BREEDING BIRD CONDITIONS IN THE CIRCUMPOLAR ARCTIC DURING 2011

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Arctic Birds Breeding Conditions Survey
(ABBCS)

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For more information please visit Arctic Birds Breeding Conditions Survey website: http://www.arcticbirds.net

Based on 60 reports to the Arctic Birds Breeding Conditions Survey (ABBCS) from the summer of 2011, we reviewed breeding bird conditions in the Arctic. Individual reports are available at http://www.arcticbirds.net along with links to other supporting data. The ABBCS received 11 fewer reports in 2011 compared to the 74 reports received in 2010, reflecting a decreasing trend in the survey coverage during recent years. The most complete information came from survey forms filled in by respondents (*n*=35), free-form text notes (*n*=21), and various reports available in internet (*n*=4). As in past years, most of the data were received from Arctic locations in Russia (*n*=37), including 14 contributions from Europe, 4 from West Siberia, 4 from Central Siberia, 3 from Yakutia, and 12 from Chukotka and Wrangel Island. Other country reports came from the United States (Alaska, *n*=13), Canada (*n*=8), and Greenland (*n*=2). In 2011, we received 37 reports from Eurasia and 23 from the New World Arctic compared with 45 and 29 in 2010 and with 44 and 32 in 2009, respectively. Spatial coverage of the Arctic region remained uneven due to differences in distribution of study sites and to variations in involvement of contributors in activities of the ABBCS.

Weather and other abiotic factors

Arctic animals are well adapted to living and breeding in a harsh and highly variable climate. However, certain abiotic factors such as late snowmelt in spring, low temperatures and snow in summer, high floods, and storm surges may have strong impacts on breeding performance by tundra birds.

We use deviations of mean monthly air temperatures in June and July from a long-term average as a convenient approximation of spring and summer weather conditions across the Arctic (Figs. 1 and 2). Average to above average weather prevailed in June across most of the Arctic in 2011 (Fig. 1). A wide area of increased temperatures spread across northern Europe, western Siberia, and the Taimyr Peninsula. Above average temperatures generally prevailed in the central Arctic Ocean, affecting northern Greenland and the high Arctic islands (the Canadian Arctic Archipelago, Svalbard, Franz Jozef Land, Novaya Zemlya, Severnaya Zemlya and New Siberian islands). Smaller areas of above average June temperatures were present in the north-east of Yakutia and around the Bering Strait, in eastern Chukotka and north-western Alaska. Regions with below average June temperatures were smaller and included Iceland, adjacent part of Greenland, south-western Alaska, and Yakutia to the south of the tundra zone.

Assessment of spring phenology by respondents generally corresponded to local temperature deviations (Fig. 1). Early spring was reported by almost all respondents from western Eurasia and late spring by respondents from north-eastern Alaska. In most other regions, respondents characterized spring timing as close to average based on a combined assessment of temperature, snow accumulation, and average timing for given latitude (spring starts in May rather than in June in several subarctic regions). In Yakutia, spring phenology was assessed to be late despite higher than average June temperatures, which could be due to high snow accumulation and delayed snowmelt.

