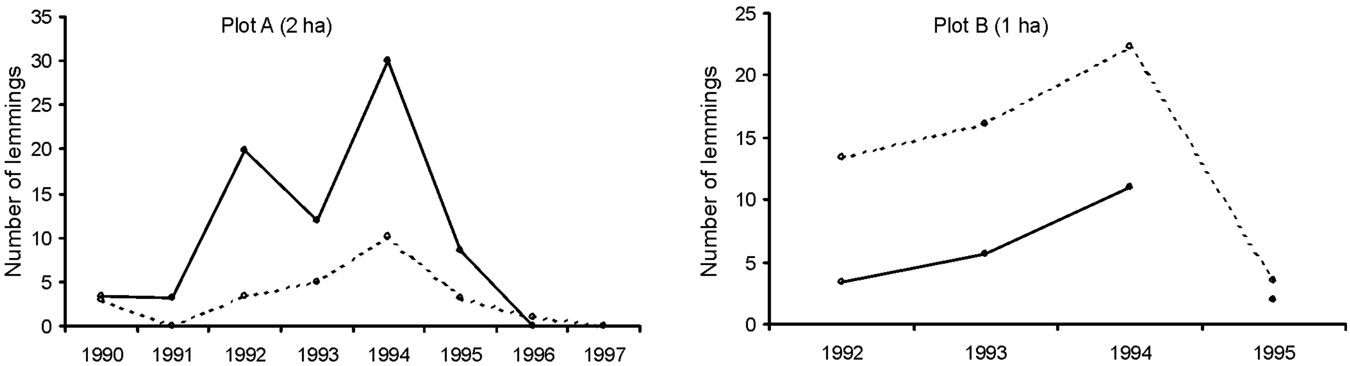

Figure 2. Dynamics of absolute numbers of lemmings *D. vinogradovi* (DT) and *L. sibiricus* (LS) on mark-recapture plots in 1990s.

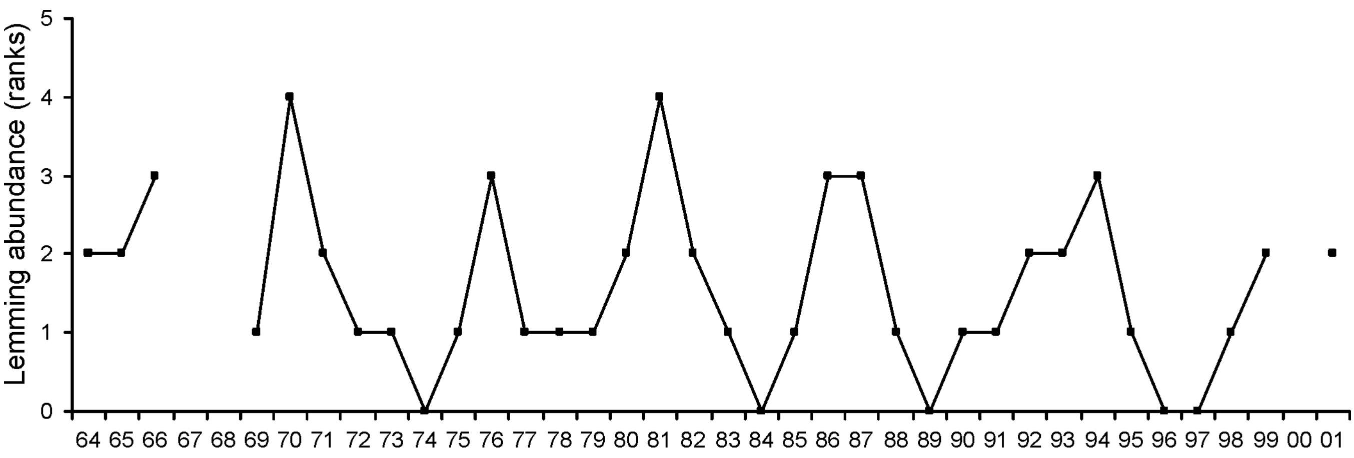

Figure 3. Dynamics of total numbers of lemmings *D. vinogradovi* and *L. sibiricus* on 5-rank scale in 1964-1999 (0 – very low, 1 – low, 2 – average, 3 – high, 4 – very high).

After 1998, the reserve authorities for "Wrangel Island" considered special studies of lemming biology to be no longer a priority, and direct counts of lemming numbers were discontinued. Based on the results of visual evaluation, lemming numbers in 1999 were average in the central parts of the island, with a tendency towards population increase (V.V.Baranyuk, I.E.Menyushina, pers. comm.). The situation in 2000 was ambiguous as V.V.Baranyuk (pers. comm.) reported a decrease in lemming numbers to a low level, while I.E.Menyushina (pers. comm.) reported average but increasing numbers. In 2001, V.V.Baranyuk and I.E.Menyushina (pers. comm.) reported that lemming distribution across the island was extremely uneven, but in general numbers were average.

Discussion

The available data allow an assessment to be made of the dynamics of lemming numbers on Wrangel Island from 1964 to 2001 with a high degree of certainty. Direct counts of lemmings are not available for every year. However, almost all researchers whose data were used in the current review (including those employing direct methods of counts) characterized the state of lemming populations using a scale from "very low" to "very high". All existing contradictions in the evaluation of lemming numbers were discussed above, and combined data on numbers are presented in Fig. 3 using a 5-rank scale. Data for the two species were combined, because separation of species was not always possible if direct counts had not been conducted. Thus, the figure is only able to show a generalized pattern of the dynamics of lemming populations (which are slightly different between the two species), but this agrees rather well with the feeding conditions and productivity for rodent-specialist predators on the island in different years.

Figs. 1-3 show that for both lemming species peaks numbers were recorded on Wrangel Island in 1966, 1970, 1976, 1981, 1986-87 and 1994. Two peaks (in 1970 and 1981) were especially high, while the last peak in 1994, in contrast, was low.

Agreement has not been reached regarding the possible range of density values for lemmings at peak population levels. Absolute counts on naturally enclosed patches of tundra in 1981 yielded a density of Siberian Lemming reaching 800 animals/ha, and of Vinogradov's Lemming reaching 350 animals/ha (Dorogoi 1987). Application of the same technique in 1976 also provided rather high values: 308 and 245 animals/ha for the two species, respectively (Chernyavsky & Tkachev 1982). Values of lemming density obtained by Belyaev and Shamurin in 1966 by digging out inhabited burrows were significantly lower (see above). Our 1994 data, based on recapturing marked lemmings gave values an order of magnitude lower (Fig. 2) compared with 1976 and 1981 values. In my opinion, this discrepancy is explained not only by the high variability of peak numbers but also by the application of radically different techniques for the evaluation of lemming density in different years. Thus the problem of peak density remains unresolved.

Duration of the peak stage in both lemming species did not exceed one year with the exception of the 1986-1987 peak. However, K.E.Litvin and V.V.Baranyuk (1989) characterized this peak as a wave spreading through the island from south-west to north-east. These authors also mentioned that lemming numbers had been decreasing gradually during the two years after "high" peaks in 1970 and 1981, while in other cases numbers dropped more rapidly to low values by the summer following a peak summer.

Despite the temporal coincidence of peaks for the two species of lemmings, patterns of their cycles differed substantially. Prolonged periods of low numbers (up to 3 years) followed by a rapid increase in population size to a maximum value during one period of under-snow reproduction (for example, before the peak in 1976) was characteristic for Siberian Lemmings, according to Chenyavsky (Chernyavsky & Tkachev 1982). In contrast, low numbers of Vinogradov's Lemming were normally restricted to one year, after which numbers gradually increased. However, according to our data, the very low phase continued for two years in both species of lemmings after the peak of 1994.

All rapid changes in lemming numbers on Wrangel Island normally occurred under snow (Chernyavsky & Tkachev 1982). Summer reproduction usually did not result in increases of lemming numbers, at best compensating for mortality in older age cohorts. This probably results from the fact that young of summer broods in both species of lemmings on the island, regardless of the phase of the population cycle, do not reach maturity before the end of the snow-free period (Chernyavsky & Tkachev 1982, our data).

Do lemming numbers change synchronously on the whole of Wrangel Island? It was thought that changes were synchronous until the 1986-87 data demonstrated that lemming numbers and cycle phases could differ in different parts of the island (see above). This conclusion was based on indirect data. However, an increase of numbers which started in 1990, in particular in Siberian Lemmings, was followed in 1991 by a decrease to very low levels in central and northern parts of the island, while stable growth in the south was confirmed by trapping data (Travina 1999). Currently, we suspect that phase differences in different parts of the island do not exceed one stage of the cycle.

