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WATERFOWL OF NORTHERN EURASIA: RESEARCH, CONSERVATION, AND SUSTAINABLE USE

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“WATERFOWL OF NORTHERN EURASIA: RESEARCH, CONSERVATION, AND SUSTAINABLE USE”

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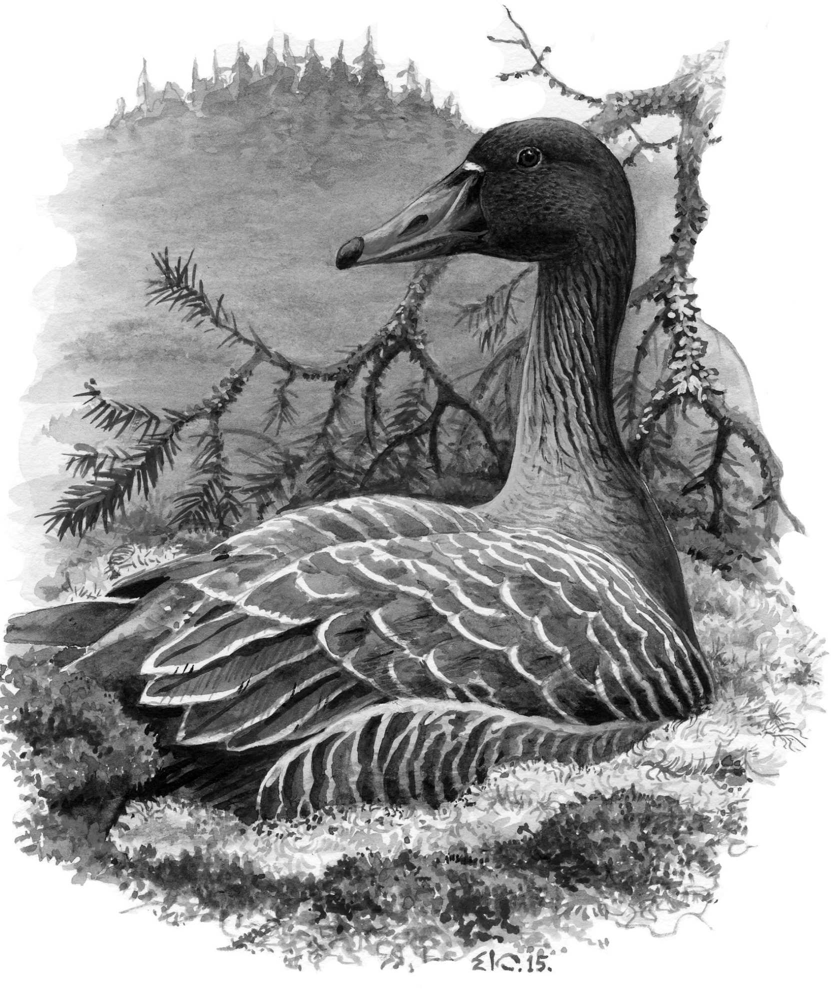

THE TAIGA BEAN GOOSE: AN EXAMPLE OF APPLYING ADAPTIVE HARVEST-MANAGEMENT AND OTHER ACTIONS TO DECLINING QUARRY GEESE

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The Taiga Bean Goose (*Anser fabalis fabalis*) is one of the few declining goose populations in the Western Palearctic; the wintering population size — estimated at 100 000 birds in the mid-1990s — had decreased to 45–55 000 individuals by 2015. Given its unfavourable conservation status and declining abundance, an African-Eurasian Waterbird Agreement (AEWA) International Single Species Action Plan is being developed for the population in order to agree on priorities and coordinate actions among range states responsible for its conservation. The 6th Session of the Meeting of the Parties to AEWA is expected to adopt the Action Plan in November 2015. The Action Plan process has defined four management units covering the entire subspecies. Recognizing the lack of knowledge of the factors affecting the change in population size, the plan will adopt an adaptive management framework to concentrate on reduction of (i) uncertainties of subpopulation delineation, abundance and dynamics; (ii) the legal and illegal harvest affecting survival; and (iii) human disturbance, breeding habitat loss and degradation contributing to reduced reproduction rates. Although adaptive harvest-management measures can be implemented without the full knowledge of all aspects of a species' life cycle, the more information that is available, the more efficient the implemented actions become. The Taiga Bean Goose is hunted in most range states. In order to ensure that the harvest is sustainable, international cooperation amongst all range states is essential. Once adopted, the flyway conservation plan will be the first under the AEWA for a species that is in decline yet still subject to hunting. The implementation of the Action Plan, including agreement on harvest levels, possible hunting bans, *etc*., will be coordinated and guided by the range states within the intergovernmental AEWA Taiga Bean Goose International Working Group, to be convened by the AEWA Secretariat following formal adoption of the Plan.

EVALUATION OF THE NESTING NUMBERS OF THE GREYLAG GOOSE (*ANSER ANSER*) IN SOUTHEASTERN UKRAINE (LEFT BANK OF THE DNIEPER RIVER)

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Scattered data of our own counts of birds, surveys and literature searches enable the laying-out of an approximate representation of the current numbers of nesting groups of the Greylag Goose (*Anser anser*) in the leftbank area of southern Ukraine. Here, in conditions of dry-steppe subzone, there are rather few natural water bodies, with the exception of the Dnieper River, that are attractive for the nesting of the species. For this reason, its distribution in the second half of the twentieth century has come about because of man-made water bodies: ponds on rivers and in large coulees; ponds in brackish marine bays in places of water discharge from irrigation systems or artesian wells; the lowest parts of large sinks [endorheic basins], into which water is also discharged from irrigation systems and artesian wells. However, at the beginning of the twenty-first century, a decline in numbers of nesting individuals of the species was noticed in the region, caused by a combination of the drying-up of the majority of water bodies, both natural — mainly due to the drop in groundwater levels — and artificial — as a consequence of the substantial reduction in the volume of discharged water from irrigation systems. As a result, at the present time it is estimated that up to 280–360 pairs of Greylag geese nest here: on the Lower Dnieper flood plains 120–150 pairs; in the estuarine zones of small rivers of the Northern Azov region (southern part of the Donetsk and Zaporozhye oblasts) 80–100; in the *sagas* (depressions in sandy terrain with ephemeral or permanent water-bodies in the centre, surrounded by marsh-reed or shrub-tree vegetation) of the Northern Black Sea Coast 20–30; on ponds and brackish bays of the Sivash (western Sea of Azov) and the Northern Black Sea Coast 30–40; on ponds of small rivers, large coulees and depressions of the Kerch Peninsula, Northern Azov and Sivash 30–40. The abundance in rice-growing areas on the Northern Black Sea coast and the Crimean Sivash remains unknown.

ENCOUNTERS OF THE BEWICK'S SWAN (*CYGNUS BEWICKII*) IN SOUTHERN UKRAINE

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An adult Bewick's swan was first recorded in the Western Crimea, on Lake Donuzlav, on 30.09.2004. It remains the earliest autumn encounter of the species in the region. Later (11.01.2011 and 12.01.2011), an adult with two young and a separate two adults and another three adults, respectively, were encountered. The overwhelming majority of these cases were recorded in the Sivash. The regular observations (7 sightings between 27.10 and 28.02 in the winter of 2013–2014) of a group of two to seven individuals in the area of the bays by the village of Yermakovo, Autonomous Republic of Crimea, indicate the stability of the wintering ground in the area. The variability of numbers could be explained by the migration of the birds to feeding grounds far from this water body. Two adult and three young swans were in this same area on ponds near Zelyoniy Yar, 8 km from Yermakovo, on 13.01.2014. The species was also regularly (six sightings between 20.12.2013 and 18.03.2015) encountered on the Kherson coast (northernmost part) of the Sivash: one individual near Churyuk Island (near the village of Vasilevka, Novotroitsk District); farther east, an adult and a young swan — and later only the adult — on rapeseed fields near Zaozyornoye village in the same District; still farther east, on a flooded field near the village of Sivashskoye (Novotroitsk District) and Novodmitrovka (Genichesk District), two adults and then 13 adults; farther south, on a pond near the village of Popovka (Genichesk District), three adults. One may also assume multiple wintering grounds on a wider-scale, significantly greater distance from the shores of the shallow waters of Karkinnit Bay of the Black Sea, where it is rather difficult to distinguish them from amongst other numerous feeding swans (*Cygnus cygnus* and *C. olor*). Here, four were encountered by us on the shores and three in a field of winter crops on 3.11.2013. It is interesting that in the Askania-Nova Reserve, an immature with a broken wing was found on 16.11.2009 (and remains in captivity in the zoo of that reserve). The species has also been encountered by colleagues along the northwest coast of the Black Sea, where 19 adults and 9 immatures were seen by us in the Tilihul estuary (Nikolaev and Odessa oblasts) on 23.02.2013.

CHANGES IN THE WATERFOWL POPULATION OF DOLGIY ISLAND RESERVE, PECHORA (BARENTS SEA, NORTHERN RUSSIA)

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Dolgiy Island is located in the southeastern Barents Sea; it has an area of 93 km^2 and is part of the "Nenets" State Nature Reserve, formed in 1997. There is no economic activity of any kind on the island. Plants on the island are members of the Typical Tundra zone. Surveys of Anseriformes on Dolgiy Island were carried out by standard methodology 3–28.07.2004 and 13–18.07.2014. The length of walked transects in 2004 comprised 190 km, in 2014 67 km. In the current paper, the results of surveys of only adult birds are analyzed. The waterfowl fauna of the island is made up of eleven species: the Barnacle Goose (*Branta leucopsis*), Bean Goose (*Anser fabalis*), White-fronted Goose (*A. albifrons*), Lesser White-fronted Goose (*A. erythropus*), Bewick's Swan (*Cygnus bewickii*), King Eider (*Somateria spectabilis*), Common Eider (*S. mollissima*), Long-tailed Duck (*Clangula hyemalis*), Greater Scaup (*Aythya marila*), Goosander (*Mergus merganser*) and the Red-breasted Merganser (*M. serrator*). The results of the surveys show that the structure of the waterfowl population has undergone changes. In 2004, the most abundant species were the Barnacle Goose (40 % of the population of Anseriformes), the King Edier (27), and the Bean Goose (12). A decade later, the Barnacle Goose was still most abundant (75), but its numbers had increased considerably compared to the Bean Goose (11), the White-fronted Goose had moved into third place with just 5 individuals, and the number of King eiders had dropped to less than that. The population of the Barnacle Goose was 4.1 times greater and that of the Bean Goose twice as great in 2014 as in 2004, while the populations of the other species declined: the King Eider to 40 % its previous abundance, the White-fronted Goose to 90 %, and the Bewick's Swan to 72 %. On account of the Barnacle Goose, the overall abundance of waterfowl on the island in 2014 was more than twice what it had been in 2004. In 2014, the total number of clutches and broods of King eiders was not even 3 % of what it had been in 2004, and the Long-tailed Duck did not breed at all. The area of the island occupied by the Barnacle Goose expanded, but that of the White-fronted Goose was fragmented and shifted into wetter habitats.

EFFECTS OF SPRING WEATHER ON VARIATIONS IN WHITE-FRONTED GOOSE NUMBERS AT THE OLONETS STOPOVER (RUSSIA)

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Approximately 100,000–150,000 migrating geese make a stopover near Olonets, Republic of Karelia, during spring migration. The most numerous visitor (75 % of all geese) is the White-fronted Goose *Anser albifrons*, followed by the Bean Goose *A. fabalis* (15 %) and the Barnacle Goose *Branta leucopsis* (10 %). The numbers of White-fronted geese and the duration of their stay at the stopover in the years between 1997 and 2014, inclusive, correlated with the weather around Olonets and at the previous stopover in Estonia (Tartu). The annual average number of geese counted per day in the period from April 21 to May 20 varied from 4600 to 12,000 birds. This parameter correlated with mean monthly air temperature in April in Olonets (r_s = 0.82) and with the date when mean daily air temperature exceeded and stayed above 5°C in Tartu (r_s = –0.69). The annual maximum number of birds counted on the peak-abundance day varied from 12,100 to 27,700 individuals, and correlated with the same parameters (r_s = 0.72 and r_s = –0.52). The peak-abundance date occurred between April 27 and May 17. It was associated with the date when mean daily temperature exceeded and stayed above 5°C in Olonets (r_s = 0.43), and the date when the minimum temperature first exceeded 5°C in Tartu (r_s = –0.44). Judging by the neck rings read, some White-fronted geese had stopped over near Tartu before arriving in Karelia. The distance from the Estonian stopover to Olonets is approximately 400 km, which is a day's flight for these birds. Goose migration is known to follow the 'green wave' — emergence of early herbaceous vegetation, which has a high dietary value. Stopovers along the route with huge congregations of migrants coincide with the peaks of emergence of this forage, and growth rates of vegetation directly correlate with spring weather. These data support the key assumptions of the 'green wave' hypothesis. They demonstrate that geese can adjust the course of their spring migration using the weather in different sections of the flyway. Hence, when forecasting the population dynamics of spring aggregations of geese at any given point on the flyway, one should, in addition to local weather, take notice of the weather in preceding stopovers.