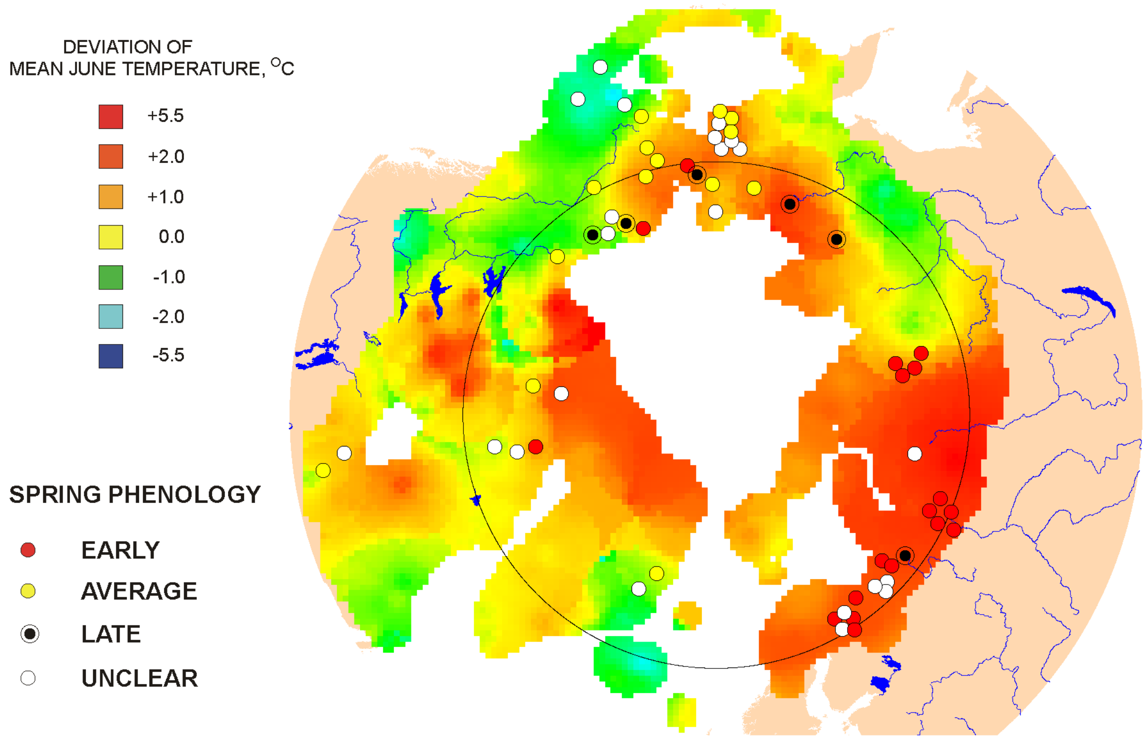


Figure 1. Deviation of June air temperature and spring phenology in the Arctic in 2011. See text in the box below for extended legend

METHODS OF MAKING MAPS

Maps on Figures 1–9 are provided to illustrate various aspects of bird breeding conditions in the Arctic in 2011.

Figures 1 and 2 represent an overlay of the map layers reflecting two different types of information. The first one is the deviation of the mean June/July temperature in 2011 from the mean June/July air temperature averaged for the period 1994-2003. This deviation indicates whether the respective month in 2011 was warmer (positive value) or colder (negative value) than average. The colour of the points at different study sites reflects a subjective evaluation by respondents of the spring as being early, average/moderate, or late (Fig. 1), and the summer as warm, average/moderate or cold (Fig. 2). Please note that, although referring to roughly the same period during the summer, the two types of information reflect essentially different phenomena that should not necessarily agree – for example spring could be early and cold. Temperature data were obtained from the National Climatic Data Center (Global Summary of the Day (GSOD) dataset, ftp://ftp.ncdc.noaa.gov/pub/data/gsod). Only stations with 26 or more daily records for a month were used for interpolation. The grid map was constructed using inverse distance interpolation, with the following settings: cell size 50 km, search radius 500 km, exponent 1. The area covered by the grid includes the territory obtained from an overlay of Arctic boundaries, as defined by CAFF and AMAP, plus an additional 100-km buffer.

Figures 3–9 illustrate abundance and breeding status of rodents, predators, and bird breeding success as reported by respondents. In some cases when respondents did not explicitly qualify breeding success, rodent abundance or another parameter, but these were fairly obvious from other information supplied, the site was assigned to a respective category based on the judgement of the compilers.

In July 2011, two broad regions of warm weather spread across almost the entire north of Canada and across the eastern part of Eurasia. Another, smaller region formed in the north-west of European Russia (Fig. 2). In July, temperatures were below average in south-west Alaska and from extreme north-east Europe to western Taimyr. Elsewhere, July temperatures were close to the long-term average. Evaluation of summer weather by respondents generally corresponded with monthly temperature deviations, although in some cases the discrepancy was high (Fig. 2). In the Mackenzie River Delta of Canada, a cold summer was reported, but this impression was apparently based on the evaluation of June rather than July weather conditions. The report of a cold summer from a site on the northern coast of Chukotka was apparently biased by the limited experience of the respondent, who had never visited this region before. The reports by several respondents of average summer conditions in the area around the Polar Urals could result from a mixture of impressions from an early May, cold June, and warm July.