While many studies have focused on population cycles of lemmings on Wrangel Island, a number of problems remain unresolved. The lack of knowledge about the state of lemming populations on the island in the last few years is the most important of these problems. Available data indicate between-peak intervals in central parts of the island were 3, 5, 4, 5 and 7 years. As lemming populations did not peak in 2001, the most recent period of low numbers and increase has continued for 7 years, and the last peak in 1994 was also of relatively low amplitude. It is not clear whether prolonged periods of low numbers and decreased amplitude of peaks represents a temporal phenomenon or reflects certain global changes in the biota of Wrangel Island. Dedicated studies of lemming populations are required to answer this question.

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LEMMING CYCLES IN NORTH-EAST GREENLAND

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The circumpolar range of lemmings includes Greenland, but only the Collared Lemming (*Dicrostonyx groenlandicus*) is present there, and it inhabits the north eastern ‘corner’ (Fig. 1). Biogeographic constraints were the reason why only the collared lemming was able to reach the island by crossing the narrow street between Ellesmere and NW Greenland north of 80° N, whereas no such pathway was possible to *Lemmus trimucronatus* or any other small rodent that could theoretically have come from Baffin Island or Labrador.

It is believed that this colonisation in Greenland antedates the Wisconsin glacial period (Macpherson 1965) and that the Collared Lemming survived in an ice free refugia in Peary Land prior to achieving a subsequent recolonization following the retreat of the ice sheets during the present post glacial period.

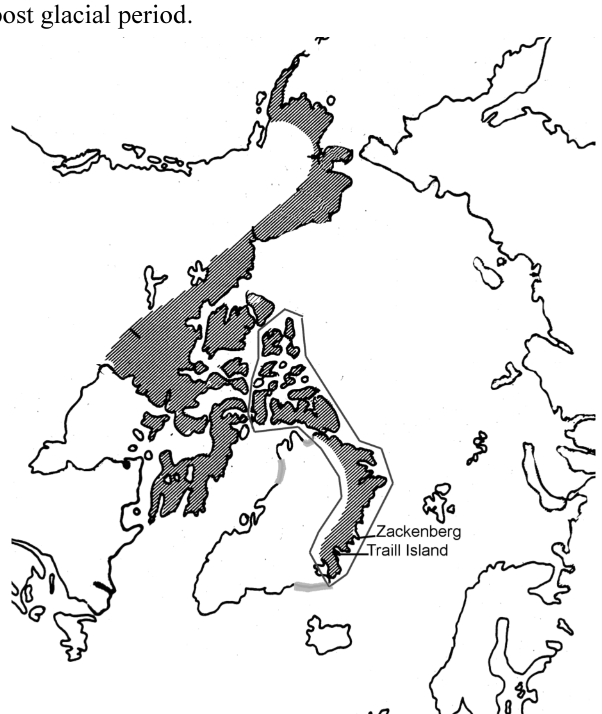

Figure 1. Distribution of Collared Lemmings (*Dicrostonyx groenlandicus*), the only microtine rodent present within the framed area. Traill Island and Zackenberg are the two long-term monitoring localities. Shaded coast lines denote biogeographical barriers that prevent migration southward.

The Humbolt glacier and the glaciated coastline of Melville Bugten however prevented them from spreading south along the west coast, whereas on the eastern coast their dispersal came to a halt north of the glaciated Blosseville coast around 69° N (Fig. 1).

As a result, the lemming population of Greenland is one of the most isolated in the world. Their range includes mainly polar desert and semi-desert habitats scattered between inland ice and the coastline and the deeply indented system of fjords. These may act as natural barriers in summer time but, especially in spring, migrating lemmings may use their frozen surface. Vegetation, when present, belongs to high arctic tundra, is generally sparse and mostly concentrated in the lowlands with great differences in cover depending on site conditions. Large tracts of the landscape support no vegetation at all, especially north of 75ºN.

The presence of lemmings is the reason why the faunistic assemblage also includes their typical predators like the Stoat *Mustela erminea*, the Snowy Owl *Nyctea scandiaca* and the Long-tailed Skuas *Stercorarius longicaudus*, all of them breeding nowhere else in Greenland.

Strong fluctuations

Marked differences in the abundance of lemmings were noticed by the first explorers (Bay 1894, Nathorst 1900, Jensen 1904) to visit this part of Greenland, at the turn of the 19th century. However, the fluctuating patterns were first reported by Manniche (1910) who travelled for over three years in succession as a member of the Great Danish North East Greenland expedition. His observational notes were mainly collected on sledge journeys or around summer field camps and as a result, patterns described may not have concerned the same population (surveys covering areas separated by more than 200 km).

There was a noticeable increase in observations from the late 1920s onwards, as North East Greenland attracted fur trappers from Denmark and Norway. As their activity focused mainly on Arctic Foxes and they maintained a continuous presence for more than two decades in the areas between 70° and 75° N, their observations provided valuable views about the lemming situation. Information on the abundance of lemmings was derived chiefly from direct sightings or through observations on the breeding status of foxes and Snowy Owls that were reported from the trapper parties scattered over the whole area. As trappers were also afield in the snowy season, they could provide some valuable information on life history of lemming in wintertime. These observations have been synthesized by A.Pedersen whose fauna reports (1926, 1930, 1934 & 1942), published at intervals of a few years, clearly document the high and lows in the lemming population, together with some information about trends on a regional scale. They revealed the cyclicity of abundance, with outbreaks at intervals of 4 or 5 years, pointing also to the deep lows when the presence of any lemmings was hardly noticed. Some indications of synchrony became apparent, such as the high peak of 1936 that was noticed over a larger range, but the previous peak apparently did not occur in the same year (1932/1933) in two adjacent regions.

After World War II and the termination of the trapping activity in the early 1950s, information became available through various biological expeditions, but as a rule these were mostly of short duration, lacking any continuity at a given place. Johnsen (1953) documented the occurrence of lemmings in the northernmost region between 1947 and 1950, suggesting that lemmings in these less productive habitats also may undergo great fluctuations in abundance.

Progress in knowledge on lemmings was achieved as a result of de Korte's intensive studies on Long-tailed Skuas in the 1970s on Jameson Land (de Korte 1977, 1984, 1988). His review (de Korte & Wattel 1988) on lemming abundance in NE Greenland also clearly revealed the cyclical patterns in lemming abundance, with periodicity of 4 to 5 years.