A FIELD EXPERIMENT ON MANAGEMENT OF GOOSE NUMBERS ON SPRING STOPOVER SITES IN KARELIA

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Spring stopover sites in the Olonets district of Russia (Karelia) began to be intensively used by large numbers of migrating geese only after spring hunting of geese had been banned on some of the fields and strict conservation measures had been put in place in the region. Since 1993, the established so-called "game peace zone" — seasonally protected area — has covered 4,900 hectares. A large-scale experiment to enhance the attractiveness of fields for geese was initiated in 1999. On half the protected area, abandoned fields of the State Ilyinsky Farm were re-cultivated, with funding by WWF Sweden and the St. Petersburg Society of Naturalists, while the fields of the State Agrarny Farm on the other half of the area were left untouched and used as the control area. Experimental fields were ploughed and then seeded either with perennial grasses, clover, cereals or row crops. Field drainage ditches were managed and trees and shrubs were removed from the banks. As a result of the experiment, the economy of the State Ilyinsky Farm improved and field management after 2001 was continued through funding by the farm itself. The control plot was covered by old perennial grasses and was less intensively exploited by the geese. By 2012, almost all fields in the experimental plot were re-cultivated and involved in crop rotation, while in the control plot such fields made up less than 30 % of the area. The trends in numbers of *Anser* geese at these sites differed dramatically. The numbers increased in the experimental plot (r_s = 0.56), while they decreased in the control plot (r_s = –0.81). Formerly (1997–2000), the control plot hosted about 41 % of all geese at the stopover site, but by 2010–2014 this proportion had dropped to about 10 %. The same change was observed for the distribution of *Branta* geese. These data show the potential to control the numbers and distribution of birds on stopover sites through effective conservation measures and large-scale biotechnical activities.

MORPHOLOGY OF THE BILL-TIP ORGAN OF WATERFOWL BEAKS

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The bill-tip organ (BTO) appears as a complex of mechanoreceptor nerve endings concentrated under the inner surface of the nail of the beak of waterfowl. It was described in detail in several species in the 1970s. This organ is a complicated sensory organ; its role, evidently, is broader than searching for and selecting food items with the help of touch. Our morphological investigation of the BTO in 35 species of the order was dedicated to comparison of the structure and quantity of touch complexes in different systematic and ecological groups. The BTO is comprised of various types of sensory nerve endings confined to a tubular connective tissue base, and opening on the inner surface of the nail of the bill as keratinaceous papillae (sensilla-like units) or pits (not-sensilla-like units). Diversity of BTO lies in differences in size of the sensory zone; the numbers and sizes of the outer parts of the papillae and pits; the density of their distribution; and the degree of asymmetry of the organ as a whole. The largest BTO external structures are in swans; as in geese, too, the ratio of their numbers on the upper and lower mandibles is 1:2. In sea ducks, this ratio varies from 2:5 in mergansers to 2:3 in scoters and others. The number of tactile papillae on the lower mandible is much less in comparison with other groups in the order. In diving ducks, the ratio of the BTO structures is 7:30. In dabbling ducks, the assymmetry of the organ (the ratio of the number of units on the upper and lower mandibles) is much greater (7:50). The asymmetry of the organs increases from species of the tribe Anserini (K = 1.7) to species of the tribe Anatini (K = 7.0). This asymmetry correlates with the number of touch units of the lower mandible ($r = 0.66$; $p < 0.01$). The mean number of BTO units per mm^2 of the lower mandible in swans is 3; in geese 6.7; in sea ducks 2–7; in mergansers 7; and in dabbling ducks 13.7. The organization of the BTO is correlated with lifestyle in the various groups of the order. Herbivorous geese and swans have a symmetrical BTO with numerous tactile structures. Diving, carnivorous sea ducks have a symmetrical BTO with few structures. Dabbling and diving ducks — both surface and underwater "filter-feeders" — have an extremely asymmetrical organ and the most numerous tactile structures on the lower mandible. The significance of the BTO in waterfowl communication is discussed.

THE WINTERING OF WATERFOWL ON THE NORTHERN RESERVOIR OF ROSTOV-ON-DON, SOUTHERN RUSSIA

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Observations on the wintering of birds was conducted on the Northern Reservoir of the Temernik River in Rostov-on-Don from mid-October 2014 to the beginning of March 2015. Over the entire period, we saw a total of 12 species of waterfowl and waterbirds (Rallidae, grebes, cormorants and gulls), of which eight were regularly encountered. Of the Anseriformes, the most numerous was the Mallard (*Anas platyrhynchos*), which was less numerous than only the Eurasian Coot (*Fulica atra*). The fifth most abundant, after the aforementioned two and the Black-headed Gull (*Larus ridibundus*) and Common Moorhen (*Gallinula chloropus*), was the Eurasian Teal (*Anas crecca*). We also saw a female Common pochard (*Aythya ferina*), a Muscovy duck (*Cairina moschata*) and a domestic duck. The previous winter we had encountered a Common goldeneye (*Bucephala clangula*), Gadwall (*Anas strepera*) and Mallard-Red-crested pochard (*Netta rufina*) cross on the this reservoir. The maximum number (128) of mallards was recorded at the end of January, and the fewest (15), in December. The change in abundance of these ducks on the wintering ground was linked with fluctuations in air temperature. In December, after an insignificant increase in temperature, the number of overwintering mallards on the reservoir noticeably dropped. A sharp drop in air temperature and shrinkage of the area of open water led to a noticeable increase in the number of mallards on the reservoir. An inverse correlation between air temperature and mallard abundance on the reservoir was identified ($r = -0{,}32$, $P < 0{,}05$), which confirmed the important role of this factor. Changes in the abundance of mallards on the reservoir are most likely connected with the fact that individuals of this species are quite mobile, and actively move to areas of open water in search of food. In warm weather, there is open water elsewhere and the ducks move to it. Besides this, there is a high degree of competition for food with the more aggressive coots. Males outnumbered females amongst the mallards overwintering on the reservoir; their proportion fluctuated from 46 % to 63 %, with a mean of 54 % for the entire period of observation. At the beginning of March, this relationship changed in favour of the females. It is quite possible that this is connected with the fact that the males begin to fly earlier than the females from the wintering ground to nesting grounds.

NESTING OF THE SMEW (*MERGUS ALBELLUS*) IN THE KANDALAKSHA SKERRIES OF THE WHITE SEA (KANDALAKSHA NATURE RESERVE)

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After goldeneye nest boxes had been set out on the islands of the Kandalaksha Reserve and after a strong decrease of Common goldeneyes (*Bucephala clangula*) nesting in them, Smews began to use the nest boxes in 1987. Arriving in spring during the first 10 days of May, the majority of these birds begin to lay eggs in mid-May; a complete clutch being most often 8 eggs. The females frequently lay eggs in nests of their own species and in nests of Goldeneyes. The Goldeneyes also lay eggs in the clutches of Smews. Both species lay eggs a day apart and incubate for 30 days. In the first 25 days of incubation, 42 female Smews did not lose weight and weighed on average 448 g (405–500 g); only in the last five days did 8 females lose weight, on average 20 g. In the Kandalaksha Skerries, the very earliest goslings hatched on 14.06.2013, the majority in the last 10 days of June. Mean weight of 79 smew ducklings in the nest was 26.4 g (20.5–32.0 g). Smew ducklings leave the nest after Goldeneyes, owing to the fact that it is harder for them to find free space for the brood in the area, since a female Goldeneye actively defends the territory on which her brood finds itself from broods of Goldeneyes and of other species. The longer trek of the smew downy ducklings to a free territory leads to an increased mortality. At the age of about 34 days, smew ducklings begin to grow flight feathers. The quills are finished growing by 40 days. During danger, the young prefer not to dive, but to take cover in the grass. The first signs of moult of the small contour feathers of adult males is evident by mid-June. Male Smews gather at moulting sites during the first half of July, and the moulting of the primaries begins. Around 1 August, females were caught who were beginning to moult their primaries. Ecologically similar species, the Smew and the Common Goldeneye have significantly different diets, which allows Smews to remain near flocks of Goldeneyes. According to faecal pellet analysis, incubating female Smews in the Kandalaksha Skerries feed primarily on the larvae and imago of aquatic insects: Hemiptera, Coleoptera, Trichoptera, Odonata, Diptera, and others. Goldeneyes, on marine invertebrates, and to a lesser extent on freshwater insects, for example Trichoptera larvae.

SPRING COUNTS OF MIGRATING GEESE AND DUCKS IN QUALIFIED GAME FARMS

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The idea of counting migrating waterfowl using the manpower of state game farms is not new. Formerly, such counts were conducted in a limited manner in several regions of Russia. The practice demonstrated that regional authorized bodies and game farms, with state workers (guides, inspectors, huntsmen) at their disposal, have sufficient manpower to conduct the counts of migrating waterfowl using methodology adapted for them. State-qualified game farms (Federal State State-financed Institution (FSSI) "State-Qualified Game Farm" ("SQGF")) perform research and development tasks, amongst which the counting of game animals and the testing of new or state-of-the-art survey methods are amongst the most important. In 2012, the Department of game ornithology of the Federal State Agency "*Centrokhotkontrol*" proposed that the adapted method of counting of migrating geese and ducks at permanent observation points (POP) be put into practice by the FSSI SQGF. In the springs of 2012 and 2013 birds were counted by this method in the FSSI SQGF "Orlinoye" in Primorskiy Krai. In 2014, this positive experience was spread to other SQGFs: "Bezborodovskoye" and "Medveditsa" (Tver Oblast), and "Meshchera" (Ryazan Oblast). An important aspect in the organization of this work was the transmission to "*Centrokhotkontrol*" by those carrying out the count of the raw data for their working up by specialists, preparation of the report on the movement of the migrating birds, and conclusions on the organization of the survey work. At the concluding stage, "*Centrokhotkontrol*" sent reports to the administraton of the game farms as a source of information about the nature of the migration of the geese and ducks in the spring season just past. The report mentioned both the positive and negative aspects of the reported work. The latter is necessary for future elimination of identified shortcomings. In the working up of the survey data, many parameters (abundance and proportions of species, the number of counted birds, dynamics of the intensity of migration, flock size, direction and height of migration of different species, *etc*.) were evaluated. In each of the aforementioned game farms, one to six POPs were constructed. In total, from 11 POPs, 26,000 geese and ducks of 15 species were counted. The proportion not identified to species comprised 34–72 % of the geese and 8–60 % of the ducks in the different SQGFs. Monitoring continued in 2015.

THE STATUS OF GOOSE POPULATIONS IN EAST ASIA

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East Asian goose populations are amongst the least studied in the Northern Hemisphere but available evidence suggests they have shown the most rapid declines of any in the world. Based on various sources of information, we present an overview of the status of seven goose populations in East Asia. Wintering numbers of the ***White-fronted Goose*** (*Anser albifrons*) have decreased in China, while those in Japan and Korea have increased since the early 2000s, resulting in a current population of approximately 275,000. The ***Lesser White-fronted Goose*** (*A. erythropus*) has declined greatly in numbers and the contraction of its wintering range has continued, making it extremely vulnerable. The almost exclusively Chinese wintering range of the ***Swan Goose*** (*A. cygnoides*) has been constricted to fewer and fewer sites, but counts suggest more than the previously estimated 75,000 individuals. The ***Taiga Bean Goose*** (*A. fabalis middendorffi*) remains poorly counted in China, but we estimate 50,000–70,000, based on coverage in Japan and Korea. The ***Tundra Bean Goose*** (*A. serrirostris*) population overwintering in Japan, Korea and China is estimated at 81,200–156,800, but the precise number remains unknown, especially in China, owing to the lack of racial definition. The ***Greylag Goose*** (*A. anser*) is estimated to number 50,000–100,000, but has shown dramatic declines in the last 50 years; its wintering area is largely confined to Eastern China. The ***Brent goose*** (*Branta bernicla*) population is estimated at 2,500–3,000,

if individuals wintering in China are of the same provenance as in Japan and Korea, but true population size and trends remain unknown, owing to the lack of winter surveys in China. In summary, the true population size and trends of all seven species remain unknown; all of them, especially the ones in decline, would benefit from improved monitoring and flyway research. Only through improved systematic collaboration can we better understand the population dynamics of these species, and thus support more effective management and policy-making.

ANSERIFORMES WINTERING IN SOUTHERN UKRAINE AS CARRIERS OF SEVERAL INFECTIOUS DISEASES OF ANIMALS AND HUMANS

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Avian viruses of the well-known subtypes H1-H16 and N1-N9 are encountered in more than 100 species in 12 orders of birds, the majority of which belong to the Anseriformes. For that very reason, from 2010 to 2015 we conducted an investigation on representatives of this order on the transmission of pathological viruses in wetlands in southern Ukraine, especially in the Sivash. Included were 25 overwintering species of Anseriformes, amongst which the dominant in abundance was the Mallard (*Anas platyrhynchos*), making up 34.3 % of all individuals identified to species, followed by the White-fronted Goose (*Anser albifrons*: 16.4 %), Common Shelduck (*Tadorna tadorna*: 13.7 %), Red-breasted Goose (*Branta ruficollis*: 11.6 %), and Eurasian Wigeon (*Anas penelope*: 8.0 %), with the remaining species totalling 16.1 %. This last group included the Greylag (*Anser anser*), and Lesser White-fronted geese (*A. erythropus*); the Mute (*Cygnus olor*), Whooper (*C. cygnus*), and Bewick's swans (*C. bewickii*); Ruddy Shelduck (*Tadorna ferruginea*); Eurasian Teal (*Anas crecca*), Gadwall (*A. strepera*), Pintail (*A. acuta*), Garganey (*A. querquedula*), and Northern Shoveler (*A. clypeata*); the Red-crested (*Netta rufina*) and Common pochards (*Aythya ferina*); the Tufted Duck (*A. fuligula*), Greater Scaup (*A. marila*), Common Goldeneye (*Bucephala clangula*), and Velvet Scoter (*Melanitta fusca*); the Smew (*Mergus albellus*), Red-breasted (*M. serrator*) and Common mergansers (*M. merganser*).