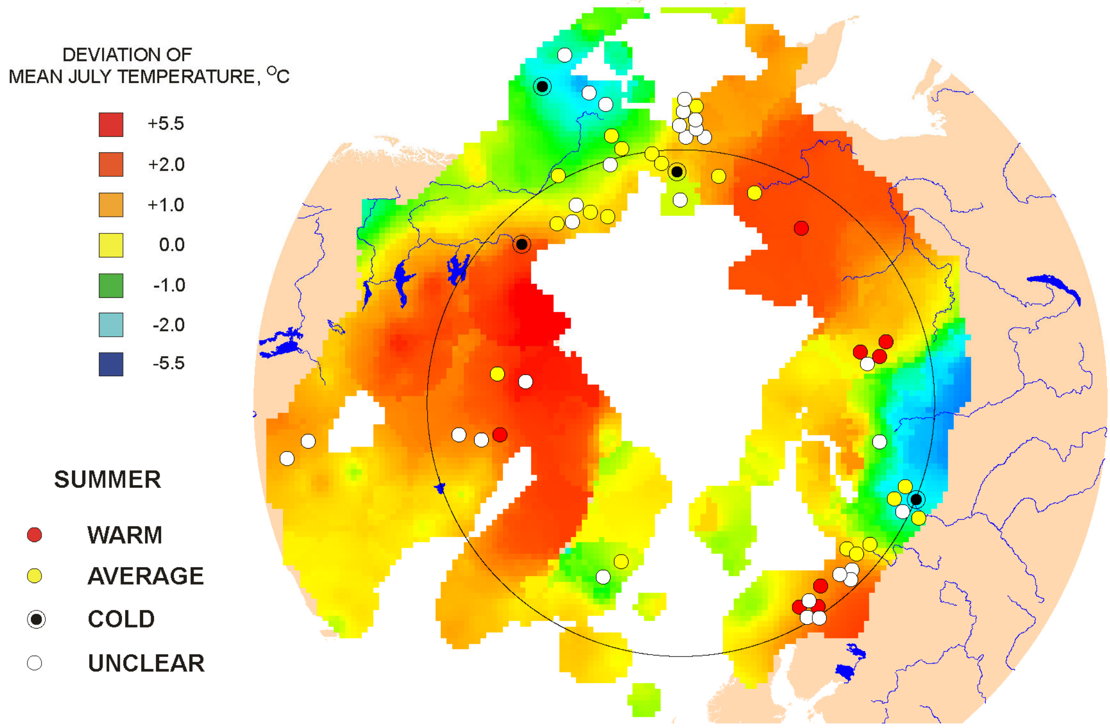


Figure 2. Deviation of July air temperature and summer conditions in the Arctic in 2011

Extreme weather events with potentially strong and wide-scale impacts on breeding success of Arctic birds were not recorded in 2011. A snowfall caused nest failure in early June in south-eastern Taimyr, but this happened before the start of mass egg-laying by birds. A snowfall occurred during three days in early July on northern Chukotka, but, did not appear to have catastrophic consequences for birds. However, presumably the same storm resulted in wader chick mortality in Nome area in Alaska across the Bering Sea. Respondents reported rainy weather and locally heavy showers in summer in the center of the Kola Peninsula, on the Kanin Peninsula, and in south-west Alaska. High floods occurred on the Indigirka River in Siberia and in the south-east of Chukotka, while unusually low water levels were recorded on the Ob' River.

Rodent abundance

Annual fluctuations in the abundance of microtine rodents (lemmings and voles) have strong impacts on distribution, abundance, and breeding success of avian and mammalian predators in the tundra. However, these fluctuations also affect and can be critical to breeding success of other land-nesting birds, whose eggs and chicks represent an alternative food supply for predators in years with low rodent abundances. Accordingly, we paid particular attention to rodent abundance when analyzing factors affecting breeding success of tundra birds.