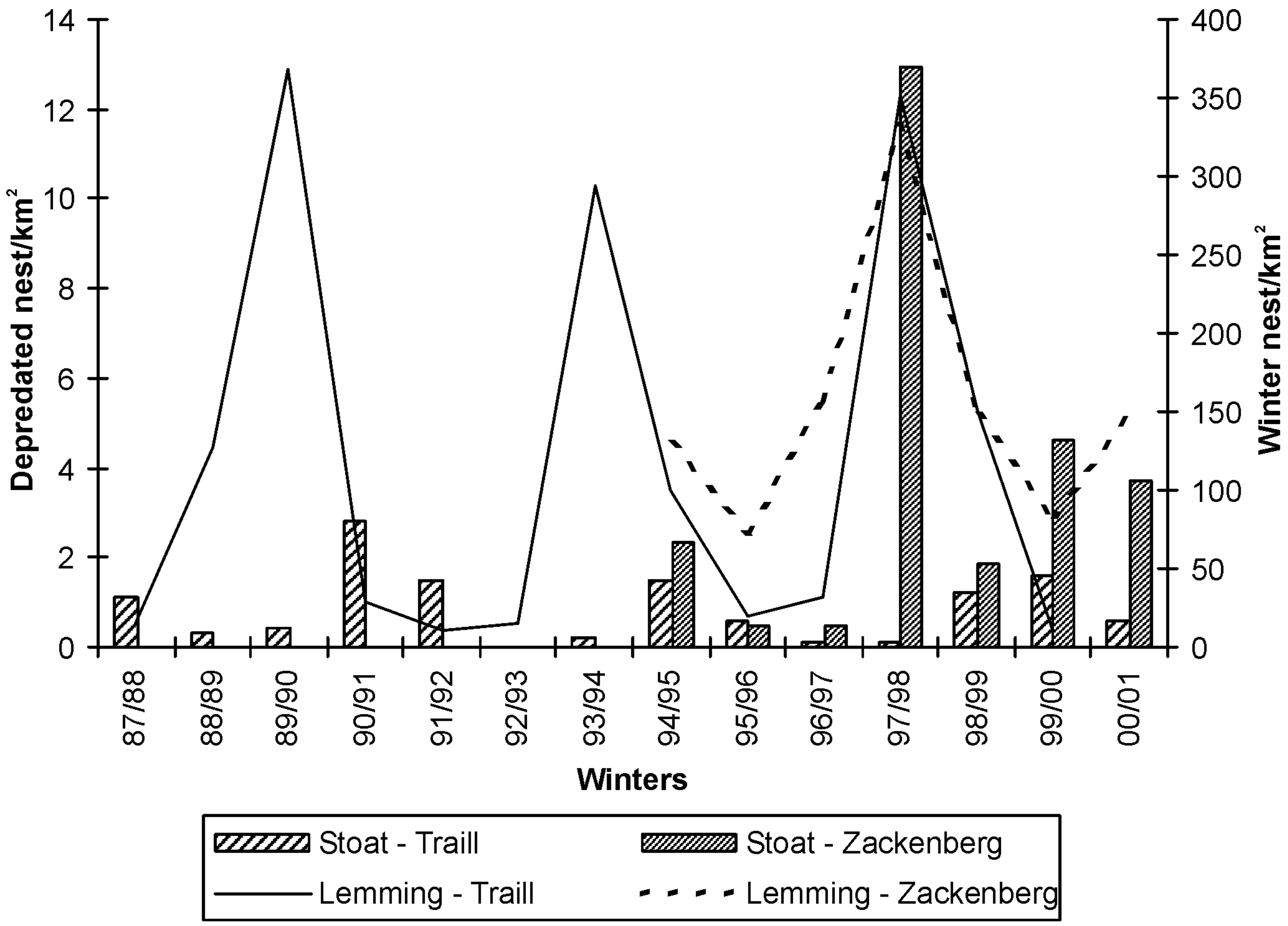

Figure 2. Fluctuating patterns of collared lemmings (lines) and the delayed response of stoats (bars) on Traill Island (10 km^2) and at Zackenberg (2 km^2). Data are based on surveys of lemming winter nests.

Closer insights into population dynamics through the implementation of long-term studies: The Karupelv Valley Project and The Zackenberg monitoring programme.

Acquiring long-term data sets is of paramount importance to address issues like cyclical population dynamics. Such an approach was first adopted in a continuing long-term study initiated in 1988 in a study area located in Karupelv Valley on Traill Island. Observations based mainly on the systematic recording of winter nests revealed a cyclical pattern (Sittler 1995) that has become obvious now that the data from 14 continuous years encompass three cyclic fluctuations (see Fig. 2).

Differences in absolute numbers of winter nests between outbreaks and deep depressions suggest that density decreases by 30-fold or more are characteristic from the cyclical dynamics. As the survey of winter nests also includes observations on stoat activity, such an approach also may provide insights to the predator response. This aspect is an important one since the role of predator impact in governing these cycles is one of the few hypotheses still debated.

With the establishment of Zackenberg station in 1995, approximately 250 km north of Karupelv Valley, the start of another monitoring programme devoted to lemmings using similar methods now offers an unparalleled opportunity to study the patterns on a greater scale. In particular, this comparison may show to what extent two lemming populations will exhibit similar patterns and whether there is synchrony in the dynamics of two separated populations of Collared Lemmings. Besides the monitoring of winter nests, further projects include trapping, marking and the use of telemetry to provide insights to population patterns in summer time (Schmidt et al. 2002, Gilg in prep., Berg in prep.).

As a whole, population trends in Karupelv Valley exemplify that spectacular highs occur with intervals of 4 or 5 years but the build up to the high (that clearly occurs in winter) differs from cycle to cycle. One pattern is for substantial increase in winter, starting from a low level to maximum density within one year, followed by a second year with lemmings maintaining a relative high level. Another situation includes a limited outbreak during the first winter, followed by a more pronounced increase in the second year. Crashes occur in the two situations but are more obvious when occurring after the highest peak. The low phase may persist for up to three years but the deep depression is achieved in the second season after the absolute peak.

Patterns from Zackenberg are in some respects not as clear-cut as in Karupelv Valley as the amplitude is up to eight times lower (a factor of only 4.5 between low and peak compared with more than 30 at Karupelv), but there is evidence that lemmings also undergo cyclical fluctuations in abundance. At Zackenberg, active summer burrows have been monitored within the same area as winter nests for five years. The peak in number of active summer burrows occurs in the summer before the winter peak. Peaks of winter nests seem to be in synchrony with the population in Karupelv Valley.

Once there is a longer time-series available, it will be possible to investigate to what extent dynamics exhibit similar or different patterns, both in terms of the build up of the peak and in the trajectories of the decline and depression phase. In this comparison one may then assess to what extent differences in habitats and landscape features may account for differences in the population dynamics.

The two projects show evidence of summer declines in which predation seems to be involved (Gilg in prep., Schmidt 2000, Berg in prep.). At Karupelv, observations on predation rates on winter nests clearly suggest a delayed response by the stoat population by more than one year following the outbreak of the lemmings. One remarkable difference in ecosystem composition between the two sites is the high abundance of Snowy Owls at Karupelv during periods with high lemming densities, with up to 20 pairs within 70 km^2 - (14 years of data), compared with a maximum of two pairs within 50 km^2 (7 years of data) at Zackenberg. This low density of Snowy Owls at Zackenberg may explain the different response by stoat to the fluctuation in lemming density (Fig.2).

During the build-up phase of the lemming population in winter 1996/1997, with an intermediate lemming density resolving in a summer peak 1997, the stoat population was able to reach a peak simultaneously with the lemming winter peak in 1997/1998.

Outlook

Cyclical dynamics are a key feature of the lemming population in North East Greenland and there is now growing evidence that there is a four to five years periodicity, with no indication of any shorter (3 years) or longer (6 years) periodicity as reported from other regions. There is a need to investigate the extent to which this may be related to the relative simplicity of the community or to other factors.

It also may be stated that on a regional scale timing patterns may differ, meaning that there is apparently no full synchrony within the NE Greenland range.

Further, the effects of gradients of snow cover (differences within North East Greenland as well as comparison with other arctic regions), as well as aspects related to habitats and plants also deserve closer consideration. Regarding predators, the delayed response of stoats as the most dependent predator becomes obvious in this system, but their role in the population dynamics remains to be assessed. This also applies to other predators, of other species like breeding migratory birds belonging to this community (see Sittler et al. 2000).

It is hoped that the continuation of these two monitoring programmes may contribute to answering some of these questions in the future.

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INDICATIONS OF ARCTIC BREEDING SUCCESS OF Little Stint (*Calidris minuta*) REFLECTED IN RINGING RESULTS AT EILAT, ISRAEL, 1990-2001

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Israel is located in the south-east of the Western Palearctic, where migrant birds belong to the flyway which is not so well studied as the East Atlantic flyway. Being located at the junction of three continents, Israel functions as a land bridge for many birds migrating from Eurasia to Africa and back (Safriel 1968). Within this land bridge Eilat, the southernmost part of Israel, is situated in the Syrio-African Rift Valley, at the north-eastern fringe of the 2,000-kilometers Sahel, Sahara and Sinai desert belt, thus being an important place for migratory birds to stage (Shirihai & Christie 1992, Shirihai 1996, Yosef 1997). The ringing station established by the International Birding and Research Centre in Eilat (IBRCE) is the only long-term station of its kind in the Middle East, and active ringing has continued there since 1984. Over 140,000 birds of 131 species in total were trapped and ringed at the station. However, because there are very few, if any, other ringing stations in the Levant and Asia to the north-east this activity has resulted in only very low recovery rates, 2% for raptors, 0.1% for waders, and 0.01% for Passerines (Yosef 1997). Hence, every piece of information from this area becomes very important, but at the same time, caution must be applied to the results based on small samples.

The ringing program was focused on passerines and raptors, while waders were ringed when trapped incidentally. The years 1990-1992 and 1999-2001 are the exception when waders were also targeted. The 1989-1991 project was a result of the encouragement of Dr G Boere and WIWO, and we do not know details about bird processing in that period, e.g. the ageing criteria used. The recent focus was an initiative of the IBRCE. During the latter period waders were trapped with 7 walk-in traps on the salinas. The Little Stint *Calidris minuta,* which breeds beyond the Arctic Circle, is one of the most numerous wader migrant species in Eilat and prevailed in catches of waders there. In total 5,195 Little Stints were ringed in 1984-2001 (60.5% of the wader total ringed in Eilat). This number is considerably larger than the numbers of this species ringed at any other location worldwide (e.g. Ward 2001).

For the analysis of the population age structure of Little Stint staging in Eilat only years with largest sample sizes during the southward migration were taken into consideration (Table). During these eight seasons a total of 3,795 Little Stints were ringed. To date none have been controlled on the breeding or wintering grounds. The only evidence of connection between Siberia and Israel is the observation of a colour-ringed Little Stint by Talya Oron (ranger, Hula Nature Reserve, Nature Reserves and Parks Authority) in the Hula Valley, northern Israel, on 7 July 2000. The bird was ringed as a chick in a nest on 1 or 2 July 2000 at Medusa Bay, NW Taimyr, Siberia; i.e. it was resighted at a distance of 5,138 km after 51 days.