In places of aggregations of birds, from 92 944 individuals in 11 species (*Branta ruficollis, Anser albifrons, Cygnus olor, C. cygnus, C. bewickii,* *Tadorna ferruginea, T. tadorna, Anas platyrhynchos, A. crecca, A. querquedula, Mergus serrator*), 3851 faecal samples were taken to determine their pathologenic virus group and Newcastle Disease. The most numerous samples were taken from *Anser albifrons* (33.58 %), *Anas platyrhynchos* (22.23 %), *Branta ruficollis* (16.26 %) and *Tadorna tadorna* (12.85 %). Isolated viruses of the groups were taken from *A platyrhynchos* (with an infestation rate of 1.66–5.33 %), *T. ferruginea* (1.11–1.66 %), *T. tador*na (2.60–3.25 %) and *Anser albifrons* (3.52–5.0 %). The results of the phylogenetic investigation revealed their connection with viruses from Western and Central Europe, Russia, the Caucasus, and Asia. For the first time a connection was established between "Ukrainian" paramyxoviruses and Central and North Africa, and the possibility of the introduction of new viruses to the ecosystems of southern Ukraine from other geographic regions was demonstrated. It was determined that different populations of a single species have dissimilar infection. The study data show that the investigation of species composition, and the abundance and distribution of wintering waterfowl is a necessary instrument in the monitoring of epizootic situations of viral disease of animals and humans in the region.

THE ROLE OF WATER BODIES OF THE SHALKAR-ZHETYKOL' LAKE REGION IN WATERFOWL REPRODUCTION

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Data obtained over the past 10 years permitted delineation of the following types of waterbodies in the Shalker-Zhetykol' region: ***Large brackish lakes*** 1) with an impenetrable margin of *Phragmites* (*e.g.*, Shalkar-Ega-Kara, 9900 ha) — formerly serving as a usual place of nesting for geese and ducks, but now, after becoming shallower, as a migratory stopover site; 2) with a *Phragmites*-cattail margin and waters with clusters of plants (Zhetykol', 4325 ha) — an important nesting habitat and concentration place for geese, swans and ducks; ***Medium-sized and small brackish lakes*** 1) with a narrow, discontinuous *Phragmites*-cattail margin and waters moderately overgrown with floating mats (1610 ha) — major nesting habitat for ducks; has become much shallower, partially dried up; 2) with a broad shoreline margin of *Phragmites* and open water being overgrown by vegetation (1380 ha) — a stopover site for migrants and without great importance for nesting waterfowl; 3) with a narrow discontinuous margin and waters with clumps of *Phragmites* (520 ha) — important for nesting ducks, and serves as a migratory stopover site for waterfowl; 4) with a narrow margin of clusters of plants and weakly vegetated waters (260 ha) — its role for waterfowl is negligible; 5) with extensive *Phragmites* margins in a basin (130 ha) — inaccessible, encircled by fields, making it attractive to migrants; 6) with a hollow becoming overgrown with clumped meadow vegetation (70 ha) — serving as a nesting place for ducks; ***Phragmites-cattail floodplains*** 1) in troughs formed by run-off (500 ha); 2) in isolated basins (275 ha); ***Limans (muddy, brackish lagoons)*** existing for one to two years and, as with floodplains, used for nesting by a large number of dabbling ducks; ***Salt lakes*** 1) with a narrow margin of *Phragmites* (Shalkar-Kara-Shatay); 2) with local shoreline and clustered stands (Aike); in 2012 this lake dried up; ***Salt pans***; ***Small steppe rivers*** 1) salty — where Common (*Tadorna tadorna*) and Ruddy (*T. ferruginea*) shelduck broods are concentrated; 2) fresh — along which ducks nest (Buruktal River with riverine lagoons); ***Artificial water bodies*** 1) relatively large ponds with dense stands of vegetation and small open ponds in ravines beside fields of grain — migratory stopover sites; 2) sewage treatment ponds, where nesting White-headed ducks (*Oxyura leucocephala*) and the majority of Red-crested (*Netta rufina*) and Common (*Aythya ferina*) pochards are found.

NESTING WATERFOWL OF THE SHALKAR-ZHETYKOL' LAKES REGION OF THE SOUTHERN URAL MOUNTAINS, RUSSIA

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Fifteen species of waterfowl nest on the waterbodies of the area. Several hundred pairs of Greylag geese (*Anser anser*) nested in the 1990s, 80 in 2007, and 15–20 pairs in 2012. In 2005–2007, seven pairs of Whooper swans (*Cygnus cygnus*) nested on the lakes in this district (Svetlinskiy); now there are only five pairs. In June 2010 and 2011, 15 swans were seen on Lake Shalkar and 150 on Lake Sarykop, in 2012 — a single pair at Aralkol' settlement and a lone bird on the neighbouring estuary and the Kabyrga River. In 2005–2007, up to 10 Mute swans (*C. olor*) nested in the study area, in recent years, not more than seven pairs. In June 2010 and

2012, 20 Mute swans were observed on Lake Shalkar; 9 on Lake Aike; three pairs, a flock of 48 and 42 individuals at Urkach settlement; and three on Shygyrta Pond. In June-July 2004 through 2010, as many as 100–720 Ruddy shelducks (*Tadorna ferruginea*) each year were on the Russian part of Lake Aike, but in 2012 not one was found on the entire stretch of water. Now in Svetlinskiy Nature Preserve, on other lakes and ponds of the Russian part of the region, 150 pairs are counted. In the brood-rearing period of 2010, the number of pairs was put at 2500, but in 2014 it was 2000 individuals. On lakes of the Russian part of the region 25 pairs of Common shelducks (*T. tadorna*) nested regularly. But in June 2012, only approximately that many of them were inhabiting the whole of Lake Aike and a host of ponds, including Lake Shalkar-Kara-Shatay and near Arakol′ settlement. The abundance of the Mallard (*Anas platyrhynchos*) reached approximately 3000 by the start of the hunting season in the first decade of this century, but in recent years dropped to 1500. The estimated abundance of the Garganey (*A. querquedula*) by the start of the hunting season reached 1000. The Pintail (*A. acuta*) and the Northern Shoveler (*A. clypeata*) by autumn numbered 100 and 300, respectively. Several tens of pairs of Gadwalls (*A. strepera*) nest annually, but only a solitary pair of Eurasian wigeons (*A. penelope*). Earlier there were 30–50 nesting pairs of Red-crested pochards (*Netta rufina*), but now not more than 30. In 2002–2007, there were 150 and 50 pairs of Common pochards (*Aythya ferina*) and Tufted ducks (*A. fuligula*), respectively, but now only 50 and 30 pairs, respectively. The number of pairs of White-headed ducks (*Oxyura leucocephala*) grew from 2–3 to 8 and 10 in 2014 and 2015, respectively.

DOES HEAVY METAL POLLUTION AFFECT IMMUNOLOGICAL PARAMETERS OF BARNACLE GOSLINGS AFTER EXPOSURE TO ACUTE STRESS?

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The toxic heavy metal mercury (Hg) is a common environmental contaminant, which can be traced back to both natural and anthropogenic sources. One of the anthropogenic sources of Hg contamination is mining, either from present day or historical activities. Studies on avian invertivores and piscivores have shown that mercury pollution can impair immune function. In the High Arctic, research has primarily focused on the effects of heavy metal contaminants on marine ecosystems, while possible effects on terrestrial ecosystems are less well understood. Our study focuses on an important terrestrial grazer in the Arctic, the Barnacle Goose (*Branta leucopsis*). We investigated immunological parameters (agglutination, lysis, nitric oxide concentrations, haptoglobin concentrations and differential blood count) at baseline and after exposure to an acute stressor, *i.e.* individual isolation, in Barnacle goslings that were exposed chronically to heavy metal pollution from an abandoned coal mine in Ny-Ålesund, Spitsbergen (Svalbard). We performed an experiment in which one group of human-raised goslings grazed daily on the polluted mining area, while the other group went to forage on clean tundra (control area). The soil in the mine area contained total mercury concentrations 5–6 times higher than the control. Consequently, the mercury concentrations in plant material in the former were also higher (2.2 times) relative to the latter. We predicted that goslings that foraged in the mine would accumulate higher mercury concentrations in their tissues. This, in turn, should negatively affect some of their immune parameters after an acute stress response. In this presentation I will discuss the preliminary findings of this experiment.

COMPARISON OF FLYWAYS OF WHITE-FRONTED GEESE (*ANSER ALBIFRONS)* THROUGH EUROPEAN RUSSIA IN THE 1960s AND 2000s BASED ON RINGING DATA

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For the past 60 years, the population of White-fronted geese migrating through central and northern European Russia and wintering in northwestern Europe has undergone a significant growth in numbers, increasing from 50 000 to more than 1200 000. In the absence of data of flyway surveys, for the comparison of the relative abundance of the migrating geese we compared the portion of hunter-killed birds from spring migration with those from autumn migration, using ring recoveries (reports on those kills with rings) from the database of the Russian Ringing Centre. For the comparison, only those recoveries of rings from White-fronted geese from the European part of the country in years with spring hunting were used. On the basis of the analysis of the dynamics of the obtained ring recoveries and of documents on the opening of the spring hunt and its length, two selections of two sufficiently lengthy intervals — 1961–1968 and 1998–2005, 2008 — were used. The total number of ring recoveries was 439. European Russia was arbitrarily divided into three regions: Northwestern, Central, and Eastern. For each time interval, the percentage of spring rings recoveries was determined, and this mirrored the proportion of the spring kill in the total number of hunter-killed White-fronted geese in that region. If we assume that the number of hunter-killed birds is correlated with the number of migrating geese, then it is possible to compare the data not only between regions, but between the two time periods. Comparison of the proportions of spring and autumn recoveries confirms the existence of a "loop migration" of the White-fronted Goose, in which a significant part of the birds migrates through Central Russian in the spring, and returns by a short White Sea-Baltic Sea route. Furthermore, in the Northwestern region, there has been a growth in the number of recoveries arriving after the spring hunt. This is most likely connected with an increased number of birds using this more direct route in the spring. Due to degradation of farmland, a large number of sites that in former days provided suitable habitat for autumn stopovers have now lost their attraction for the geese, such that now the birds migrate more quickly to their wintering grounds.

THE CURRENT STATUS OF THE BARNACLE GOOSE (*BRANTA LEUCOPSIS*) ON VAIGACH ISLAND, NW RUSSIA

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Until the end of the 1970s, Vaigach Island, along with Novaya Zemlya, was in the nesting range of the "Russian" population of the Barnacle Goose. The basic nesting biotopes in traditional habitats were flat marine islands, river conyons, and coastal cliffs. From the 1980s to the present, the abundance of the Barnacle Goose has increased from less than 50,000 to 800,000. On the eastern coast of Dolgaya Bay of Vaigach Island, a control area was established in 1986, including within it 9 colonies of Barnacle geese. Nearly all were located on rocky islets, in river canyons, and on the edges of sea cliffs. Observations in this area were carried out from 1986 through 1988, 1995–1997, and in 2013. In addition to this, in 2013 a significant proportion of the southern part of the island and of the region around Lyamchino Bay were followed. In 1986, 1987, and 1988, the abundance of nesting birds depended on the general nature of the spring weather, and there were 25, 5, and 79 nesting pairs, respectively. Based on the number of nest cups, the maximum number of nests possible in these colonies would be about 200. In 1996, 69 nests were recorded in the control area. At the same time, the first nesting of these geese in atypical open habitats was noted. In 2013, 196 nests were counted in the control area. Furthermore, two small colonies disappeared at this time, and not even old nests cups were seen. In addition to the control area, in 2013 surveys were conducted on 11 colonies located on various parts of the island. Several colonies not encountered previously were found, including the largest colony on the island (8200 nests), at the mouth of the Yunoyakha River, on open tundra, on the rims and overhangs of the river canyons. Thus the abundance of the Barnacle Goose nesting in traditional habitats on Vaigach Island has grown, and at the same time, the main growth in numbers has occurred on account of the appearance of colonies forming in new biotopes.

HOW SHOULD WE MANAGE INCREASING POPULATIONS OF GEESE?

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Geese wintering in the Netherlands were at an all-time low in the 1960s. After major restrictions were placed on hunting in 1970, goose numbers increased. To understand the recovery and to predict future population levels, regular censuses and age-ratio assessments in winter were started, as well as ringing programs. Since 1990, supplementary studies have been carried out on the breeding grounds of the Dark-bellied Brent Goose (*Branta bernicla bernicla*) in the Russian Arctic. Growth in goose numbers is not only correlated negatively with intensity of hunting, but also positively with intensity of farming (use of more fertilizer). These factors are difficult to separate in the Netherlands, because hunting restrictions and intensification of farming started simultaneously. However, goose numbers were also high at the beginning of the twentieth century, before agriculture had been intensified, so at that time hunting must have been the main factor limiting goose populations. It is thus concluded that while winter food has become more abundant and of better quality, it has never been a limiting factor. On the other hand, spring staging grounds in the temperate zone are of prime importance to geese for storing sufficient reserves to enable successful breeding in the High Arctic. As in the model developed by Klomp to illustrate the impact of hunting on goose populations, reproduction is positively correlated with population size at very low population levels, but beyond a certain level, production rate decreases with increasing population size; natural mortality is positively correlated with population size; and hunting mortality is considered as an addition to natural mortality. A stable equilibrium is attained when total mortality equals production rate. Geese can escape density-dependent effects by establishing new colonies and expanding their breeding range. However, as the new colonies grow, density-dependence again becomes important, as demonstrated in the new colonies of Barnacle Geese (*B. leucopsis*) in the Baltic. Consequently density-dependency operates in a stepwise manner.

CURRENT STATUS OF GEESE IN THE SOUTH OF CENTRAL SIBERIA

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Work on nesting and migrating groups of geese in Central Siberia has been regularly conducted since 1980. The present communication provides details characterizing the period from 2006 to 2015. The studies were carried out according to the standards of a complex of methodological procedures adopted for the region. The arena of the studies included the territory of Tuva, Khakassia and Krasnoyarsk districts, from the Sayan Mountains to the Angara River basin. The total length of the survey routes was more than 30 000 km.