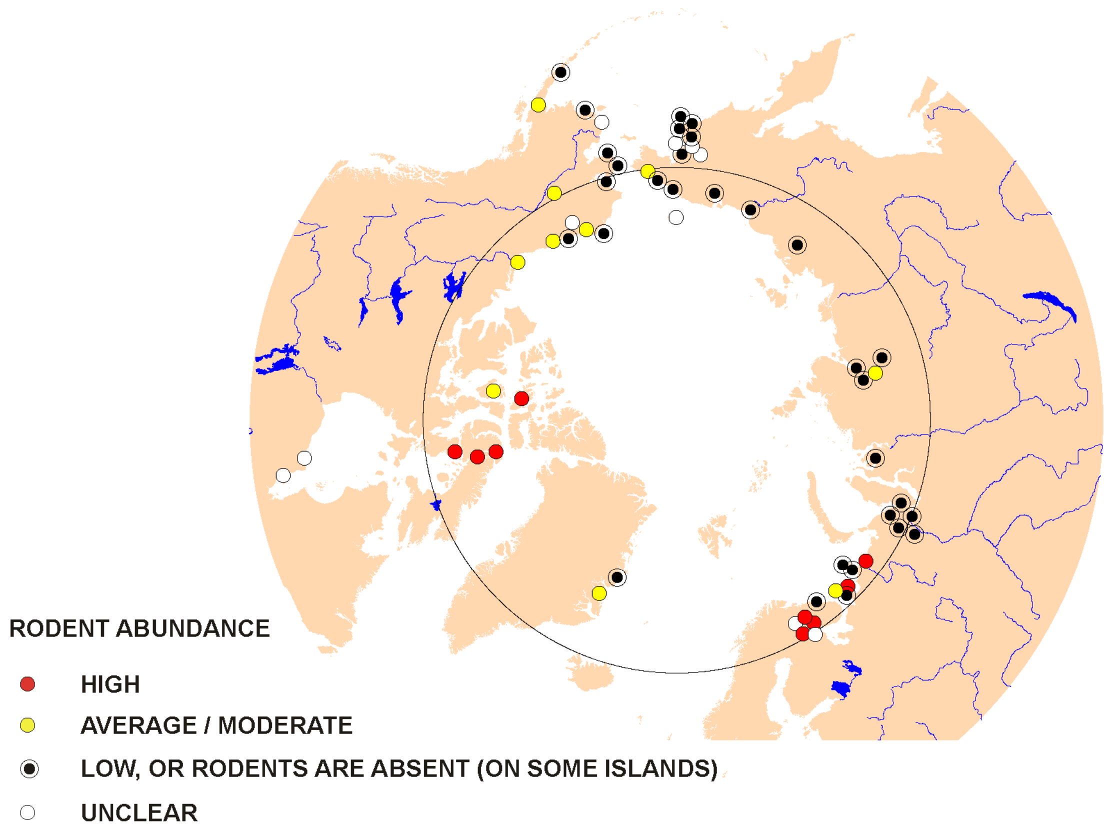


Figure 3. Rodent abundance in the Arctic in 2011

Low numbers of rodents prevailed in 2011 across most of the Arctic (62% of sites with available information, *n*=50; Fig. 3), spreading across the entire Asian Arctic and Alaska. In addition, low numbers of lemmings were recorded in extreme north-eastern Europe and at one site in north-eastern Greenland. Islands of the Canadian Arctic Archipelago and northern European Russia had high abundance of voles and/or lemmings; however, in the latter region there was considerable variation. The Norway Lemming *Lemmus lemmus* and Wood Lemming *Myopus schesticolor* were common or numerous in the north of Norway, central part of the Kola Peninsula, and north-western coast of the White Sea, while the abundance of lemmings was low to the east of the White Sea.

Compared with 2010, in 2011 rodent numbers showed a marked increase in Fennoscandia, northern Alaska, and the Canadian Arctic Archipelago, while populations of rodents in the north-east of Asia crashed.

Predators

The Arctic Fox *Alopex lagopus* is believed to have the strongest impact on nest success of tundra birds. Arctic Foxes were common and bred in 2011 in areas with increased abundance of rodents (Canadian Arctic Archipelago and European north from the White Sea to the Pechora River Delta), at one site in northern Chukotka with average abundance of rodents, and at one site in the north-eastern Greenland with low abundance of lemmings (Fig. 4). Non-breeding foxes were common but rarely numerous from Taimyr in Asia east to the Arctic coast of Alaska. Winter mortality of Arctic Foxes reported from lower reaches of the Kolyma River could be caused by a decline in lemming abundance.

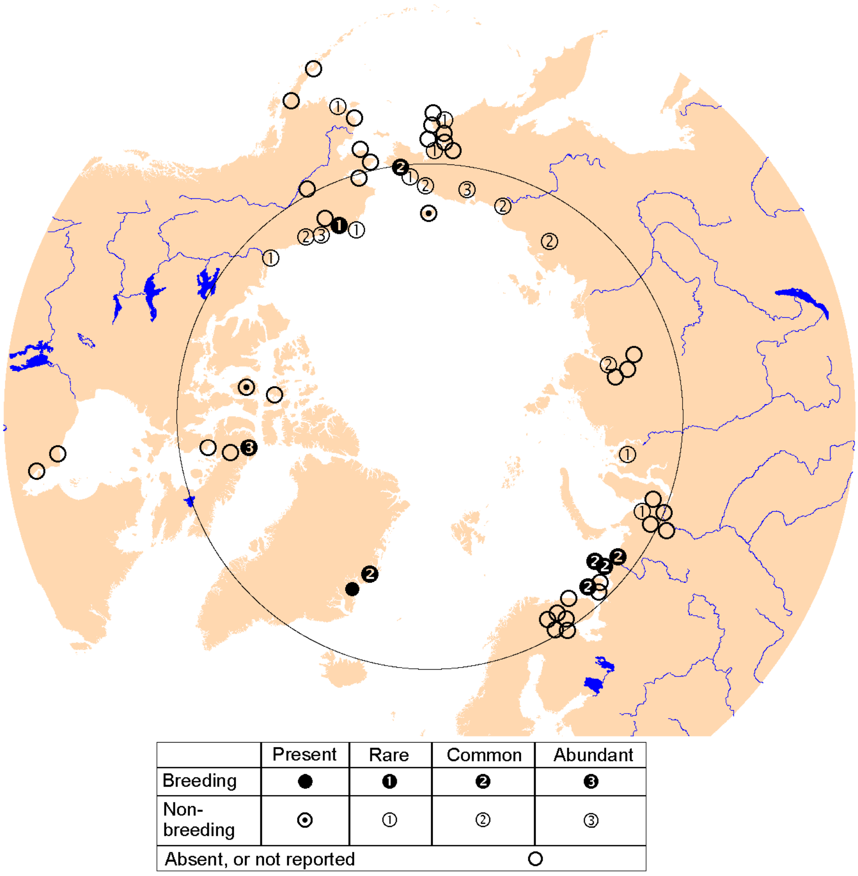


Figure 4. Abundance of Arctic Foxes in the Arctic in 2011

The Red Fox *Vulpes vulpes* was recorded at 14 continental sites in Eurasia and Alaska and on Kolguev Island. They were not observed on islands, including Greenland, and in the vast area of Siberia from the Gydan Peninsula to western Chukotka.