Table. Numbers of Little Stints ringed and proportions of ages on southward migration in Eilat, Israel.

Year	Total ringed	Adults	(%)	Juveniles	(%)	Breeding success on Taimyr*
1991	598	59	10	539	90	H-M (2.5)
1992	101	35	35	66	65	L (1)
1993	123	4	3	119	97	H (3)
1996	81	21	26	60	74	H-M (2.5)
1998	301	71	24	230	76	L (1)
1999	937	328	35	609	65	H (3)
2000	1077	643	60	434	40	L (1)
2001	577	168	29	409	71	M? (2)

* - L – low, M – moderate, H – high; based on data from Hotker et al. (1998) and ARCTIC BIRDS (2002). Rank used to estimate correlation in parentheses.

Several issues arise from the data presented in the Table. First, juvenile Little Stints (on their first migration to wintering grounds) form an extremely high proportion of trapped birds every year. The reason for this phenomenon is unclear. It may be that juveniles are inexperienced and require more frequent stops than adults, and that adults overfly the region. Another possibility is that migration routes of juveniles and adults are different, and this is reflected in the age composition of trapped birds. Trapping method was not evaluated, and this could be a further source of bias. Second, the data suggest a decline in the percentage of young birds trapped and ringed since 1993 in Eilat (Figure). However, these data should be treated with caution because of the inconsistency in effort between years, which has also resulted in large differences in the total numbers of birds ringed. Another parameter that needs to be validated is the ageing criteria used in the early 1990s by WIWO and recently at the IBRCE ringing station. Further, it is also possible that the building of new salt ponds in Eilat has created a situation wherein increased numbers of adult Little Stints choose the area as a stopover. Third, whatever the reason for the high proportions of young birds, there is also considerable variation in this parameter which ranges between 40% and 90%. Comparison of this parameter with estimates of breeding success at the Taimyr (Table) reveals some comparability between these two (although the correlation is not significant, Spearman Rho = 0.441, $P>0.05$). At least the lowest values of percentages corresponded well with low breeding success if the early 90s and later years are considered separately. Thus, variation in the proportion of juvenile Little Stints coming to Eilat at least partly reflect breeding success in the Siberian Arctic.

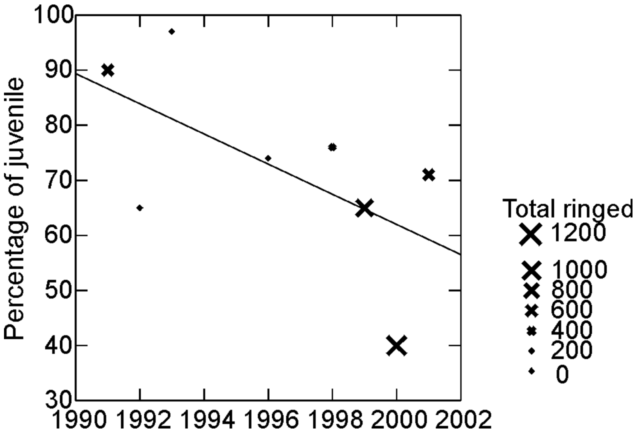

Figure. Percentage of juvenile Little Stints ringed at Eilat during southward migration in the years included in the study (y= 5540.239-2.739*x, Squared multiple R: 0.371).

The large numbers of Little Stint as well as other waders visiting Eilat suggest that this location may be a critical one for some Arctic wader populations. International collaboration to improve local expertise in wader studies as well as increasing manpower would be of great help to increase the understanding of wader migrations and assist in setting up a reliable database. Wader researchers and relevant organizations are welcome to work with us in Eilat.

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YEAR 2001 ARCTIC BREEDING SUCCESS, AS MEASURED BY THE PERCENTAGE OF FIRST YEAR BIRDS IN WADER POPULATIONS IN AUSTRALIA IN THE 2001/02 AUSTRAL SUMMER

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Introduction

The Victorian Wader Study Group and the Australasian Wader Studies Group (through the Broome Bird Observatory and NW Australia Wader Study Group) continued their long term programmes of monitoring migrant wader populations during the 2001/02 non-breeding season in SE Australia and NW Australia. These two locations, on opposite sides of the continent and nearly 3000 km apart, enable a wide range of the wader species/populations which migrate from the Northern Hemisphere breeding grounds to Australia to be studied.

A core element of the fieldwork activities over the last 20 years has been a banding programme which attempts to catch a representative sample of as many species as possible, in each of the two regions, during the period when the majority of adult and juvenile/first year birds are present. The proportion of immature birds in such catches is then used as a measure of the breeding success in the previous Arctic summer. Results for the 1999 and 2000 breeding seasons were detailed in Arctic Birds newsletters ## 2 and 3, respectively.

Methods

For this year's data (and for revisions of previous years' data included in Tables 3 and 4) some adjustment has been made to the dates for which data are included in the light of a refinement of the knowledge of the migration period of each species in each region.

In SE Australia the earliest date normally used is 1st December (occasionally very late November) as some juvenile birds continue to arrive throughout November. The end date is normally 28 February, because adult Sharp-tailed Sandpipers and Curlew Sandpipers commence their northward movements in early March. However samples of Red-necked Stints, Ruddy Turnstones and Sanderling are included up to 20 March (in 1999 to the first few days of April) because these species do not leave until well into April.

In NW Australia an earlier 'start' date is possible because birds arrive there (latitude 18° S) significantly earlier than in SE Australia (latitude 38° S). Furthermore in the 2001/02 season no catching was undertaken in the December/January/February period because of the absence of key personnel. All catches included in Table 2 were made between 20 October and 16 November when intensive fieldwork was undertaken. Examination of the data showed negligible variation in the proportion of juveniles in this period suggesting most juveniles had arrived in NW Australia by the end of the third week of October. Catches up to 20 March were used (though in most seasons the majority were in the November/February period) since visible migration studies at Broome have shown that only Eastern Curlew depart from NW Australia in significant numbers before that date.

As stated in the Arctic Birds newsletter # 2, we consider breeding success in a population was poor in the preceeding breeding season when the proportion of juveniles in Australia is 0-10%, moderate – 10-20%, good – 20-30%, and exceptional – over 30%.

Results

Tables 1 and 2 give the results of wader catches in 2001/02. The number of catches made for each species is given as an indication of the spread of samples obtained. In most of the main species in SE Australia 4 to 8 catches were made (but 23 for Red-necked Stint) whilst in NW Australia the range was 6 to 13 catches.

<u>South-east Australia</u>

The "winners" in SE Australia in 2001/02 were Red Knot (69% first year birds), Red-necked Stint (34%) and Curlew Sandpiper (27%) – all falling in the "exceptional" breeding success category. For Red Knot and Red-necked Stint these were the highest percentages ever recorded in SE Australia. The Curlew Sandpiper figure was the highest since the record, uniquely good, 45% recorded after the 1991 breeding season (a year of widespread bountiful breeding success).

In contrast, populations of other species such as Sanderling, Ruddy Turnstone, Sharp-tailed Sandpiper and Great Knot contained only modest levels of first year birds and their 2001 breeding season would be classified as moderate to poor.

For the Bar-tailed Godwit population which visits SE Australia, the 2001 breeding season was obviously disastrous. These birds are all from the *baueri* subspecies, which breeds in Alaska. Bob Gill, of the US Fish and Wildlife Service in Alaska, had forewarned us of this likely outcome as extremely poor weather conditions occurred in Alaska during the 2001 breeding season. They had subsequently seen very few juvenile birds at migratory departure points.

<u>North-west Australia</u>

In 2001, the breeding success of wader populations which spend the non-breeding season in NW Australia appears to have been more uniform across species than in SE Australia. Also most species could be classed as having moderate breeding success, with Curlew Sandpiper (19%), Red-necked Stint (17%) and Grey-tailed Tattler (17%) tending towards 'good'. However Great Knot appear to have fared poorly.

The most interesting contrasts with SE Australia occurred in Bar-tailed Godwit and Red Knot. In both species NW Australia results were the opposite of SE Australia figures. Thus Bar-tailed Godwits in NW Australia, which breed in the Yakutia Region of Northern Siberia, had quite a reasonable breeding year in 2001 (15% first year birds). However, Red Knot (5.4%) had a poor year. Red Knot in NW Australia are of the newly named *piersmai* subspecies breeding in the New Siberian Islands. Those visiting SE Australia probably all breed in the Chukotsky Peninsula (*rogersi*).

Data on Little Curlew is included for the first time, ageing methods having now been satisfactorily developed. The figure of 30% first year birds suggests high breeding success in 2001 (but see later).