Analysis of the data showed that the abundance of nesting (four species) and migrating (five species) geese is subject to significant interannual fluctuations, but has a steady negative trend. The local population of ***Greylag geese*** (*Anser anser*) finds itself on the verge of utter annihilation. Not more than 300 of these geese remain within the borders of the south of Krasnoyarsk Krai, Khakassia and the adjacent parts of Kemerovo Oblast. Over the past decade, their numbers decreased by more than 66.7 %. A ban on spring hunting on the Greylag Goose in recent years and its inclusion in the Red Data books of Krasnoyarsk Krai and the Republic of Khakassia have not yet yielded any results. The chief reason for the decline in numbers is excessive removal in neighbouring regions. Against a background of further fragmentation of its range, the ***Eastern Taiga Bean Goose*** (*Anser fabalis middendorffii*) remains at low numbers. The vulnerable Sayan subpopulation is comprised of only 1500–2000 individuals. For the study period, the abundance of geese in key habitats decreased 33.3–50 %. More stable local populations of the subspecies living in Tuva are inhabiting the waterbodies of the Todzha Basin. Up to 60 % of the birds of the region are concentrated there. Along the northern slopes of the Western Sayan Mountains the geese survive in disparate focal points: the Tyukhtet-Shadat marshes (30–50 pairs) and the basins of the Kazyr, Kizir and Upper Abakan rivers (20–30 pairs). Practically none remain in the western Eastern Sayan Mountains and the Kuznetsk Alatau. Several tens of pairs of the Eastern Siberian Taiga Goose inhabit basins of the right bank of tributaries of the Angara River, although their numbers are far from stable and are decreasing.

A local population of the ***Bar-headed Goose*** (*Eulabeia indicus*) suffered from influenza virus A and was reduced in some places by 75–80 %. Against this backround, the previously observed spreading of the species to Khakassia and the south of Krasnoyarsk Krai was halted. The total number, by various estimates, does not exceed 200–300 individuals. The Swan Goose (*Anser cygnoides*) nests only in the middle and lower reaches of the Tes-Khem (Tes River). Its total abundance currently consists of 100–200 individuals. The abundance of a major migrating species, the Tuva-Minusin subpopulation of the Western ***Tundra Bean Goose*** (*Anser fabalis serrirostris*), was reduced by more than 50 % in 2011–2012, dropping to 3500–5000 individuals. After introduction of a ban on the taking of these geese and the entering of the given local population into the Red Data Book of Krasnoyarsk Krai (2012), and then into that of Khakassia (2014), the decline in numbers was suspended. A complex of environmental protection measures positively impacted the state of the resources of this Bean Goose. During spring 2014, the population reached 11 000 individuals, and in 2015, 13 000. Moreover, an absolute majority of the birds, of the given local population, were confined in the area of Lake Salbat, where they form their spring and autumn migratory flocks. The numbers of the migrating groups of Bean geese in the Lower Angara Basin dropped significantly (by more than 66.7–80 %) and continue to decline. Their stopovers on migration in the Krasnoyarsk forest-steppe and the Kanskaya Basin have practically disappeared. Other migrating species of geese (the White-fronted Goose, Lesser White-fronted Goose, and Red-breasted Goose) are extremely low in numbers and their appearance is episodic in nature. For the conservation of geese in the south of Central Siberia, administrative measures of a systemic nature, including multi-faceted monitoring, regulatory provision for protective measures, a ban on spring hunting on all species of geese and the creation of a network of Protected Areas within the main migration corridors. It is important to strengthen the work on environmental education of the population and, above all, of hunters.

CURRENT RANGES OF WATERFOWL BASED ON ONGOING STUDIES FOR THE BREEDING BIRD ATLAS OF EUROPEAN RUSSIA

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The ranges of a host of Anseriformes in Russia have not been examined during the past decade. Mid- and late twentieth-century descriptions of their limits are virtually identical. However, anthropogenic transformations, climate and other changes that occurred recently have impacted the distribution of waterfowl. Data collected for the project on the creation of the Breeding Bird Atlas of European Russia has made possible the identification of these changes. Project participants recorded the nesting of 32 waterfowl species on the study territory. The comparison of contemporary data with those from the literature on range limits revealed an expansion in four species (Barnacle Goose *Branta leucopsis*, Mute Swan *Cygnus olor*, Whooper Swan *C. cygnus*, and Ruddy Shelduck *Tadorna ferruginea*), and contraction in five species (Lesser White-fronted Goose *Anser erythropus*, Bewick's Swan *C. bewickii*, Pintail *Anas acuta*, Ferruginous Duck *Aythya nyroca*, and White-headed Duck *Oxyura leucocephala*). The Barnacle Goose, in addition to Southern Island of Novaya Zemlya, now nests on

Vaigach Island, the Kanin Peninsula, the northern coast of the Kola Peninsula and on Lake Ladoga. The Mute Swan has moved north as far as the Don and Volga river basins, and from the Baltic Sea to northwestern regions of Russia. The Whooper Swan has appeared in Leningrad and Pskov oblasts. The Ruddy Shelduck has expanded its range northwards as far as Central Chernozem Region [southwestern Russia], and has been introduced in Moscow and Moscow Oblast. The abundance of the Gadwall (*Anas strepera*) in optimal forest-steppe and steppe habitats has declined, the exception being in the southern Ural Mountains. At the same time, the spreading of the Gadwall to the Taiga zone — Vologda and Arkangelsk oblasts — has been observed. The western limits of the ranges of the Lesser White-fronted Goose, Bewick's Swan, Ferruginous Duck and White-tailed Duck are retreating, decreasing the area of their ranges. The Pintail has disappeared from the southern part of its range. Ranges of the Greylag Goose (*Anser anser*), Shelduck (*Tadorna tadorna*), Eurasian Teal (*Anas crecca*), Tufted Duck (*Aythya fuligula*) and Common Goldeneye (*Bucephala clangula*) have been elucidated. The Greylag Goose is distributed as far north as 61°N, although extremely sporadically; the majority nest only just north of the Caucasus foothills and on the Caspian Sea coast. The range of the Ruddy Shelduck in Kaliningrad and Bryansk oblasts, in Central Chernozem, in the middle reaches of the Volga River, and in the southern Urals was revealed. Study of the quadrats yet to be investigated will help complete a full revision of the ranges of European species, which is extremely important for the study, use, and conservation of the avifauna.

A PROPOSAL FOR THE OPTIMIZATION OF THE WATERFOWL HUNT IN THE LAKE MANYCH-GUDILO AREA

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An array of factors affect waterfowl populations. Amongst these, hunting is one of the primary limiters of population abundance. Currently, hunting determines the size of a population no less than climate and productivity of the land. Regulation of hunting is thus important in the management of waterfowl. Rationalizing the use of waterfowl resources is complicated by their biological characteristics. As migratory birds, waterfowl have their population composition determined not only by breeding success, but also by survival on migratory flyways and wintering grounds. For the past decade, the number of waterfowl on the waterbodies of the Kuma-Manych Depression has declined. This decline coincided with the development of telecommunications and with a growth in the numbers of automobile here. Hunters, through cellular communication, are very knowledgeable about the presence of game in the area, and the availability of modern personal transportation permits them to reach waterbodies previously virtually inaccessible. Excessive disturbance at optimal feeding sites causes a greater impact on the population than their small numbers in the bag might imply. Hunters regularly scare away ducks from shoreline zones rich in food to less food-rich territories farther from the waterbodies. Zones closed to hunting would help ensure high-grade food for the birds. Such small parcels of peace should cover all large wetlands like a mosaic. The negative trend is partly provoked by the unsuccessful reorganization of hunting in the nation. Hunting land was leased in small parcels to a large number of hunters. Under such conditions it is not possible to carry out management on migrating, hunted animals. It seems there should be a government body dedicated solely to questions on the use, reproduction and conservation of migratory and nomadic birds and animals. At the same time, the development of hunt farming — the raising of game in captivity — should be encouraged. Confrontations between hunters and ornithologists have worsened, which impedes joint decision-making aimed at the conservation and production of wild game. In particular, it is important not to secure a full ban on the spring hunt, but to bring order to it with joint efforts. It is desirable to close the goose hunt, as it is biologically not justified and is contrary to the ethical rule of old hunters — don't kill a female and don't kill a pair. At the same time, one needs to preserve the right of hunters to the traditional hunt with decoy ducks. The damage to nature from this is minimal.

UPDATE ON THE COMMON POCHARD (*AYTHYA FERINA*) IN THE KUMO-MANYCH DEPRESSION, RUSSIA

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Ringing data has shown two separate populations of the Common Pochard (*Aythya ferina*) on the territory of Russia: European, overwintering on the Black and Mediterranean seas, and Western Siberian, which spends the winter predominantly on the Caspian Sea. In the area of the border between them, birds are encountered that fly both to Western Europe and to the southern Caspian. Our information is based on 178 birds that were ringed or encountered in the northern foothills of the Caucasus since 1931. Analysis of the data confirms the Common Pochard to have a rather high degree of conservativism in choice of breeding territory. Of 25 ringed birds later encountered in the nesting period after a year or more, 68 % were observed in locations near to those in which they had been ringed. Ducks from the Northern Caucasus, as part of the European population, fly to overwinter predominantly in the Mediterranean region: 15 individuals were noticed in Switzerland, six in France, four in Italy, three in Greece, two in Yugoslavia, and one in the Czech Republic. The direction of migration was along the Northern Black Sea coast (10 returns). In addition to this, two birds were recorded in the Northeastern Atlantic region (in Ireland and Denmark). A connection was established between the Western Siberian population and the Caucasus. Of these, five ducks were recorded along the Black Sea coast and five on the Caspian coast. From 2013 to 2015, we studied the avifauna of the Kumo-Manych Depression, located in the north of the Central Caucasus foothills. The Common Pochard is widely distributed on the water bodies there, and numerous on migration. However, here it is beginning to be replaced by the Red-crested Pochard (*Netta rufina*), a biologically close and previously a not numerous species. In our expeditionary journeys in May and June, 23 broods of the Red-crested Pochard and only four of the Common Pochard were encountered. The number of ducks in the depression increases on account of the moult in the second half of the summer, and migrating flocks in September. In mid-September 2011 a 60-km route along Lake Manych, Lysiy Estuary, and Chogray Reservoir, there was a count of 8250 Common pochards and 2070 Red-crested pochards. However, by the end of the month, nearly all had departed. The proportion of Common pochards in hunter bags is not large, because the hunt in the depression opens at the end of September. And in the spring, their migration occurs in April, which is after the close of the spring hunt.

DISTRIBUTION OF THE COMMON EIDER (*SOMATERIA MOLLISSIMA*) IN COASTAL WATERS OF NORTHERN NOVAYA ZEMLYA, RUSSIA, IN AUTUMN 2014

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The work was conducted on 25 September 2014 in the coastal zone of the northern tip of the Severniy [Northern] island of the Novaya Zemlya Archipelago, on the territory of the "Russian Arctic" National Park. Aerial observations were conducted aboard an L-410 airplane. The parameters of the flight: altitude 80–150 m, speed — 300 kph, distance from shore 100–500 m. Visual and photo observations were conducted on the right side of the craft by a single observer. The data of the visual observations were recorded on a digital voice recorder, and the flocks of ducks recorded on a Canon 7D 100-400×5.6 IS USM digital reflex camera for later precise counts. The total length of the transect was 270 km, which included the entire length of the shore of the park on the side of the Kara Sea and approximately half of the Barents Sea coast. The marine waters in the area of the work, as well as in the region as a whole, were free of ice cover. Only in the area of Inostrantsev Bay were places observed with accumulations of iceberg ice. Flocks of marine ducks were recorded along the entire route, both on the western and on the eastern coasts of Severniy Island of Novaya Zemlya. All birds determined to species were Common eiders (*Somateria mollissima*). No other waterfowl species were recorded. Altogether there were approximately 1200 Common eiders, of which 368 were on the Barents side and 833 on the Kara side. The eiders were encountered in flocks of several individuals to 200. Concentrations of birds were noted in the area of capes Medvezhii and Varnek, between capes Flissingskiy and Konstantina, and south of Cape Skalistiy. The ducks were noticed along lowland shores with beaches, often in shallow bays and coves. The mean density of birds along the coasts was 2.8 and 5.74 per km transect for the Barents and Kara seas, respectively. This was the first quantitative count of waterfowl in this area.

ON THE STATUS OF THE LIGHT-BELLIED BRENT GOOSE (*BRANTA BERNICLA HROTA*) POPULATION IN THE FRANZ-JOSEF LAND WILDLIFE REFUGE

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The Light-bellied Brent Goose is a rare, sporadically breeding species on Franz Josef Land. During the non-breeding season, the geese are widespread over the archipelago, but in small numbers. A map and a list of all known breeding sites and areas of non-breeding concentrations of the Light-bellied Brent Goose is created based on all available published data and observations by the author from 2010 through 2015.

Nests and flightless broods had been found on Alger, Hooker, Elizabet, and Graham Bell islands in the past. The current study adds Apollonoff, Eva-Liv, Lamont, Dead Seal, Hayes, Gage, and Central Area of Alexandra Land. Flocks of 30–40 adults and young were observed on Hall (Cape Tegetthoff), Hayes, and Wilczek islands, abundant faecal matter and shed feathers were found on capes Bystrov and Norvegia, Jackson Island; capes Krauter and Nansen, George Land; Cape Mary Harmsourth, Alexandra Land; and Cape Flora, Northbrook Island. Historical data on post-breeding observations of Light-bellied brent geese had been reported from Scott Keltie, Aagaard, and Hooker islands. No data on population numbers or distribution-pattern changes for the historical period of observation are available.