Ermines *Mustela erminea* were observed at 4 sites (compared with 8 in 2009 and 7 in 2010); Least Weasels *M. nivalis* at 4 sites (6 in 2009 and 4 in 2010); Minks *M. vison* at 4 sites (same as previously); Wolverines *Gulo gulo* at 1 site (5 in 2010); Wolves *Canis lupus* at 5 sites (8 in 2010); and, Brown Bears *Ursus arctos* and Black Bears *Ursus americanus* at 14 sites (same in 2010). On the Yamal Peninsula, Brown Bears destroyed nests of White-tailed Eagles *Haliaeetus albicilla* and Gyrfalcons *Falco rusticolus*.

Owls are rodent specialists and generally nest only when rodents are abundant. In Eurasia, breeding by boreal species of owls was recorded in 2011 in the center of the Kola Peninsula, while observations of non-breeding Snowy Owls *Nyctea scandiaca* and Short-eared Owls *Asio flammea* were rare, with an exception of common Snowy Owls in the northern Chukotsky Peninsula (Fig. 5). Breeding by owls was reported from 6 sites in the New World Arctic, including sites with moderate (northern Alaska and north-eastern Greenland) and low (Barrow) abundance of lemmings. Breeding Snowy Owls were numerous only on Baffin Island in Canada. In total, Snowy Owls were recorded at 14 sites in 2011 (14 in 2009, 15 in 2010) and Short-eared Owls at 16 sites (24 in 2009, 22 in 2010).

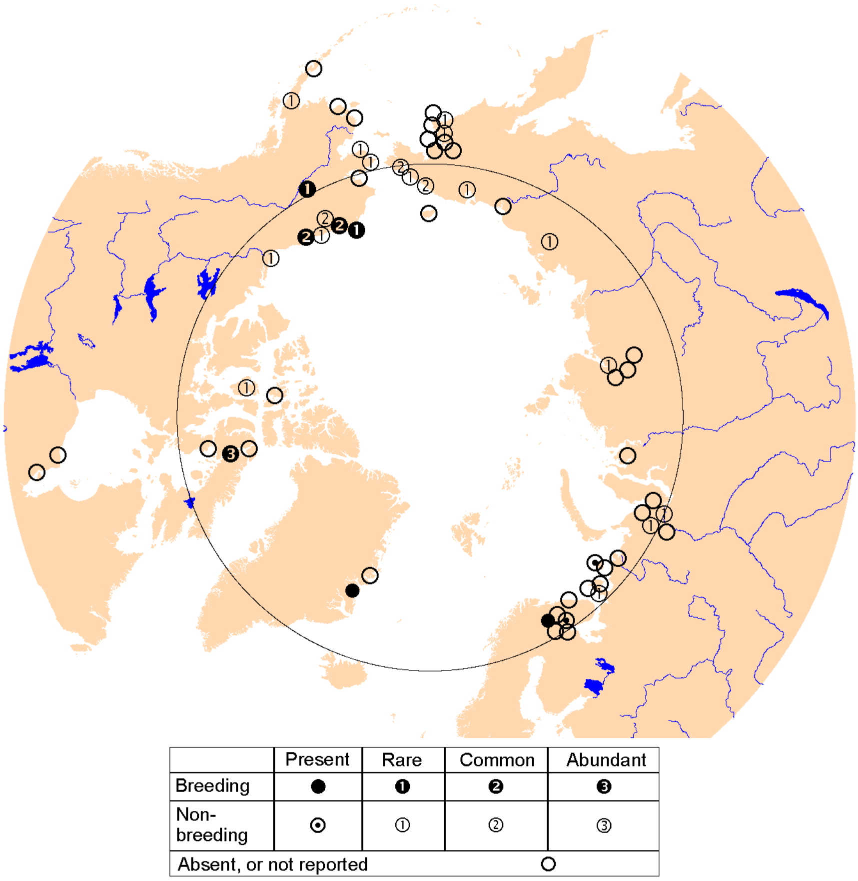
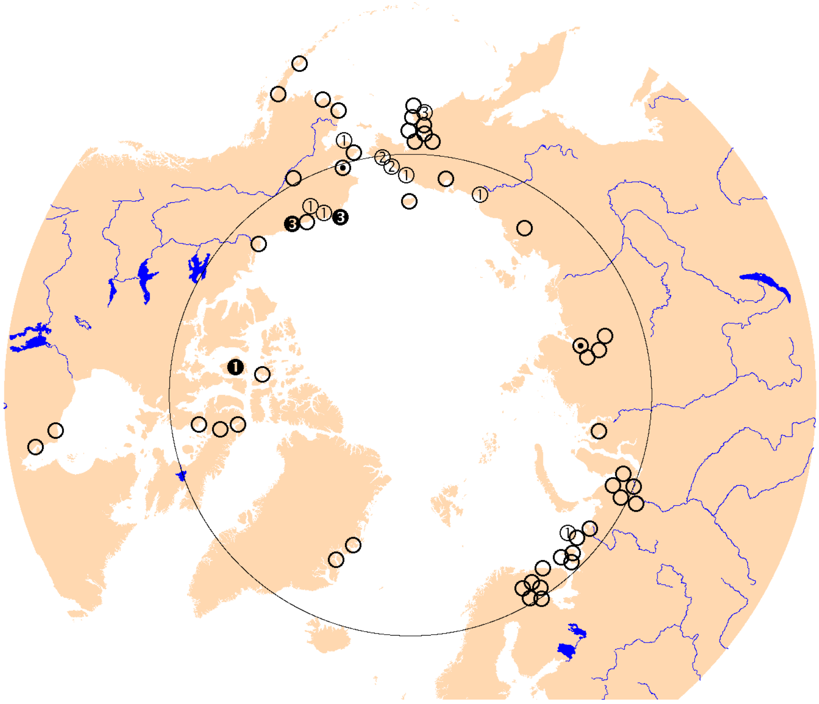