<u>Comparisons between years</u>

Tables 3 and 4 give the percentage first year figures for 1998/99 (newly presented data), 1999/00 and 2000/01 (revised slightly from data published in Arctic Birds Newsletters 2 and 3) and 2001/02 (summary of data from Tables 1 and 2).

A number of conclusions can be drawn.

<u>In SE Australia</u>

(a) The 1999 breeding season was by far the best for most species during the last four years.

(b) Red-necked Stints have had three very good breeding seasons in the last four years [see also separate article in this issue of the Arctic Birds Newsletter].

(c) Most species show quite a marked variation of apparent breeding success from year to year.

(d) There appears to be little correlation between species, except in the good 1999 year. Bar-tailed Godwit and Red Knot seem to have the greatest tendency to depart from the norm. Red-necked Stint and Curlew Sandpiper figures, which quite often showed a good correlation in the 1980s, have not correlated well in recent years.

(e) When Red Knot have a successful breeding season this is reflected in exceptionally high "percentage first year" figures. There are two reasons for this. Firstly, in such years, flocks of largely juvenile birds tend to occur in habitats where they are more easily cannon-netted. Secondly, banding and flagging has shown that most juvenile birds of the Flyway population tend to remain in Australia. Only in their second year do a high proportion of these birds move on to their future regular non-breeding areas in New Zealand.

(f) More years of data will need to be generated and examined to see what cyclical patterns of breeding performance, possibly associated with lemming/predator cycles, may be apparent in the wader species/populations which visit SE Australia.

<u>In NW Australia</u>

(a) The 1999 breeding season also appears to have been the best of the last four years for most species.

(b) Patterns of yearly breeding success for Red-necked Stint and Curlew Sandpiper follow the same pattern as in SE Australia, though the figures differ in absolute terms.

(c) Red Knot do not show the exceptionally high percentage first year figures apparent in some years in SE Australia. This suggests the NW Australia Red Knot population is not affected by a comparable "New Zealand" factor like the Red Knot in SE Australia.

(d) There is no correlation between the annual percentage first year figures for Bar-tailed Godwits in NW Australia and SE Australia. This in not surprising given their widely separated breeding areas.

(e) Greater Sand Plovers seem to show a more consistent, and on average higher, breeding success than other species. They, of course, do not breed in the Arctic region and thus may be less susceptible to variations in weather conditions and/or predator cycles.

(f) Little Curlew populations have contained a very high (33-59%) proportion of first year birds in all three years which were sampled. It is not clear whether this is a genuine reflection of the situation for the population as a whole or whether some local timing/habitat factor is influencing the figures. This will be investigated further in the future.

(g) As in SE Australia there seems to be only a modest correlation between species / years with quite wide variation occurring. Great Knot seem to be most out of phase with any general trend (perhaps because they nest in markedly different habitat).

Discussion and conclusion

Caution is needed in interpreting the "percentage of first year" figures due to potential biases in the data (see Arctic Birds newsletter # 2). However it is clear that the collecting of such information from wader populations in their non-breeding areas - especially if a number of independent samples are obtained each year - is giving a fair and logical indication of the variation in breeding success between species/years. At present it is the only quantitative information available on the reproductive output of wader populations in the East Asian - Australasian Flyway. Such information is fundamental to trying to determine causes of short term variations and long term trends in population monitoring counts of waders.

Data sets of this type increase markedly in value if collected in a consistent manner over a prolonged period. The VWSG and AWSG fieldwork programmes will continue to have the collection of "percentage of first year" data as key priorities for the foreseeable future.

Further information from previous years will be progressively amassed to extend the data set backwards in time. In the long term such data series may well be useful also in delineating the effects of climate change on the general reproductive success of Arctic - breeding waders.

Increasing banding recoveries and flag sightings are gradually enabling the specific breeding areas of wader populations visiting SE Australia and NW Australia to be pinpointed. It should thus be increasingly possible to tie in more closely the apparent breeding success of populations with conditions in specific regions of the Siberian Arctic each year, as reported in Arctic Birds. Such an examination is needed to explain in particular the variation between the breeding success of different species in any year.

What will the 2002 breeding season bring? If a three-yearly breeding cycle is operating then, on the basis that 1999 was generally good, it should be a good breeding year. But surely we cannot expect another good Red-necked Stint (or Curlew Sandpiper or Red Knot) year? Only time will tell. As usual we shall be eagerly waiting in Australia for the return of the wader migrants, with the adults arriving in August/September and the juveniles in September/November.

Table 1. Proportion of first year birds in wader catches in SE Australia in 2001/2002

Species	Number of catches		Total birds caught	Number of first year birds	% first year
	Large >50	Small <50			
Grey Plover	-	1	12	0	(0)
Pacific Golden Plover	-	1	15	1	(6.7)
Ruddy Turnstone	1	3	114	10	8.8
Red-necked Stint	15	8	6351	2188	34
Sanderling	4	2	483	49	10
Curlew Sandpiper	3	5	419	115	27
Sharp-tailed Sandpiper	2	4	535	42	7.8
Great Knot	1	2	61	5	8.2
Red Knot	3	1	363	249	69
Bar-tailed Godwit	2	-	282	4	1.4
Non-arctic northern migrants:					
Eastern Curlew	-	1	18	1	(5.6)

All catches were in period 1 December 2001 to 28 February 2002 except for Red-necked Stint, Sanderling and Ruddy Turnstone where catches up to 20 March 2002 are included. Figures in brackets are where sample size is less than 20 birds. A dash indicates no sample.

Table 2. Proportion of first year birds in wader catches in NW Australia 2001/2002

Species	Number of catches		Total birds caught	Number of first year birds	% first year
	Large >50	Small <50			
Red-necked Stint	4	8	840	140	17
Grey-tailed Tattler	5	8	506	85	17
Ruddy Turnstone	-	7	16	0	(0)
Sanderling	1	6	115	5	4.3
Curlew Sandpiper	1	10	230	44	19
Great Knot	6	7	634	33	5.2
Red Knot	2	8	221	12	5.4
Broad-billed Sandpiper	-	5	19	7	(37)
Little Curlew	2	4	315	112	36
Whimbrel	-	2	44	5	11
Bar-tailed Godwit	2	10	332	50	15
Non-arctic northern migrants:					
Greater Sand Plover	9	4	943	123	13
Terek Sandpiper	3	8	380	45	12
Eastern Curlew	-	2	33	0	0
Black-tailed Godwit	-	1	32	0	0

Also Lesser Sand Plover 6 (-),Common Sandpiper 1 (-), Sharp-tailed Sandpiper 2 (-), Asiatic Dowitcher 1 (1) and Oriental Pratincole 1 (-). All catches were in period 20 October to 16 November 2001 except for two Little Curlew catches on 26 November and 01 December 2001 (9 and 20 birds respectively).

Table 3. Percentage of first year birds in wader catches in SE Australia between 1998/99 and 2001/02

Species	98/99	99/00	00/01	01/02
Ruddy Turnstone	3.3	21	10	8.8
Red-necked Stint	32	23	14	34
Sanderling	7.8	13	2.9	10
Curlew Sandpiper	4.1	20	6.8	27
Sharp-tailed Sandpiper	12	10	17	7.8
Great Knot	-	7.5	(3.7)	8.2
Red Knot	2.8	38	52	69
Bar-tailed Godwit	41	19	3.6	1.4

All birds caught by cannon netting in the period late November to mid March (Sharp-tailed Sandpiper and Curlew Sandpiper to end February only).

Table 4. Percentage of first year birds in wader catches in NW Australia between 1998/99 and 2001/02

Species	98/99	99/00	00/01	01/02
Grey-tailed Tattler	26	(44)	17	17
Red-necked Stint	26	46	15	17
Curlew Sandpiper	9.3	22	11	19
Great Knot	2.4	4.8	18	5.2
Red Knot	3.3	14	9.6	5.4
Little Curlew	59	33	-	36
Bar-tailed Godwit	2.0	10	4.8	15
Non-arctic northern migrants:				
Greater Sand Plover	25	33	22	13
Oriental Plover	12.5	-	6.4	(0)
Terek Sandpiper	12	(0)	8.5	12

All birds caught by cannon netting in the period 20th October to mid March (Curlew Sandpiper to end of February only). Figures in brackets are where sample size is less than 20 birds. A dash indicates no sample.

VARIATIONS IN APPARENT ANNUAL BREEDING SUCCESS OF RED-NECKED STINTS AND CURLEW SANDPIPERS BETWEEN 1991 AND 2001

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Introduction

The reproductive rate is one of the two fundamental parameters (mortality is the other) which govern the population level of a species. In Arctic-breeding waders it is difficult to directly measure reproductive success on the breeding grounds and certainly impractical to do this on a wide range of species simultaneously and for a prolonged period.