SUCCESS ON THE RESTORATION OF A WILD POPULATION OF THE ALEUTIAN CANADA GOOSE (*BRANTA HUTCHINSII LEUCOPAREIA*) IN ASIA

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The Asian population of the Aleutian subspecies of the Cackling Goose (*Branta hutchinsii leucopareia*) nesting on the Kurile and Komandorskiy islands and wintering in Japan died out in the 1930s. The chief reason for its disappearance was the introduction of foxes to islands of the Kurile Ridge. The project on the restoration of the Asian population of the Aleutian Goose was carried out by members of the Kamchatka branch of the Pacific Ocean Institute of Geography of the Far Eastern Department of the Russian Academy of Sciences over the course of 18 years. It began in 1992, when American colleagues from the U.S. Fish and Wildlife Service sent 19 geese to a nursery built on Kamchatka. Another group, consisting of birds caught in the wild on Buldir Island in the Aleutian Archipelago, arrived on Kamchatka in 2001. In 18 years, a total of 609 young geese were raised in the Kamchatka nursery. In special surveys of the Northern Kurile Islands, two islands were found on which terrestrial mamals were absent. One of these — Ekarma Island — was chosen for the release into the wild of birds raised in captivity. From 1995 through 2010, 551 geese were put on the island in 14 releases. Geese with Kamchatka nursery markers were first noted in Japan in 1997. Since 2002, there has been a tendency for a slow annual growth in numbers. In the winter of 2007–2008, no fewer than 50 of these birds were noted in Japan, in the winter of 2008–2009 — 59, in 2009–2010, 89. In 2008, there began to be recorded in Japan birds raised in the Kamchatka nursery that were paired and accompanied by broods of immatures. Subsequently, the number of geese overwintering in Japan began to grow at an even greater rate. In the winter of 2010–2011, 160 individuals were recorded, in 2012–2013 — more than 400, and in 2014–2015 — approximately 1500. The program of restoring the Asian population of the Aleutian subspecies of Cackling Goose is acknowledged to be successfully completed.

ANNUAL OBSERVATIONS OF THE SPRING MIGRATION OF ANSERIFORMES IN THE PECHORA RIVER DELTA, NORTHERN RUSSIA

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Annual observations of the spring migration of Anseriformes in the delta of the Pechora River (specifically at 68°10´34´´ N, 53°38´44´´ E) in the northeastern European part of Russian, have been conducted for the past 20 years and have shown a particular pattern of waterfowl migration. Independent of the ice conditions on the river, annual peak migration occurs in a specific period: 23–28 May. Eight to 10 days after migration begins, the peak migration of drakes to their summer feeding and mountling grounds occurs. It is noted that with daily change of air temperature (above freezing during the day and below at night), the first flocks of geese migrate by a single flight path: in the daytime to the northeast, and in the evening returning. The main direction of the spring migration is from southwest to northeast. In total, the spring migration on the territory of the Nenets Autonomous Okrug (NAO) was determined to follow three basic routes of the North Atlantic Flyway. The majority of birds follow an "***Island***" route, across the Kanin Peninsula to Barents Island and the Pechora Sea. Another group follows a "***Coastal***" route, along the shores of the White and Barents Seas to the Yamal and Taimyr peninsulas, as determined from ring recoveries. The third group follows a "***Mainland***" route, over the tundra, where some of the birds remain on nesting and moulting grounds in the basins of the numerous rivers. Considering that in spring the birds fly by specific "corridors" across the entire territory of the NAO, we took as a basis the count of birds through a km-wide corridor (in which there is good visibility, even without the use of optical equipment), where at the time of migration there was only in a single direction of flight and a count of more than 10 000 individuals, then multiplied by the width of the NAO territory along the Pechora River (20 km), and got an abundance of approximately two million migrating birds using the mainland and coastal routes. With regard to the island route, it is not possible to count the birds, owing to their route over the sea, far from the coast. The autumn routes (August — September) of the returning birds on Russkiy Zavorot Peninsula showed that they are an order of magnitude more numerous. This shows that the population of waterfowl of the European Arctic is stable at about 15 million birds.

THE STATUS OF WATERFOWL RESOURCES AND THEIR SPATIAL DISTRIBUTION ON THE FLOODPLAIN OF THE LOWER OB'

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The aim of the current work was the large-scale evaluation of waterfowl resources and the nature of their distribution in the vast floodplain biocenosis of the Lower Ob'. The work began in 2004 on the territory from the southern border of the Yamalo-Nenets Autonomous Okrug (YaNAO) to the Ob' Delta. Observations and counts of waterfowl were conducted during migration aboard a scientific ship on large branches of the river, on special boat routes, and excursions on foot. The last were organized such that all major types of floodplain habitats were included. Population counts were conducted along transects and from observation platforms, paying attention to the direction of the movement of the birds in order to avoid multiple counts of one and the same individual. Transiting birds, flying at a great altitude, were ignored. Nesting density was calculated on the basis of encounters of nesting birds, including nests; females, disturbed and with broods, as well as following males; and males expressing territorial behaviour. Estimation of the resources was accomplished by scaling the results of the survey (density in corresponding habitats) by the areas. The habitat area in different regions of the surveyed part of floodplain of the Lower Ob′ was calculated using satellite data. The entire floodplain of the Lower Ob′ was divided into several regions of similar proportions of habitat with different elevations of flooding levels. The extremely low water levels in 2010–2013 gave unfavourable conditions for waterfowl breeding, as a result of which their numbers decreased by about two-thirds, reaching about 1.5 million individuals in the reproductive period of 2014. Ducks gathering for moulting were concentrated in regions a bit farther upstream than the most flooded areas. Here the density of ducks reached 230 ind./km^2. Their species composition in order of abundance was as follows: Wigeon (*Anas penelope*), Pintail (*A. acuta*) and Shoveler (*A. clypeata*), Tufted Duck (*Aythya fuligula*) and Teal (*Anas crecca*). The main waterfowl breeding grounds covered a broader area than the forementioned flooded regions; nesting density here was about 30 nests/km^2. The Ob′ Delta, despite its attraction for waterfowl in years of low water, could be a unique "ecological trap" for nesting birds, owing to the very unstable hydrological regime. Habitats at low flood levels in the delta, where one finds the greatest number of nests, may, depending on the weather conditions, unexpectedly, unpredictably, and in a short period of time (over the course of several hours) be flooded. As a result, more than 80 % of all waterfowl nests are lost. The most affected species are the Shoveler, Tufted Duck, and Wigeon.

THE LESSER WHITE-FRONTED GOOSE (*ANSER ERYTHROPUS*) TEN (MORE) YEARS LATER

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Ten years ago the author, jointly with Jorma Pessa, administrated the "Workshop on the protection of the Lesser White-fronted Goose Lammi, Finland 1–2 April 2005" organized by The Ministry of Environment in Finland; Goose Specialists Group of Wetlands International; African-Eurasian Waterbird Agreement (AEWA); BirdLife Europe; WWF Finland; Friends of the Lesser White-fronted Goose, Finland; and Goose, Swan and Duck Study Group of Northern Eurasia (RGG). It is of interest to review the ideas presented at this meeting. Not only is it customary to look at things in retrospect in 10-year intervals, but also this meeting had important consequences: the AEWA "International Single Species Action Plan for the Conservation of the Lesser White-fronted Goose" was drafted; and only months later the Scientific Council of the Convention on Migratory Species (CMS) met in Nairobi, Kenya, where its paper ScC.13/Doc.9 mentioned that "a workshop was held in Lammi, Finland, in April 2005, at which participants with a deep interest and involvement in the conservation of the Lesser White-front agreed to request the opinion of the Council on a number of issues, which have for some time seriously divided conservationists interested in a better future for this species", which led to the CMS adopting formulations that then influenced the formulation of the AEWA conservation plan.

Thus it might be worthwhile to review the minutes of the Lammi meeting, which are easily accessible on the World Wide Web, to focus on its key issues, to add personal memories and, most important of all, to include a follow-up. Today we know the answers to most questions asked a decade ago. It is tempting to ask for an update of our now out-of-date recommendations and to speculate on answers to the remaining questions.

HOME RANGE AND MOVEMENTS OF THE MALLARD (*ANAS PLATYRHYNCHOS*) IN EAST ASIA

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The Mallard is an abundant winter visitor to South Korea. The Mallard migrates long distances between Russian Siberia and Korea, where it prefers rice paddies as its winter habitat. This species is also known as a potential carrier of the HPAI (highly pathogenic avian influenza) H5N1 virus. Thus, we tracked the wintering activity of mallards to determine the relationship between HPAI outbreak and waterfowl presence. A newly invented telemetry device by Wild Tracker Inc., the WT-200 (GPS-Mobile Phone based Telemetry), was used for tracking the mallards. The WT-200 is based on the GPS (Global Positioning System) combined with the WCDMA (World Code Division Multiple Access) mobile-phone system. When attached to a wild animal, the device will record the GPS coordinates at a given time interval and transmit the geographic coordinates at a preset time of the day using the public network of a mobile-phone system. Researchers can acquire individual tracking-location data on a web site. During the winters of 2012 through 2014, we captured ducks using cannon nets, and attached the WT-200. We analyzed the tracking-location data using ArcGIS 9.0 and calculated Kernel Density Estimation (KDE) and Minimum Convex Polygon (MCP). The average home-range size according to MCP was 118.5 km^2 (SD = 70.1, n = 7) and the maximum and minimum home-range sizes were 221.8 km^2 and 27.7 km^2, respectively. Spatial extent (90 %, 70 %, and 50 %) of home-range by KDE was 60.0 km^2, 23.0 km^2 and 11.6 km^2, respectively. The marked mallards moved on average 19.4 km after leaving the start site (where the WT-200 was attached); the maximum distance travelled was 33.2 km and the minimum was 9.4 km. The average distance travelled from a GPS fixed point was 0.8 km (range 0.2–1.6 km), and the maximum was 19.7 km. The mallards overall moved very short distances on their wintering grounds and their movements there showed very high water dependence. On the breeding grounds, both the home-range size and the movements of the mallards showed similar trends to those exhibited at wintering sites.

INTRASPECIFIC NEST PARASITISM IN SOME POPULATIONS OF THE WHITE-FRONTED GOOSE (*ANSER ALBIFRONS ALBIFRONS*)

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Raw data on nesting parameters of White-fronted geese (*Anser albifrons albifrons*) were collected on Kolguev Island (Barents Sea, Russia) in 2008. Information on clutch size, egg-laying order, and egg size (length and maximum diameter) was collected, and fresh weight of eggs calculated, in order to identify non-host eggs in clutches. In all, 459 clutches, with clutch sizes ranging from 2 to 15, were analyzed. According to this method, one-third of the nests (137) were deemed to contain dumped eggs. Two types of nest parasitism were differentiated. In the first, the nest parasites lay eggs in a nest guarded by an effective heterospecific defender (Peregrine falcon (*Falco peregrinus*) and Rough-legged Buzzard (*Buteo lagopus*)). Nearly 100 % of nests located around such defenders contained suspect eggs. Moreover, in such aggregations, clutch sizes were extraordinarily large (10–15 eggs) for this species. In the second type, the nest parasitism was non-selective (according to our data) and had no strong restrictions by nest location; there were no significant correlations between the number of parasitic eggs and nesting density or clutch size. A majority (about 60 %) of "unguarded" nests with suspect eggs contained one or two such suspect eggs in a clutch of 4 or 5, sometimes 6, eggs. A significant number of these eggs were lighter in weight than other eggs from the clutch and were narrower. We can thus suggest that in such cases the nest parasite was younger than the host and according to published data, it shows the propensity of a young daughter, breeding for the first time in her life, to lay eggs in her mother's nest. Nests with suspect eggs often seemed to be aggregated in small groups, where closely spaced nests contained suspect eggs.

BRENT GEESE (*BRANTA BERNICLA*) AND RED-BREASTED GEESE (*B. RUFICOLLIS*) NESTING ON ISLANDS APART FROM AND WITH LARGE GULLS

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Studies were conducted in two areas of Taimyr: 1) along 400 km of the Agapa River from 70°11´ N, 86°15´ E downstream to 71°26´ N, 89°13´ E in 2004, 2007, 2010, and 2013; 2) on the Olenyi Islands near the Willem Barents Station (73°23´ N, 80°32´ E) from 2000 through 2014. Brent Geese (BG) nest on the offshore islands, either forming their own colonies or in mixed colonies, in which the Taimyr Herring Gull (THG) (*Larus heuglini taimyrensis*) predominated. Colonies dominated by BG were less dense than colonies with THG domination. Within each, however, BG and gulls nested at the same density. THG pairs established their nests in BG colonies less harmoniously than did BG pairs breeding in gull colonies. The smaller Red-breasted Goose (RBG) rarely formed single-species colonies; most RBG on islands were associated with THG colonies. In distinction to BG, the distances between RBG nests and the nearest gull nests compared to the distances between gull nests varied to a great extent. Unlike BG, RBG behaved as a foreign element within the gull colonies, either locating their own nests very close to gull nests, even evicting the gulls, or breeding apart from the gull colonies. On the mainland, RBG showed a strong tendency to breed near gull nests. The reason for this tendency is not clear, because on the mainland gulls did not provide protection for the RBG nests. Such RGB nests were successful only in years of high lemming numbers.