Figure 5. Abundance of owls in the Arctic in 2011

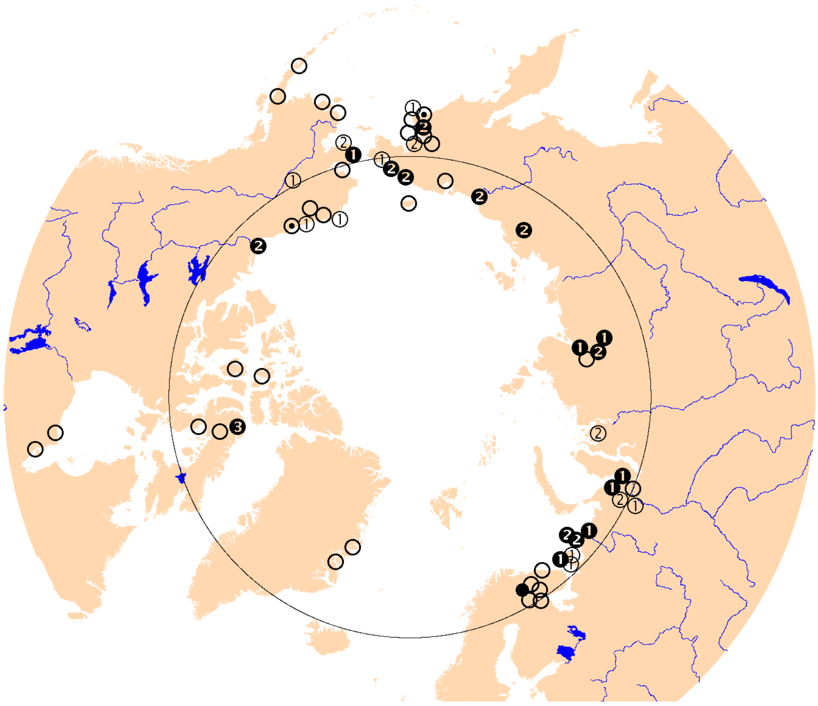
The Pomarine Skua *Stercorarius pomarinus* is similar to Snowy Owl in respect that it generally nests only where lemmings are sufficiently abundant. Breeding by Pomarine Skuas was recorded in 2011 at 3 sites in North America - two in northern Alaska and one in the Canadian Arctic Archipelago (Fig. 6). Lemming abundance was not high at these sites and numbers of nesting skuas were low, even when overall abundance of these birds was high.

Unlike owls and Pomarine Skuas, Rough-legged Buzzards *Buteo lagopus* can breed even when rodents numbers are low or absent (Kolguev Island), which makes distribution of this species across the Arctic more even. Rough-legged Buzzards are generally rarer in America compared with Eurasia (Fig. 7). Small rodents occurred in small numbers almost everywhere in Eurasia, but breeding of Rough-legged Buzzards was recorded at almost half of visited sites (15 of 32), although the abundance of buzzards was never high. Rough-legged Buzzards bred at 3 American sites and reached high abundances on Bylot Island, where lemming populations peaked.