A long established alternative on goose and swan populations has been to scan flocks on the non-breeding grounds to determine the proportion of juvenile (first year) birds, still recognisable by plumage differences throughout most of the year. This is not so feasible on waders because many immature birds soon become almost identical in appearance (in the field) to adult birds, often even before all birds have reached their non-breeding destinations.

For waders the best quantitative estimates of breeding success have been obtained by catching samples from flocks on the non-breeding grounds and determining the proportion of juvenile/first year birds (which still can be aged in the hand). Whilst there may be potential biases in such data (as in most field data) such information at the very least produces an annual breeding success index for each species. Short and long term changes in this index may be helpful in understanding changes in wader population levels determined by systematic annual counts.

This note examines the apparent breeding success, since 1991, of Red-necked Stints and Curlew Sandpipers which spend the non-breeding season in SE Australia. It also relates the index of breeding success to changes in population levels during this period.

Methods

The Victorian Wader Study Group has been catching and banding waders in SE Australia since late 1975, initially by mist-netting but since early 1979 mostly by cannon netting. Up to April 2002 approximately 168,000 have been caught (135,0000 newly banded and 33,000 retraps). By far the greatest volume of data has been collected on Red-necked Stints (108,000) and Curlew Sandpipers (28,000).

This analysis is based on data collected in the last 11 years. All the birds included were cannon-netted, at a variety of sites along the coast of Victoria and in the southeast corner of South Australia. Only catches made in the period between the end of November and the end of February were included (except for a few Red-necked Stint catches up to 20th March in some years). This is the period when populations in SE Australia are at their most stable with the majority of adult and juvenile birds being present in their non-breeding area destinations (see article elsewhere in this Newsletter and also articles in Arctic Birds newsletters ## 2 and 3).

Table. Catches of Red-necked Stints and Curlew Sandpipers in SE Australia between 1991/92 and 2001/02

Year	Red-necked Stint					Curlew Sandpiper					% Curlew Sandpipers in catches
	No. of catches		Total caught	No. of first years	% of first years	No. of catches		Total caught	No. of first years	% of first years	
	Large >50	Small <50				Large >50	Small <50				
91/92	8	4	1994	580	29	4	3	437	198	45	21
92/93	15	-	4340	163	3.8	6	6	2232	6	0.3	34
93/94	10	3	6015	892	15	6	4	1239	215	17	17
94/95	7	8	3191	594	19	3	9	954	92	9.6	23
95/96	8	3	1804	452	25	4	5	506	30	5.9	22
96/97	10	7	3526	421	12	5	13	636	56	8.8	15
97/98	11	8	4232	331	7.8	5	10	934	196	21	18
98/99	9	6	4854	1572	32	5	5	737	30	4.1	13
99/00	19	6	4885	1108	23	6	4	1016	206	20	17
00/01	11	14	5815	770	14	2	11	381	26	6.8	6.1
01/02	15	8	6351	2188	34	3	5	419	115	27	6.2
Total			47007	9091				9491	1170		Average = 16.8%
Average % first years					19.3 %					12.3%	

All catches made by cannon netting. All catches in the period late November to end February except for a few Red-necked Stint catches up to 20th March in some years.

Results

Table shows the number of Red-necked Stints (47,007) and Curlew Sandpipers (9,491) caught in SE Australia each austral summer between 1991/92 and 2001/02. It also shows the number of first year birds in each yearly sample and the corresponding percentage of first year birds in the total population sampled.

The table also indicates that the level of sampling of each species has been relatively consistent throughout this 11 year period, with between 11 and 19 (23 – 25 in the last three years) Red-necked Stint catches each year and 7 – 18 Curlew Sandpiper catches annually in the defined period.

For the whole period combined the percentage of first year birds in the Red-necked Stints captured was 19.3% and in Curlew Sandpipers it was 12.3%.

Figure shows the percentage of first year birds in each of the 11 annual samples of each species.

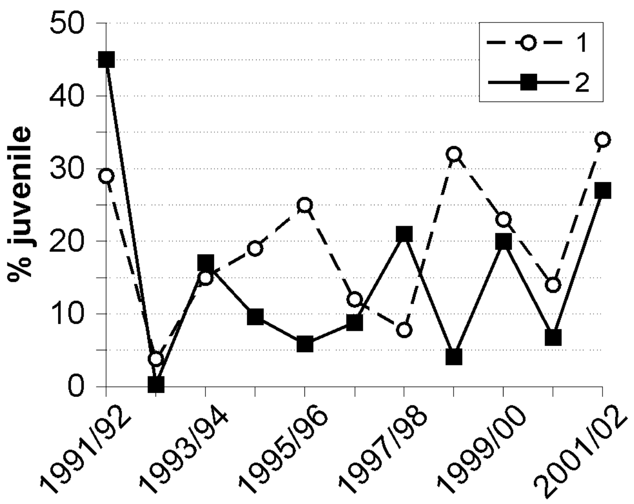

Figure. Percent of 1st year Red-necked Stints (1) and Curlew Sandpipers (2) in wader catches in SE Australia in 1991/92 - 2001/02

A number of interesting facts are apparent.

(a) The Red-necked Stint and Curlew Sandpiper "percentage figures" do not correlate closely. In six of the ten year-to-year changes the direction of change was opposite for the two species. The extreme example was 1997/98 to 1998/99 when Red-necked Stint increased from 7.8% to 32% but Curlew Sandpiper dropped from 21% to 4.1%.

(b) There is no evidence for a strong regular cycle of breeding success associated with, for example, possible lemming/predator fluctuation periodicity. The nearest approximation is that 1991, 1995, 1998 and 2001 were apparently the best breeding years for Red-necked Stints compared with adjacent years. However of these only 1991 and 2001 were really good for Curlew Sandpipers.

(c) In Red-necked Stint:

- i) only 2 years were below 10%
- ii) 5 years were above 20%
- iii) 5 of the 6 years in the 92/93 to 97/98 period were below average
- iv) 3 of the last 4 years have been above average (2 at record levels)

(d) In Curlew Sandpiper:

- i) 6 years were below 10%
- ii) 4 years were above 20%
- iii) 6 of the 9 years in the 92/93 to 00/01 period were below average

Overall there is a clear picture that Curlew Sandpipers appear to have fared much less well than Red-necked Stints as far as breeding success is concerned during the last decade. Relative population levels have changed (see later also) and this is apparent too from the decreasing proportion of Curlew Sandpipers in "small wader" catches made by the VWSG over the period (see Table 1). In the earlier years of the period the proportion of Curlew Sandpipers in such catches was usually above 20%, but in the last two years it has dropped to only 6%.

Discussion

Patterns of breeding success for both Red-necked Stint and Curlew Sandpiper in the 1990s seem to have departed from the more regular situation of the 1980s, when a three-yearly cycle was more apparent with "good" years in 1982, 1985 and 1988 (followed also by 1991).

Starting with the universally disastrous 1992 breeding season, when world weather effects following the Mount Pinitubo volcanic eruption accentuated normal negative breeding factors (Ganter & Boyd 2000), both species had a long run (Red-necked Stint six years, Curlew Sandpiper nine years) with generally below average breeding success. In the case of Red-necked Stint this was followed by four years of good breeding success, with two of these years being at record levels.

The effects of these patterns of breeding performance have, not unexpectedly, been apparent in population levels. Curlew Sandpiper numbers in Australia have declined by 70% over the last 20 years. This conclusion was based on an analysis of the annual austral summer (February) population monitoring counts organised by the Australasian Wader Studies Group (Wilson 2001a,b). Many of these sites are in Victoria (SE Australia) and all except one of the count sites showed this marked downward trend. At Corner Inlet (Victoria) Curlew Sandpiper numbers averaged 2,440 (range 1,400-2,700) in the February counts in the period 1981-1985 but only 665 (range 500-920) in the period 1998-2002 (Minton in prep.). Most of that decline has occurred since 1994.

Red-necked Stint numbers in SE Australia also declined during the period of below average breeding success in the 1990s. However they have now rebounded, to record levels. For example in the eastern half of Corner Inlet – which has the largest Red-necked Stint population of any of the 20-30 sites in Australia which are counted annually – the population averaged 21,465 in the February 2000-2002 counts (range 19,300-23,675). For the previous 19 years (1981-1999), the February count averaged 9,895, ranging from 6,300-14,300 (Minton in prep.).

Red-necked Stints have also spread extensively into new habitats as a result of the high population levels over the last four years. Flocks of hundreds, sometimes thousands, are now present on ocean beaches where previously only tens occurred normally. Numbers in all the traditional areas – muddier bays and estuaries – have also increased but not as dramatically as in the previously more marginal Red-necked Stint habitats.