THE RED-BREASTED GOOSE (*BRANTA RUFICOLLIS*) BREEDING POPULATION ON THE WESTERN TAIMYR PENINSULA

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Two areas were monitored in the western part of Taimyr: 1) 400 km of the Agapa River, from 70°11´ N, 86°15´ E down to the river mouth (71°26´ N, 89°13´ E) in central Taimyr, in 2004, 2007, 2010, and 2013; and 2) 175 km^2 near the Willem Barents Station (73°23´ N, 80°32´ E), including the lower streams of the Lemberova, Maximovka and Efremova Rivers and part of the Kara Sea coast in northern Taimyr, including eastern Medusa Bay, from 2000 to 2014. At the first location, the numbers of the Peregrine Falcon (PF), the main host species for the Red-breasted Goose (RBG), increased by a factor of 1.3 over the first 7 years, then decreased in the adverse season of 2013. Nevertheless, the PF numbers appear stable at a population size of 24 eyries for the 400 km of the river. The highest possible number of falcons along this river is 28 pairs. In the period 2004–2013 RBG numbers fluctuated between 54 and 68 nests. The main feature of the RBG population was stability in numbers, with small fluctuations. The mean linear density of geese along the Agapa River was 1.49 + 0.07 nests per 10 km of river (n = 4). RBG used 68.4 + 5.3 % of available nest sites (n = 4). Theoretically, at that same mean number of RBG nests per colony near a PF nest (3.13) and the possible maximum number of RBG in all colonies on islands, the estimated maximum number of RBG along the Agapa River is 100 breeding pairs. In the northern area, near Medusa Bay, the PF numbers briefly increased in 2006-2007, then decreased to the previous stable state of 6-7 eyries per season. RBG numbers from 2000 to 2014 fluctuated between 1 and 11 breeding pairs. In this area, the general trend in population numbers was stable, but with sharp fluctuations. The mean RBG linear nesting density along rivers near Medusa Bay was 1.85 + 0.31 nests per 10 km of river (n = 10). In addition, the RBG used just 37.2 + 5.3 % of available nest sites (n = 10). The state of the RBG population on western Taimyr is stable.

STOPOVERS, FLIGHT AND THE INFLUENCE OF WIND ON THE SPRING AND AUTUMN MIGRATIONS OF WHITE-FRONTED GEESE

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In most migratory birds, migration is faster in spring than in autumn, because earlier arrival at the nesting sites is advantageous. Migrants that breed in the Arctic have only a limited window of favourable conditions for raising their young. Therefore, they use many stopovers during spring migration to refuel and build up extra fat reserves to be ready to nest as soon as possible after their arrival on the breeding grounds (*capital breeding*). This strategy is not necessary during autumn migration, leading to the latter's comparably shorter duration. Using a large set of GPS tracks, we compared the migration and stopover behaviour of Greater white-fronted geese (*Anser a. albifrons*) on their way between Western Europe and Northern Russia. From an analysis of 40 and 45 complete migration tracks for spring and autumn, respectively, from the years 2006–2015, we show that in this species spring migration takes longer (80 days) than autumn migration (40 days). The longer duration of spring migration relates to more and longer stopovers along the route, during which the geese feed on highly nutritious, young grass. Notably, our data show that the geese frequently encounter headwinds in autumn, leading to highly synchronised timing of departure from the stopover sites when tailwinds prevail. This is not the case in spring, when flight phases between stopovers are not synchronised and when factors like the onset of spring, food quality and hunting pressure seem to be the main determinants of the timing of migration. Our comparative study thus shows not only that White-fronted geese migrate faster in autumn than in spring, but also that the birds are limited by different environmental factors during the two migrations. Our results, particularly when combined with information about breeding success, provide first ideas about individual variation during large-scale migrations in White-fronted geese and how individuals might be able to adapt to climate and habitat changes.

DISTRIBUTION OF WATERFOWL IN THE EASTERN GULF OF FINLAND AND THE MAIN TRENDS IN SPECIES NUMBERS

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Nineteen species of waterfowl breed in the eastern Gulf of Finland. The most common is the Tufted Duck. The Mute Swan, Mallard, Gadwall, Northern Shoveler, and Common Eider are typical for this area. The Greylag Goose, Barnacle Goose, Common Teal, Goldeneye, Goosander, and Red-breasted Merganser are few in number. The Shelduck, Garganey, Pochard, and Scaup are rare. Nesting Wigeon and Pintail have been encountered sporadically. Within the region, we can distinguish several landscape zones with different populations of waterfowl. Freshwater swamps of Neva Bay are inhabited only by the Tufted Duck, Mallard, Common Teal, Garganey, Northern Shoveler, and Gadwall. The zone of sandy beaches is the place of nesting only for isolated pairs of the Mallard and Goosander. The moraine zone and skerries are inhabited by a complex of maritime species: the Mute Swan, Greylag Goose, Barnacle Goose, Shelduck, Scaup, Velvet Scoter, Common Eider, Goosander, and Red-breasted Merganser. The differences between these zones are expressed in the relative numbers of the various species. Thus, the Mute Swan, Greylag Goose, Shelduck, Tufted Duck and dabbling ducks prevail in the southern moraine zone, whereas the Barnacle Goose and Common Eider are more numerous in the northern zone of skerries. There are several groups of species with different types of population dynamics in recent decades: 1) Species with a stable population: the Mallard, Common Teal, Northern Shoveler, Tufted Duck, and Goldeneye; 2) Species whose populations have become stable in the past decade following a long-term decline: the Velvet Scoter, Goosander, and Red-breasted Merganser; 3) Species whose numbers stabilized during the last decade after an active increase: the Mute Swan and Gadwall; 4) Species with a declining population: the Garganey, Pintail, and Pochard; 5) Species continuing a long-standing trend of population growth: the Common Eider; 6) Species demonstrating population growth in the last 5–7 years: the Greylag Goose and Barnacle Goose; 7) Species appearing in the 2014 nesting season after having completely disappeared some years previously: the Shelduck.

MOULTING FLOCKS OF WATERFOWL IN THE EASTERN GULF OF FINLAND: NUMBERS AND DISTRIBUTION

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Waterfowl of the eastern Gulf of Finland are divided into two groups by moulting habitat: 1) species moulting in extensive reed-bed habitats (dabbling ducks, Coot, Pochard); 2) species moulting in shallow open water (swans, geese, sea ducks). The Tufted Duck (2500–3000 individuals) and the Great Crested Grebe (800–1000 individuals) can be observed in both habitats. Species of the first group are found in Nevskaya and Luzhskaya bays, on the Seskar Archipelago and along the western coast of the Kurgalsky Peninsula. The Mallard is dominant (800–900 individuals). The Coot, Common Teal and Wigeon are numerous (600–750 individuals of each species); the Gadwall is usual (300–450 individuals). The Pintail, Garganey and Pochard are rare. The most widespread species moulting on open water is the Goldeneye: on the Tiskolovsky (2000 individuals) and Kurgalsky reefs (2000–4000 individuals); in Narva Bay (1000 individuals); and on Moschniy (1500 individuals), Maliy (300 individuals), Seskar (2500 individuals) and Maliy Tuters (350 individuals) islands. The Mute Swan (310–520 individials) moults on the Tiskolovsky and Kurgalsky reefs, and on Seskar and Moschniy islands. Little moulting groups of Mute swans were observed near the northern coast in 2014. The Goosander is usual (1700 individuals) on Bolshoy Fiskar, Nerva, Sommers, Gogland, and Moschny islands and on the Kurgalsky Peninsula. The Red-breasted Merganser (350 individuals) was observed on Moschniy, Maliy Tuters, and Maliy islands and on the Kurgalsky Peninsula. In the period 2010–2014, we recorded the first observations in the eastern Gulf of Finland of moulting individuals of several species: the Barnacle Goose (56 birds) — on Dolgiy Reef, Bolshoy Fiskar and Nerva islands; the Long-tailed Duck (95 birds) — at Dolgiy Reef, Bolshoy and Maliy Fiskar, and Rondo islands; the Velvet Scoter (250 birds) — on the Kurgalsky Reef; the Common Eider (145 birds) — on Bolshoy Fiskar, Dolgiy Reef, Moschny and Maliy Tuters islands; and single individuals of the Brant Goose, Scaup, Smew, Common Scoter and Red-necked Grebe, in flocks of other species. Summer aggregations of nonbreeding Black-throated Loons were observed on Gogland (45 birds) and Moschniy (75 birds) islands.

BIOLOGY OF THE BARNACLE GOOSE (*BRANTA LEUCOPSIS*) IN THE EASTERN GULF OF FINLAND

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The first case of nesting of the Barnacle Goose in the Russian part of the Gulf of Finland was recorded on Dolgy Reef Island in 1995. Thirty-one nesting pairs were recorded in 2006, from 10 to 20 pairs in 2010–2012, and 38–43 pairs in 2013 and 2014. The breeding area in the eastern Gulf of Finland is limited to its northern district; the most southerly points of breeding are Nerva and Rodsher islands, located in the open sea. Other breeding sites are located right on the archipelago, close to the northern shore. Barnacle geese preferentially nest on islands with smooth rocks and grassy vegetation, with isolated shrubs and trees only in rocky depressions and cracks. Eleven of the 12 islands inhabited by geese also had gull colonies. The egg-laying period lasts for about one month, beginning around 20 May. The majority of nests were located in small, tall-grass meadows in rocky depressions or in individual grass clumps in rock cracks (respectively, 29,55 % and 27,27 % (n = 132)); 17,42 % of nests were in bushes; 12,39 % on open-rock substrate; and 11,36 % under trees. Full clutches contained from 2 to 6 eggs, 4.85 on average (n = 37). A mixed clutch — 6 eggs of the Barnacle Goose and 2 eggs of the Common Eider (*Somateria mollissima*) — was found on the Bolshoy Fiskar Archipelago in 2013. Broods fed mostly on low herbaceous — often halophytic — vegetation growing in the cracks of rocks. From time to time the geese fed on short algae growing along the rocky shoreline. From 30 to 50 nonbreeding birds were moulting on Dolgy Reef and Nerva islands and on the Bolshoy Fiskar Archipelago in July — early August 2013 and 2014.

THE COMMON POCHARD (*AYTHYA FERINA*) IN LENINGRAD OBLAST: CURRENT POPULATION STATUS AND MAJOR LONG-TERM TRENDS IN ABUNDANCE

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In the late nineteenth century only solitary cases of nesting Common pochards were known for the region — on the Karelian Isthmus and the south shore of Lake Ladoga. Expansion and growth in numbers of this species were observed during the entire twentieth century, but were most intensive from the 1950s to the 1970s. The species was distributed in Leningrad Oblast extremely unevenly, even in the period of its greatest abundance in the 1970s and 1980s, preferring large eutrophic ponds with extensive belts of reeds: the Narva Reservoir, the southern coast of Neva Bay, fish ponds and lakes south of the Gulf of Finland (areas of the villages of Kovashi and Ropsha, and Krasnoye Selo), and the south and southeastern shores of Lake Ladoga. The main nesting area of the Pochard was on the Rakovye Lakes on the Karelian Isthmus, where there were 1000 birds during the breeding period. A decline in the Pochard population to one-twelfth to one-fifteenth its former level was observed between the 1980s and the present day. The current numbers of recorded breeding pairs are 16–20 on the Rakovye Lakes, 6–10 pairs at Zagubye (southeastern shore area of Lake Ladoga near the mouth of the Svir River), 4–10 pairs on the southern coast of Neva Bay and solitary pairs in other places. Habitat degradation is noted only for the Rakovye Lakes. The abundance of the Tufted Duck (*A. fuligula*), whose breeding biology is very similar to that of the Pochard, has remained unchanged in the region over a long period. Climate warming during these decades promoted the growth in numbers and expansion in the region of a whole host of species, which, like the Pochard, are herbivorous birds of predominantly southern distribution. Such species include the Mute Swan (*Cygnus olor*), the Greylag Goose (*Anser anser*) and the Gadwall (*Anas strepera*). Thus it seems that the reasons for the decline in numbers of the Common Pochard in Leningrad Region are unlikely associated with changes in habitat and feeding conditions on the breeding grounds. Our hypothized causes are: 1) changes in conditions on the wintering grounds; 2) increased anthropogenic pressure, from both recreation and hunting (changing opening dates and season duration in ways that are harmful to the Common Pochard, which is a late-breeder; and 3) the presence of some global (endogenous or exogenous) drivers of population fluctuations ("waves of life"), the mechanisms of which are not yet clear to us.