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

Figure 6. Abundance of Pomarine Skuas in the Arctic in 2011



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

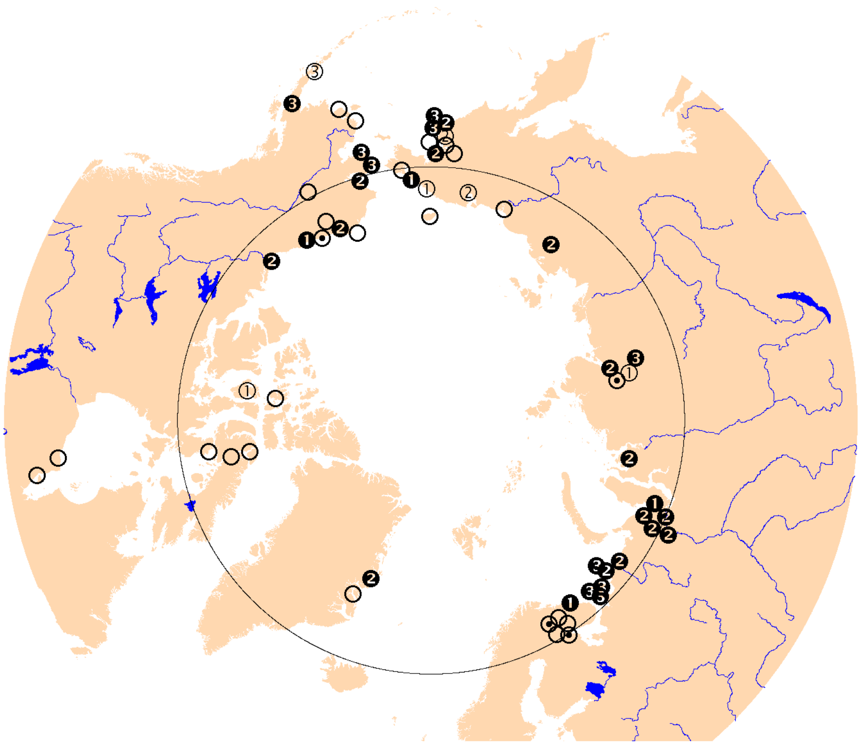
Figure 7. Abundance of Rough-legged Buzzards in the Arctic in 2011

A diversity of other tundra avian predators was high, but they showed little, if any, dependence on the abundance of rodents. Available data do not allow us to analyze their abundance and breeding performance on a circumpolar scale. It is noteworthy that increased numbers of White-tailed Eagles resulted in heavy pressure on nesting Common Eiders at the White Sea. Observations of White-tailed Eagles increased compared with past years on Chukotka.

Distribution and numbers of tundra birds

Reports suggest that the distribution and abundance of birds across the Arctic varies among years. Thus, in 2011, for the first time, the Baird's Sandpiper *Calidris bairdii* was recorded breeding on the Belyaka Spit on the Arctic coast of Chukotka and the Lesser Yellowlegs *Tringa flavipes* was observed in north-eastern Greenland. However, these observations can rarely be put in the context of large-scale processes.

Information about the abundance of the Willow Grouse *Lagopus lagopus* and Rock Ptarmigan *L. mutus* is more favourable in this respect, because both species have circumpolar distribution and at a genus level can be easily recognized by most non-ornithologists. Overall, in 2011, grouse were recorded as often as in 2010 (Fig. 8). Rock Ptarmigans were observed at 17 sites (20 in 2010), and Willow Grouse at 31 site (36 in 2010). Based on the data from previous years (Tomkovich & Soloviev 2011, 2013), we conclude that the abundance of both grouse species has remained low on the Kola Peninsula since 2009. Rock Ptarmigans were relatively common in the lower reaches of the Anadyr River in Chukotka and were generally rare in northern Alaska. Grouse numbers remained at average levels in north-eastern Greenland, while the data from the Canadian Arctic were not sufficient for conclusions.



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

Figure 8. Abundance of grouse in the Arctic in 2011

Willow Grouse numbers were high in northern Europe to the east of the White Sea, and remained moderately high around the Polar Urals. The species was common to abundant everywhere in the north-eastern Asia, with an exception of the Arctic coast. Numbers were high in Chukotka. Willow Grouse were generally abundant in Arctic Alaska to the Mackenzie River Delta, Canada, in the east; although numbers in this area compared with 2010 were reduced.

Breeding success

Breeding success of tundra birds depends on a variety of factors, several of which were analyzed in this review. Evaluations of breeding success available from different areas of the Arctic were based on the assessment of nest survival, as well as of other, usually less reliable parameters, such as brood abundance. In some cases, we, rather than report writers, evaluated breeding success based on unambiguous information in the reports. In total, we could assess breeding success for a half of the sites (31 of 60) in 2011 (Fig. 9).