It is interesting that the species appears to have been able to adapt to such a major increase in numbers. No detrimental consequences have yet been noticed – normal weight levels and patterns seem to be being retained – but it is possible that there may be effects on survival rates. It will be interesting to see how rapidly habitat utilisation returns to previous patterns if/when breeding success of Red-necked Stints drops to more traditional levels.

Another consequence of the ubiquitous presence of Red-necked Stints recently is that it is almost impossible to make a cannon-net catch of any species of wader (except oystercatchers and Eastern Curlew, with which they rarely associate) without obtaining a significant by-catch of Red-necked Stints!

Collection of data for these "breeding success" series will be continued in the future. It will be especially interesting to monitor Red-necked Stints and Curlew Sandpipers given past similarities and recent divergences in their apparent breeding performance and consequent population levels.

References

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.

Wilson, J. R. 2001a. The January and February 2001 Victoria wader count. The Stilt, 40: 55-64.

Wilson, J. R. 2001b. Victoria wader surveys January and February 2001. AWSG Report. 62 p.

MONITORING ARCTIC SHOREBIRD POPULATIONS IN CANADA

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Canadian and American shorebird biologists and managers have developed the Program for Regional and International Shorebird Monitoring (PRISM). The program's objectives are:

- monitor the size of the breeding populations of shorebirds in North America;
- estimate the size of breeding populations of shorebirds in North America;
- monitor shorebird numbers at stopover locations as an indication of habitat suitability at these sites;
- use the monitoring infrastructure to assist local managers in meeting their shorebird conservation goals.

A large component of PRISM is surveys on the North American arctic breeding grounds. The Arctic Survey consists of three "tiers" of surveys that require different amounts of effort and funds to undertake. Together they will provide a very good picture of the size and trends in arctic shorebird populations of most species. The tiers are:

- Arctic-wide surveys- these are undertaken at broadly distributed sites and employ a double sampling methodology. The first set of surveys (which will occur over a five year period) will provide a "benchmark" estimate of population size. This survey will be repeated at roughly 15-year intervals, or sooner if necessary.
- Site-specific surveys- these surveys will be undertaken at locations known to be "good" shorebird sites, that have relatively simple logistics and where there is existing shorebird population data. Each survey will be surveyed in two consecutive years out of every ten. They will provide estimates of abundance, and medium-term trend information.
- Checklist surveys- This tier is an extension of the NWT/Nunavut Bird Checklist Survey. Checklists will be filled out annually at selected sites across the arctic. The checklists will provide us with short-term distribution and relative abundance information.

The double-sampling method for the Arctic-side surveys has been tested in Alaska over the past five years. In 2001, we tested the method in Canada, where habitats are more diverse and bird populations are different from Alaska. The method was tested at three Canadian locations; one site in the extreme High Arctic (Alert), one site in the southern portion of the High Arctic (Creswell Bay, Somerset Island), and one site in the mid-western Arctic (Kent Peninsula and Melbourne Island) (Figure).

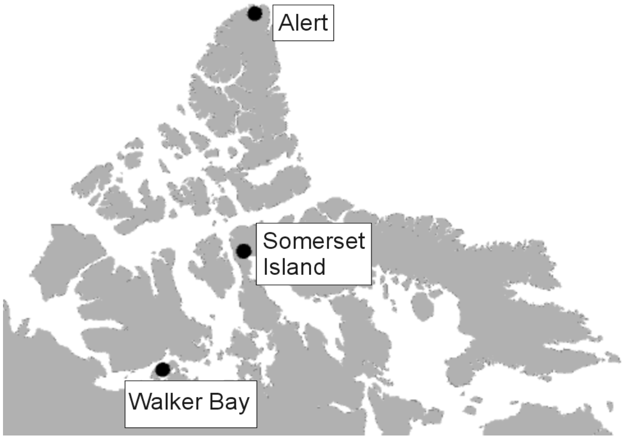


Figure. Study sites in 2001

We discovered some modifications will be necessary to use the method successfully in Canada. For example, in the extreme high arctic, it may not be possible to monitor population trends of breeding birds using this method, because nesting individuals occur in very low densities over vast areas. In fact, all of the Canadian sites tested had much lower densities of birds than did the Alaskan sites where the method was developed. This will necessitate other adjustments to the method. We also discovered that the use of satellite habitat classifications for plot selection may need to be restricted to smaller geographic areas, because of the larger areas and thus more heterogeneity of habitat.

Our studies produced two other interesting results. First, 2001 data from the Creswell Bay site was compared to data from surveys done in the same area (and even some of the same plots) in the mid-1990's. Populations of White-rumped Sandpipers, Buff-breasted Sandpipers, and Sanderling were significantly lower in the 2001 surveys, while populations of Baird's Sandpipers were significantly higher. Second, preliminary surveys on Melbourne Island indicate that it is likely a key site for breeding shorebirds of at least five species.

In the summer of 2002 we will return to the Kent Peninsula to complete surveys there, and to study Melbourne Island more closely. We will also test the double-sampling method at a low arctic site in northern Quebec to ensure that it works in that ecozone.

RECOMMENDED READIND ON ARCTIC BIRDS:

Zöckler, C. 2002. Declining Ruff *Philomachus pugnax* populations: a response to global warming? Wader Study Group Bull. **97**: 19-29.

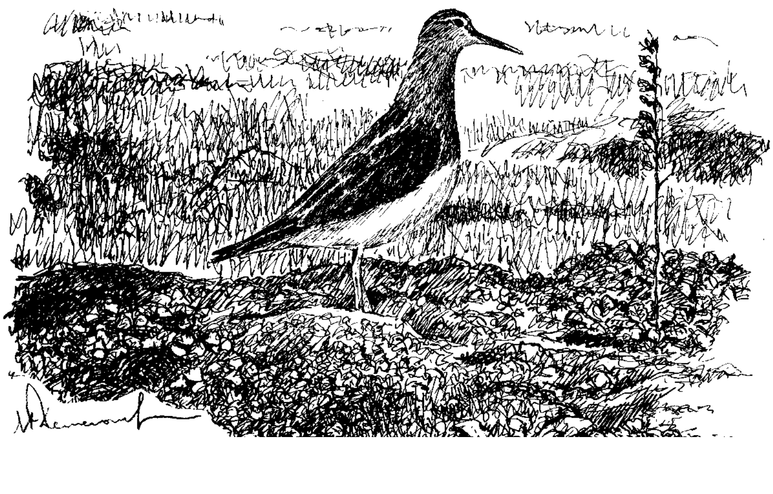
MAP COLLECTION

Four maps below are provided to illustrate various aspects of bird breeding conditions in the Arctic in 2001.

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 2001 from mean June/July temperature averaged for the period 1994-2001. This deviation indicates whether respective month in 2001 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 exponential kriging in Manifold® System 5.00 GIS software, with the following settings: cell size 50 km and interpolation radius 500 km. 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 were downloaded from GRID-Arendal's WEB site (http://www.grida.no/db/gis/prod/html/ arctic.htm), projection - Lambert Azimuthal Equal-Area.



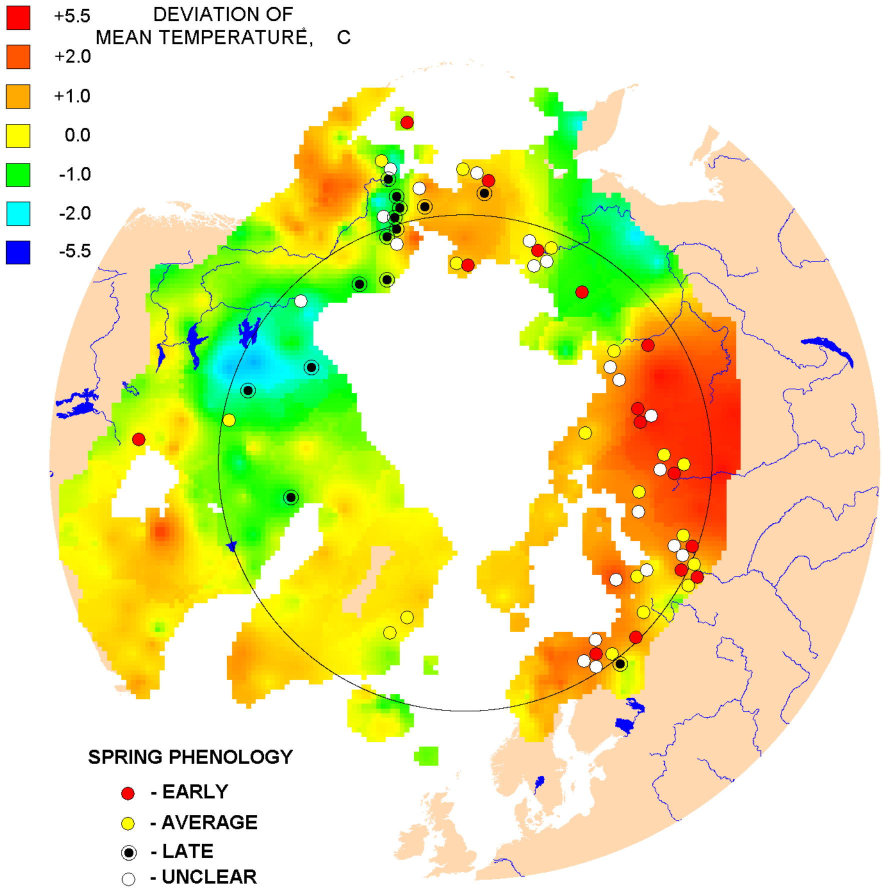


Figure 1. Temperature and phenological characteristics of early summer in the Arctic in 2001. See text above for legend