FACTORS DETERMINING THE NW RUSSIAN DISTRIBUTION OF THE MUTE SWAN (*CYGNUS OLOR*) AND ADAPTATIONS CONTRIBUTING TO ITS RANGE EXPANSION

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Climate change and improved protection have enabled the Mute Swan to significantly expand the northern border of its range in the twentieth century. However, in the last 20 years, its distribution in northwestern Russia has not extended northeastwards farther than the islands of the eastern Gulf of Finland, and its nesting in inland waters is limited to the regions of Pskov and to the southwest of Leningrad. This is because the Mute Swan, as the largest of the Palaearctic swans, requires the longest breeding season (about 7 months), thus limiting its breeding to those areas where the ice-free period is at least that long. In the Pskov region, this period is more than 7 months; in the Leningrad region 6.5–7 months; and in Karelia 5.5–6 months, whereas it is about 9 months in the Gulf of Finland. The ice-free period in the most northerly nesting area of the Mute Swan — the Pechora Delta — is abnormally long (7–7,5 months) for its Arctic location (owing to the maritime effect of the Barents Sea). Swan distribution in the Gulf of Finland is determined by the presence of islands (moraines and skerries), providing a safe haven for nesting. More than 90 % of the swans in this area nest on moraines, which have the largest shallow-water foraging areas. The following traits appear to have enabled the species to extend its range: 1) feeding exclusively on plants; 2) tolerance of a wide range of water salinity; 3) habitat plasticity; 4) territorial plasticity, allowing swans to form dense settlements (colonies and associations) and to dramatically increase their numbers under optimal conditions; 5) ability to collect floating algae bits in deep water; 6) transportation of cygnets on the backs of parents, enabling feeding in relatively deep water. These features could have evolved in dynamic environments in arid and semiarid zones. Similar behaviour is demonstrated by southern hemisphere swans most closely related to the Mute Swan, *C. atratus* and *C. melanocoryphus.*

DIETS OF THREE SWAN SPECIES IN THE SOUTHERN SECTOR OF THE EASTERN GULF OF FINLAND IN SPRING

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The current investigation was carried out by means of visual observations, analysis of faecal and vegetation samples, and records of torn-off bits of plants on the foraging places of swans on the southern coast of the Gulf of Finland from February through May in 2014 and 2015. The diet of the Mute Swan (*Cygnus olor*) is quite different from that of the other species. Its faecal samples consisted 80–95 % of algae, mainly *Cladophora* spp., and rather fewer species of *Enteromorpha* and brown algae. Vascular plants in feeding leftovers, usually *Potamogeton pectinatus* and *Batrachium marinum*, were present in the form of thin, weak stems and leaves. The highest proportion of vascular plants in faecal samples was encountered in May, a 15 % increase above February levels. The main feeding places of Mute swans in spring were extensive sandy shoals lacking attached vegetation at this time. The birds gathered floating bites of vegetation carried by currents from deeper parts of the gulf. The diets of the Whooper Swan (*C. cygnus*) and the Tundra Swan (*C. bewickii*) are quite similar to each other and exhibit significantly greater dynamics during spring compared to the Mute Swan. In March and early April their feeding places on the Kurgalsky Peninsula and the composition of their faecal samples were similar to those for the Mute Swan. In 2014 and 2015, annual growth of aquatic vegetation off the Kurgalsky Peninsula began at the end of the first decade of April, and then the swans began to actively feed on the rhizomes and young shoots of reeds, *Phragmites australis* (which comprised up to 70–80 % in the samples), and, to a lesser extent, other vascular plants. The birds moved to feed on tussocks of emergent reeds on the shore itself. In April — early May no algae at all were detected in faecal samples of Tundra swans and Whooper swans. The main foods of the Whooper swans were seedlings and roots of reeds (90–95%). Young shoots and roots of *Carex* spp. comprised 50–55 % of Tundra swan rations in Neva Bay. The remaining 40-45 % consisted of seedlings and roots of reeds.

CURRENT STATUS OF BARNACLE GOOSE (*BRANTA LEUCOPSIS)* COLONIES IN KOLOKOLKOVA BAY, BARENTS SEA, RUSSIA

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Barnacle Goose colonies in the Kolokolkova Bay area were established recently and have been studied since 2002. The number of breeding pairs in most of the colonies was increasing until 2008–2009. In recent years, however, the number of nests has dropped dramatically; only half the number of birds now breed in the Tobseda area and on the Chaichi Islands. The main factors determining such a decrease are rapid degradation of the salt marshes (important areas for breeding, feeding and brood-rearing), nest and bird depredation, and hunting, possibly in combination after an extreme event. Such as that resulting in extremely low breeding success in 2010. Our long-term study shows how recently established goose colonies in the Russian Arctic can be impacted by changes to their environment, and we discuss this in the light of population dynamics in the Russian Arctic.

PREDICTING THE EFFECTS OF FUTURE CLIMATE ON THE REPRODUCTIVE SUCCESS OF ARCTIC-BREEDING BARNACLE GEESE (*BRANTA LEUCOPSIS*)

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For geese nesting in the Arctic, the spring migration is an important preparation for the breeding season. Early arrival on the nesting grounds is important for ensuring maximal food conditions during the gosling growth period, but comes at the cost of acquiring ample body stores to

fuel migration, egg-laying and incubation. Individual geese differ in the migration strategy used to attain this balance and still ensure their own survival, but it is unknown exactly how this trade-off regulates reproductive success. Future climate change might lead to shifts in the timing of optimal conditions for breeding and migration, and could thus impact the reproductive success of the geese. Using GPS trackers and geolocators attached to female Barnacle geese, we quantified arrival time and outcomes of migration strategies. We weighed geese on arrival and during incubation to estimate body-condition dynamics prior to and during nesting. In combination with data on breeding monitoring, we can use these data to quantify the trade-off between arrival time and body-store accumulation and its effects on reproductive output. Furthermore, we can look into the carry-over effects of different migration strategies for Barnacle geese. With experimental data on the effect of climate warming on food availability during the migration and breeding periods, we can make the first predictions on the effects of future climate change on the reproductive success of geese breeding in the Arctic.

MEDIEVAL BELIEFS ABOUT THE BARNACLE AND BRENT GOOSE ORIGIN

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There was a long-standing belief (from the twelfth century to the early nineteenth century) that Barnacle geese (*Branta "Anas" leucopsis*) and Brent geese (*B. bernicla*) developed attached to seaside trees by their beaks and clad in shells before dropping into the sea, where they became mature geese. The food-gathering appendages of the sessile goose-necked barnacles were supposedly protofeathers. Barnacle geese nest in remote areas well above the Arctic Circle, so Europeans, who only saw these birds during the migratory and winter periods, filled in the unknown part of the life history of the species with the folktale about this bizarre metamorphosis. This myth may have persisted as long as it did, because the meat of these — but not other — geese could continue to be eaten during Lent.

THE ECOLOGY OF URBAN WATERFOWL IN KAZAN, TATARSTAN, RUSSIA

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Anthropogenic processes transform nature, leading to significant changes in the environment. Biotopes of cities are a clear example of direct and indirect impacts of human activities on the habitats of many species of animals. The degree of water content on the territory of Kazan — a city generously endowed with natural waterbodies — significantly affects the diversity of its aquatic fauna population. The Volga River (Kuibyshev Reservoir) approaches the walls of the city, its tributary, the Kazanka River, flows through the entire city, a loop of the Volga lies as the Kaban Lakes (Lower, Middle, and Upper), and the Bulak Canal connects these with the Kazanka. On the waterbodies of the City of Kazan, the following species of waterfowl and waterbirds are encountered: the Mallard (*Anas platyrhynchos*), Eurasian Teal (*A. crecca*), Tufted Duck (*Aythya fuligula*), Common Pochard (*A. ferina*), Long-tailed Duck (*Clangula hyemalis*), Great Crested Grebe (*Podiceps cristatus*), Eurasian Coot (*Fulica atra*), and Moorhen (*Gallinula chloropus*), and there have been the odd sightings of the Red-crested Pochard (*Netta rufina*). Waterbirds include the Black-headed Gull (*Larus ridibundus*), Herring Gull (*L. argentatus*), Pallas's Gull (*L. ichthyaetus*), and Common Tern (*Sterna hirundo*).

The most abundant Anseriform on the Kazan waterbodies is the Mallard, where it is resident year 'round, and both its wintering and nesting numbers are increasing. In the summer of 2013, there were approximately 100 broods, each with two to 15 ducklings. Mallards with broods primarily inhabit the network of Kaban Lakes, which lie in the heart of the city. In the summer there are approximately 100–110 mallards, but this increases sharply to approximately 800 with the arrival of migrants in the autumn. Some 600–1000 individuals overwinter in Kazan. In January 2013, 570–575 mallards were recorded in the city, and in the winter of 2014 the number reached 1000. The 2015 midwinter count of waterfowl, conducted on 18 January in Tatarstan, showed that 1175 mallards were overwintering on the open waters of the city.

AN EXPERIMENT ON MAINTAINING THE ABUNDANCE AND CONSERVATION OF POPULATIONS OF WATERFOWL IN SOUTHERN EUROPEAN RUSSIA

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Waterfowl are the most important biological resources of wetlands in southern European Russia. Given the loss of habitat and the decrease in numbers of waterfowl and waterbirds, the development of measures for their recovery and maintenance is required. Long-term observations revealed a decrease in the abundance of populations of mallards (*Anas platyrhynchos*) and other ducks at the start of the twenty-first century. A program of recovery for the mallard population was begun in 2005, and in 2010 for the Greylag Goose (*Anser anser*). Raising birds in captivity with subsequent reintroduction into the wild has stabilized the abundance of local populations of mallards. Study of the adaptations of farm-reared mallards has enabled identification of features of dispersion of the young, breeding, feeding behaviour, *etc*. The methodology of saturating hunting zones of hunted species at the expense of adaptation of the "farmed" ducks in natural biotopes, the forming of new local groupings in places where hunting occurred, and the maintaining of wintering populations in unfavourable weather conditions was also developed and experimentally tested. Marking confirmed the high proportion of "farmed" ducks in hunter bags. We carried out studies of a "cold" waterfowl wintering ground, and in addition, carried out regular observations of the seasonal distribution of waterfowl — the numbers of migrants and of residents — on control sites. Also identified were the most important habitat characteristics contributing to the increase in ecological capacity, and thus the formation of aggregations of birds. On the basis of new data gathered from 2011 to 2014, a proposal was made to establish buffer zones for migrating and wintering birds. This strategy was introduced at the Veselovsky Reservoir. These measures led to an increase in the number of aggregations in the buffer zones.

EAST ASIAN MIGRATION ROUTES OF THE MALLARD (*ANAS PLATYRHYNCHOS*), DETERMINED BY THE NEWLY INVENTED WT-200

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The WT-200 tracking microchip (GPS mobile-phone-based telemetry), a newly invented telemetry device by KoEco, was used to track migrating mallards. The WT-200 combines GPS (Global Positioning System) with the WCDMA (World Code Division Multiple Access) mobile-phone system. When attached to wild animals, the device records GPS coordinates at a predetermined time interval and transmits these geographic coordinates using the public network of the mobile-phone system. Researchers can acquire individual tracking-location data at a web site. We studied the Mallard's migration routes, distribution of stopovers and breeding sites, and timing of migration. We captured mallards using cannon-nets, and attached the WT-200 devices in the winter of 2013–2014. The ducks departed individually from their wintering areas in Korea between March 21 and May 7. Migration from the Korean wintering grounds to their nesting grounds in northeastern Asia took 19.0 days (SD = 9.8, n = 15), on average. The marked mallards used several stopover sites (SD = 5.25, n = 15), where they stayed from one day to 45 days. The breeding areas were distributed widely throughout northeastern Asia. These birds also departed individually for the south, between October 17 and November 8.

CHARACTERISTICS OF THE URBAN POPULATION OF THE MALLARD IN KALININGRAD

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In anthropogenic landscapes of Europe, the Mallard (*Anas platyrhynchos*) is one of the most numerous and widespread waterfowl species that has established urban populations. Within the borders of Kaliningrad, the breeding ecology of the Mallard was studied and phenological observations conducted from 1994 through 2015. Surveys were carried out in the preparation of the Atlas of Breeding Birds of Kaliningrad (1999–2003 in the urbanized part of the city and 2006–2007 in the non-urbanized part). Midwinter counts were made from 1999 through 2007 on the large water bodies (Upper Pond, Lower Pond and the Pregolya River) of the city. In the course of the preparation of the Atlas, the city was divided into 206 1-km^2 quadrats. The number of nesting birds, their habitat distribution, and rate of urbanization were determined for each quadrat. For the last parameter, a scale with five grades was used: the more urbanized the quadrat, the higher the grade. The following characteristics of the Mallard population in Kaliningrad were revealed: habitat versatility; lack of habitat preference with regard to urbanization; but inverse with regard to its rate (r_s = –0,33; P < 0,01); nesting density of 1–8 nests per km^2 (occupying 33.5 % of the quadrats) (n = 200); earlier nesting than their rural counterparts (first clutches in early March); high tolerance of humans; poorly expressed migratory activity (300–2000 overwinter in the city); and frequent albinism and other aberrant coloration.

THE GADWALL (*ANAS STREPERA*) IN EASTERN SIBERIA: RANGE DYNAMICS AND CURRENT STATUS

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Until the middle of the twentieth century, the Gadwall (*Anas strepera*) was noted only in the very south of Eastern Siberia and nested in unknown numbers on water bodies located on the steppes that extend from Mongolia and China to Lake Baikal and regions to the east of the lake: Buryatia and Transbaikalia. At that time, it was an extremely common and numerous species on the adjacent territories of Mongolia and China. At the end of the 1950s and beginning of the 1960s, a significant increase in its spring migration in Southern Transbaikalia was noted. At the same time, very few encounters with this species were recorded at the latitude of Irkutsk (52°31´ N). At that time, isolated cases of its nesting in the forest-steppe area of Southern Cisbaikalia, including the Bratsk Reservoir, were recorded. In the mid-1970s, the abundance of the Gadwall in Eastern Siberia increased significantly. It became a typical waterfowl species on the Torey lakes and in the Selenga River Delta. At times, its numbers here changed sharply, falling to nearly zero or significantly increasing. However, the overall tendency for an increase in the abundance of the Gadwall in the south of Eastern Siberia was quite clear. In the forest-steppe areas, there were cases of the nesting of this species, as well as encounters during spring and autumn migration. At the same time, the Gadwall appeared at the western and eastern edges of its range at various times, and its numbers continually fluctuated. A significant growth in the abundance of this species in the Irkutsk area was observed in the 1980s. The Gadwall became a common nesting species of the Angara forest-steppe, and its range was extended far to the north, even including the southern edge of Yakutia. A new wave in the increase of numbers was observed at the turn of the twenty-first century; in forest-steppe areas of Cisbaikalia, the Gadwall became a quite common nesting species. At the same time, its abundance in Mongolia and China, as well as at the southern edges of Russia, noticeably decreased. There is no doubt that the change in the northern boundary of its range and the abundance of the Gadwall in Eastern Siberia are connected with the inexorable warming of the climate, and with the eviction of the species from the southern areas of its range, which have been gripped by strong droughts. Inclusion of the Gadwall in the Red Data Book of the Russian Federation is premature. However, in steppe areas, where the abundance of the species has been strongly reduced (up to completely extirpated), its inclusion in regional Red Data Books is a necessity.