Overall, 2011 was moderately successful for breeding Arctic birds. Low breeding success was recorded at 5 of 31 sites (16%), average breeding success at 19 sites (61%), and high breeding success at 7 sites (23%). Highest breeding success was concentrated in northern Alaska, where the abundance of rodents increased in 2011 compared with the previous year. High breeding success was recorded on Bylot Island, the only site with breeding success data in the High Canadian Arctic. However, the concentration of sites with high abundances of lemmings in the Canadian Arctic Archipelago allows us to extrapolate that elsewhere in this region birds bred successfully in 2011, for the second year in a row.

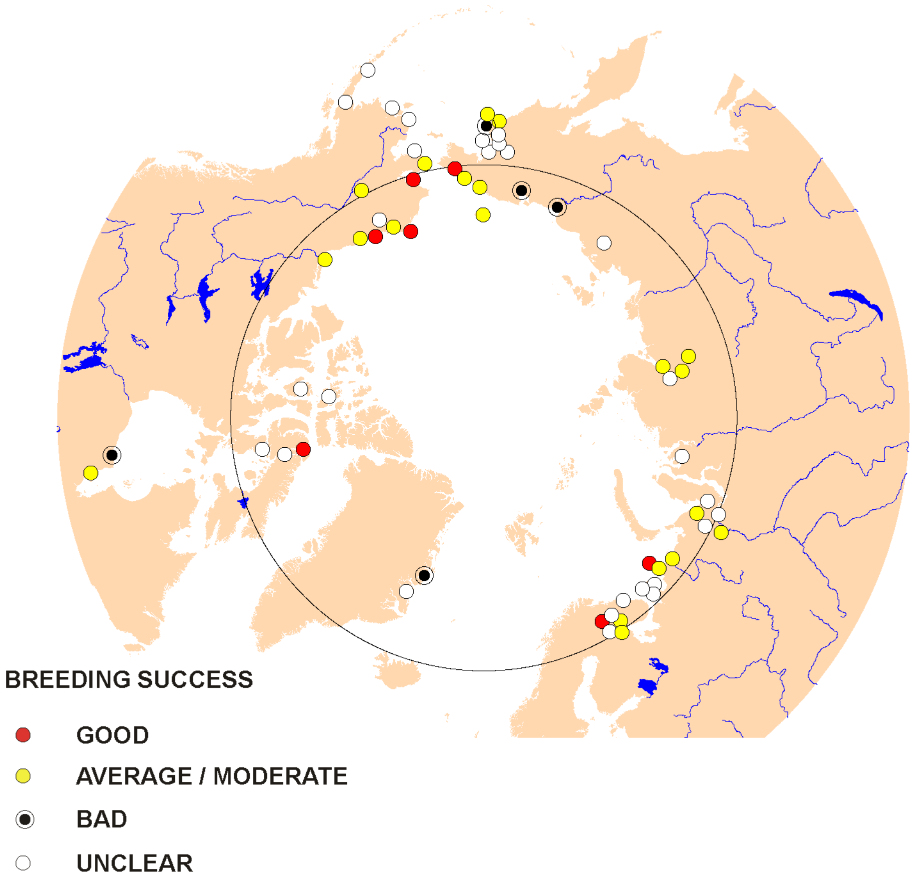


Figure 9. Bird breeding success in the Arctic in 2011

The sites with low bird breeding success were widely spread across the Arctic. An upsurge in lemmings in north-eastern Greenland was, apparently, not sufficient to result in an increase in bird breeding success. Low breeding success was reported from two adjacent areas in eastern Siberia, the Kolyma River Delta in Yakutia and Chaun Bay area in north-western Chukotka. This assessment was supported by results of wader catches in Australia in winter 2011/2012, where proportion of juveniles of species likely to have come from Yakutia was low or below average [Curlew Sandpiper *Calidris ferruginea*, Sharp-tailed Sandpiper *C. acuminata*, Sanderling *C. alba*, Yakutian populations of Red Knot *C. canutus piersmai* and Bar-tailed Godwit *Limosa lapponica menzbieri*) (Minton et al. 2012)]. This scenario was anticipated, given a crash of rodent populations in northern Yakutia in 2011 following two summers of successful reproduction by birds (Minton et al. 2011a, 2011b).

In contrast, proportions of juvenile birds in Australia likely to have come from Chukotka [Red-necked Stint *Calidris ruficollis*, Chukotka Red Knot *C. canutus rogersi*), Alaska (Bar-tailed Godwits *Limosa lapponica baueri*)] indicated average or above average breeding success in these populations (Minton et al. 2012).

In summary, breeding by tundra birds in 2011 was successful in the western part of Eurasia, in eastern Chukotka, in Alaska and in the Canadian Arctic Archipelago, while low breeding success prevailed across a wide area of eastern Siberia (Yakutia and north-western Chukotka) and in north-eastern Greenland.

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