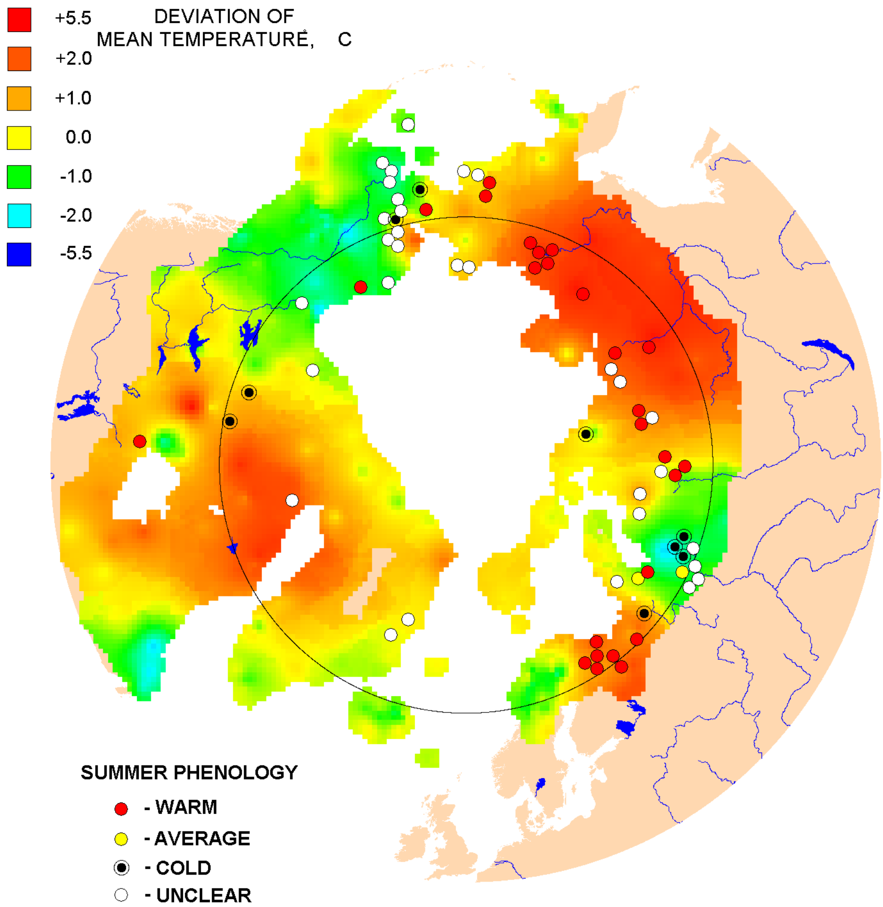


Figure 2. Temperature and phenological characteristics of mid summer in the Arctic in 2001

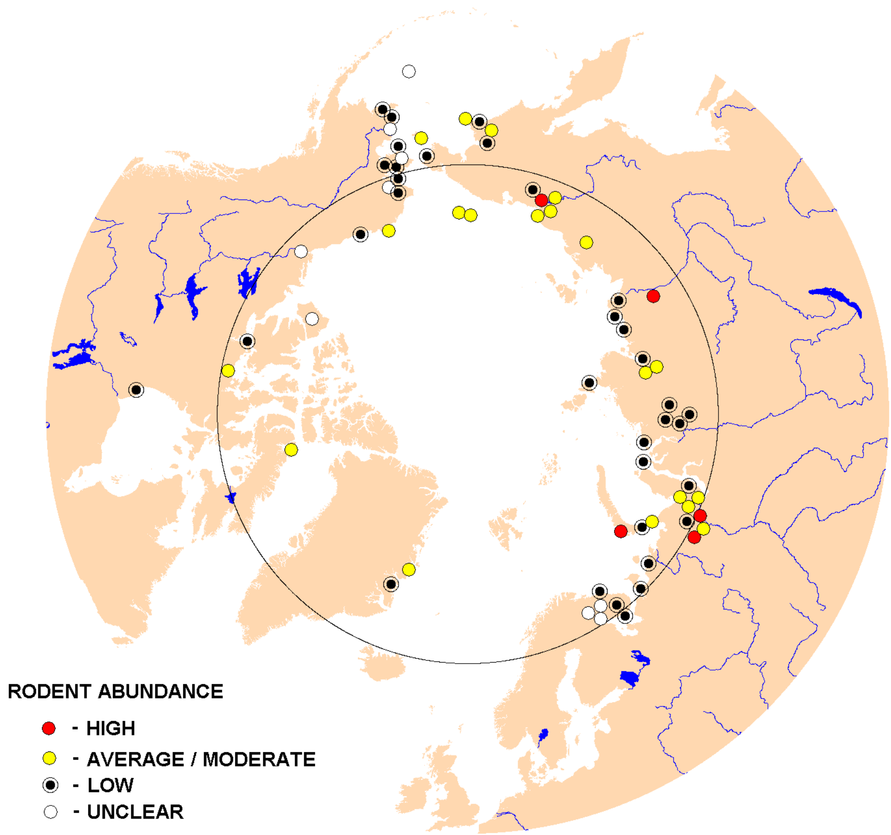


Figure 3. Rodent abundance in the Arctic in 2001

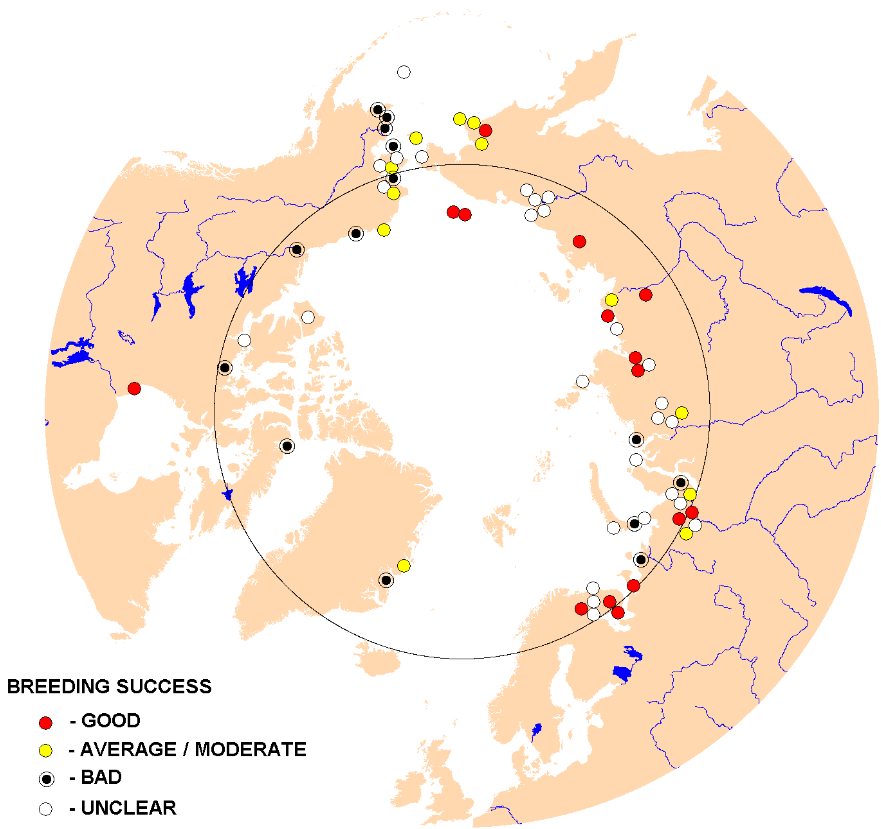


Figure 4. Bird breeding success in the Arctic in 2001