ABUNDANCE OF WATERFOWL AND WATERBIRDS ON THE "COLD" WINTERING GROUND AT THE SOURCE OF THE ANGARA RIVER (SOUTHERN BAIKAL)

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The largest "cold" wintering ground of waterbirds and waterfowl of Eastern Siberia is found at the source of the Angara River. Previously, a single species, the Common Goldeneye (*Bucephala clangula*), comprised virtually all this overwintering population (94.0–98.0 %). Virtually every year, the Common (*Mergus merganser*) and Red-breasted (*M. serrator*) mergansers were recorded. The remaining species were encountered periodically and their abundance varied greatly — from complete absence to several tens or hundreds of individuals: the Smew (*M. albellus*), Harlequin Duck (*Histrionicus histrionicus*), Greater Scaup (*Aythya marila*), Long-tailed Duck (*Clangula hyemalis*), Ruddy Shelduck (*Tadorna ferruginea*), and on the lower wintering ground (behind the dam of the Irkutsk Hydroelectric Station), the Mallard (*Anas platyrhynchos*), Eurasian Teal (*A. crecca*), Eurasian Wigeon (*A. penelope*), and Tufted Duck (*Aythya fuligula*). Overall abundance of waterfowl and waterbirds (including gulls, skuas, *etc.*) in the twentieth century was approximately 5,000–7,000. Despite the rather high proportion of gulls (sometimes up to 150), they did not survive the harsh winter conditions, and perished in mid-January, at the time of the real formation of the "cold" wintering ground at the source of the Angara River. The current warming of the climate at Lake Baikal (by almost 8°C in the winter period) has led to an increase in the numbers of wintering birds, although the species composition has remained as before. The trend of an increase in numbers was seen for the entire second half of the twentieth century. Peak numbers were recorded in 1992 — 32,000 birds, after which they decreased somewhat and stabilized at approximately 20,000. Currently the numbers fluctuate in different seasons from 13,859 to 25,503. Feeding and comfort behaviours have significantly changed, and they have ceased their evening flight to Lake Baikal. As before, the main wintering species is the Common Goldeneye, however there has been substantial growth in the population of Long-tailed Ducks (more than 465 individuals), and in some seasons the Common (457) and Red-breasted (70) mergansers.

POPULATION DYNAMICS OF SEVERAL SPECIES OF DUCKS IN SOUTHERN WESTERN SIBERIA RELATED TO HYDROCLIMATIC AND METEOROLOGICAL CONDITIONS

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Observations were conducted from 1970 through 2015 on waterbodies in the Karasukskiy, Baganskiy and Krasnozerskiy administrative districts of Novosibirsk Oblast. Birds on the water were counted from the shore, always from a single location in May/early June and at the end of

July/August. Duck nests on Lake Krotovaya Lyaga were counted in May through July. Correlation and spectral analysis were used in analyzing the data. Complex curves of long-term population dynamics of ducks are the superposition of several periodic components. For the Mallard (*Anas platyrhynchos*), the most powerful is a 28-year cycle. Its stability can be ensured by the Brückner temperature cycle. The second most powerful in the calculated spectrum of rhythmicity of the dynamics of the local mallard population is an approximately six-year cycle. Furthermore, the population dynamics have several high-frequency harmonic components in the two-to-three-year band of frequencies. For the Common Pochard (*Aythya ferina*), a low-frequency 25-year cycle and a 4.5-year cycle are most powerful. More weakly expressed on the spectrum are three-, six- and 11-year periodic components. Change in the number of nests of the Tufted Duck (*A. fuligula*) is governed by a seven-year cycle, secondly by a 14-year one, and thirdly by a four-year cycle. In addition to the Brückner cycle, long-term fluctuations in temperature and precipitation characteristic of a given location can act as internal synchronizing agents of this rhythmicity.

Recently, the interest in global temperature fluctuations has grown. For example, the North Atlantic Oscillation (NAO), a global feature that impacts temperature and the quantity of precipitation at northern latitudes, thereby changing the timing of spring migration, date of the start of breeding, clutch size, and reproductive success, which altogether is reflected in the dynamics of the population. One gets the impression that the NAO oscillation during winter more greatly impacts the fluctuations in numbers of the Common Pochard: an approximately five-year cycle and the harmonic component in the low-frequency band coincide. In spring, the NAO has a powerful four-year cycle, which is well defined on the spectrum of the Tufted Duck. Adjustment to the fluctuations of these natural cycles can be an important tool in assuring viability of the population.

BREEDING BIOLOGY AND ABUNDANCE OF LONG-TAILED DUCKS (*CLANGULA HYEMALIS*) IN THE EAST-EUROPEAN TUNDRA OF RUSSIA

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Our study was conducted on the tundra of Nenets Autonomous Okrug of Arkhangelsk Oblast from 1973 through 2014. Long-tailed ducks, some already in breeding pairs, arrived on tundra habitats between 22 May and 11 June. The Long-tailed Duck is the most eurytopic (uses about 30 types of breeding biotopes) species of duck inhabiting the tundra zone. In some biotopes this duck nests at high population densities every year, in others the species breeds in low numbers or periodically. This species typically nests in small monospecific colonies (14–25 nests) on islands and peninsulas of lakes, often with other species of ducks, Arctic terns (*Sterna paradisaea*) and waders. Long-tailed ducks return to the previous year's nest sites. Of 20 ringed breeding females, 50 % repeatedly occupied their old nests. More than 60 % of the birds located their nests in the scarce clumps of bushes and 11 % situated them in sedge-grass communities among different forms of micro-relief. Egg-laying occurred during the first 10 days of June. Clutches generally contained 1–12 eggs, with the means being 5.9 on the Malozemelskaya Tundra; 6.1 on the Bolshezemelskaya Tundra; and 5.6 on the Yugorskiy Peninsula. The first broods were recorded between 9 June and 10 August, with averages being 15 July on the Malozemelskaya Tundra; 13 July on the Bolshezemelskaya Tundra; and 25 July on the Yugorskiy Peninsula. Broods contained 1–14 goslings, with the means being 6.1 on the Malozemelskaya Tundra; 4.1 on the Bolshezemelskaya Tundra; and 5.8 on the Yugorskiy Peninsula. The population density (individuals per 1 km^2) of the Long-tailed Duck varied strongly between regions, being 1.7–7.7 (on average 4.7) on the Malozemelskaya Tundra; 3.1–15 (on average 7.6) on the Bolshezemelskaya Tundra; and 1.6–10.1 (on average 3.4) on the Yugorskiy Peninsula. In the past two decades, a negative trend in the abundance of this species has been observed on the Eastern European tundra. This decrease may be the result of two major factors: succession of tundra in connection with warming in high latitudes and pollution of coastal habitats due to human exploitation of resources.

THE IMPACT OF SOCIO-ECONOMIC AND CLIMATE FACTORS ON ABUNDANCE OF DUCKS OF KEY WATER BODIES OF MOSCOW REGION

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The monitoring of duck broods was carried out during the 1980s in three wetlands differing in characteristics, intensity of use, and hydrological regime. An overall high density of broods (24.2–33.6 per km^2) in the fish farm "Biserovo" in 1981–1983 was observed in the vicinity of islets and floating bog. In conjuction with large colonies of lake gulls (*Larus ridibundus*), this was the cause of the clear dominance of the Tufted Duck (*Aythya fuligula*) and Common Pochard (*A. ferina*). In 2012–2014, the nature of use of part of the ponds hardly changed, however the density of broods was significantly lower, 7.3–8.4 per km^2, with a sharp decline in the proportion of Tufted ducks and a marked increase in the proportion of the Mallard (*Anas platyrhynchos*). In the "Lotoshino" fish farm, differing in the presence of woods side by side with swampy areas and having fewer islets, brood density in 1981–1982 was substantially lower than at "Biserovo": 4.7–6.3 / km^2, and the proportion of diving ducks was significantly lower. In 2012–2014 diving ducks essentially did not nest (a single brood of the Common Pochard in 2014), but the total density of broods did not change (6.4–6.7 / km^2), with the dominant species remaining the Mallard, and the Eurasian Wigeon (*Anas penelope*) and Common Goldeneye (*Bucephala clangula*) comprising a significant proportion. On the Vinogradovo floodplain, at the beginning of the 1980s, the Garganey (*A. querquedula*) was the absolute dominant, and the Northern Shoveler (*A. clypeata*) and Common Pochard the subdominants. The abundance of the Tufted Duck and Pintail (*A. acuta*) was high as well (no fewer than 100 broods annually). At the beginning of the twenty-first century, the Pintail stopped nesting, and only solitary Tufted duck broods were seen, and not every year. There were significant declines in the abundance of the Garganey, Shoveler, and Pochard. At the same time, there was a significant growth in the numbers of the Gadwall (*A. strepera*) and mallards. A positive trend in abundance of mallards and a negative one, and lowered nesting success, for Tufted ducks was identified. The impact of fundamental factors on the population dynamics of ducks — the decrease in spring flooding levels over the past 30 years, the discontinuation of fish farming and management activities, and the reduction in numbers of gulls — is discussed.

MANUAL FOR THE IDENTIFICATION OF THE HUMERUS OF ORDER ANSERIFORMES: GENUS *AYTHYA*

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Currently, in the study of species and age and sex characteristics of birds difficulties arise with respect to the collection of bulk material. Hunters are the easiest way to collect these data, but to a significant degree these are excluded from scientific studies, owing to the absence of a method of analyzing such collections. We propose using the collection of the humerus as a method of collection of great quantities of data, especially with respect to "hunted species of birds", which is highly to the point for Anseriformes, since hunters put them in first place amongst game birds. The widespread utility of this method lies in not only its prodigious nature, but also its ease of collection, which may be carried out by both hunter-volunteers and professional ornithologists. Moreover, the collection of the humerus does not detract from the culinary aspect of the fowl — the bones may be collected and later the birds can be eaten; the exact identity of the species is not needed; and for 50–100 birds the external dimensions of the collections do not exceed a single plastic bag. Preservation of the collections, if they are sprinkled with salt, lasts for several years. It is important to indicate the place and date of the collections. Collections of the anseriform humerus were made by us from 1998 through 2013 in Uzbekistan, and 2013–2015 in southern Tyumen Oblast. In the current paper, we present an identification manual of the humerus bones of the genus *Aythya*. In the study areas we collected 196 bones from four species of this genus: the Common Pochard *A. ferina* (74 bones), Tufted Duck *A. fuligula* (63 bones), Greater Scaup *A. marila* (11 bones) and Ferruginous Duck *A. nyroca* (48 bones). Using morphologic and morphometric indicators of the humerus bones of the genus *Aythya*, by the method developed by us, we were able to identify both the features of the structures for each species, as well as for age and sex. The obtained results can be used to analyze hunter collections from different areas in aiding in the identification of a Red Book species, as we did in the middle course of the Syr Darya (Uzbekistan) for the Ferruginous Duck, as well as, having such a great volume of material, to reveal the status of a population of a species.

INCUBATION BEHAVIOUR IN BEWICK'S SWANS (*CYNUS BEWICKII*)

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The pattern of incubation in the Bewick's Swan had been studied in the delta of the Chaun River in the 1980s, when the population of this species was not high. We considered it necessary to repeat this study at the present time, when nesting densities have undergone a tenfold increase. The investigation was conducted in the summer of 2014 in the Chaun River delta on Ayopechan Island, monitoring the nesting of the birds in the given territory. Searching for nests was carried out on 9 selected 1-km^2 plots. On the finding of a swan nest, besides information on the clutch, the behaviour of the pair in relation to the observer was recorded as (1) flying from the nest from afar (2) fleeing into the vegetation at several meters (3) showing aggression toward the observer. Camera traps were set up only at the nests of the last, so that if the camera trap gave away the nest, the trap would not be responsible for the nest's destruction. The camera trap took photos once every minute. This interval was optimal for the capture of the behaviour of the birds. The photo trap was placed at nest No. 1 on 14 June and remained near the nest until hatch on 12 July. At nest No. 2, we obtained poor quality photos, owing to spiders covering the lens with webbing, although the data were sufficient for comparitive purposes. The first pair of swans spent a total of 658.5 hours at the nest, of which the female spent 435.3 hours, or 64.63 % of the total incubation time; a further 2.23 % of the time the pair spent on defending the nest and changing places. The male sat on the clutch 33.14 % of the incubation period. The amount of time spent by the female on the nest was significantly greater than that for the male. The number of daily changes of incubating individual decreased from the beginning to the end of incubation. Differences in the incubation pattern between the two pairs were insignificant.

SATELLITE TRACKING RED-BREASTED GEESE (*BRANTA RUFICOLLIS*)

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The Red-breasted Goose is one of the most threatened goose species in the world. It breeds on the Arctic tundra, on the Taimyr, Gydan, and Yamal peninsulas, and currently overwinters primarily in Bulgaria and Romania. The Red-Breasted Goose Bulgaria-U.S. Project, a collaboration between Bulgarian and American conservationists and colleagues from Holland, Romania, Belgium, and Russia, deployed GPS-Platform Transmitter Terminals on 8 Red-breasted geese between 2012 and 2014 on their wintering ground in Bulgaria. The enormous value of this wide-ranging collaborative effort, in which satellite tracking is crucial to the conservation of the long-distance migrants, is presented, and details are given on the fate of each tracked bird. The important stopover sites for the populations, the challenges of using satellite tracking technology, its incredible value for natural resource conservation, and the challenges that lie ahead are discussed.

AN INITIATIVE TO ADDRESS THE ILLEGAL SHOOTING OF THE NORTHWEST EUROPEAN BEWICK'S SWAN (*CYGNUS COLUMBIANUS BEWICKII*) IN THE RUSSIAN ARCTIC

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The Northwest European Bewick's Swan population is listed in the Red Data Book of the Russian Federation and is legally protected from hunting under legislation throughout its migratory range. However, illegal shooting remains a threat with 23 % of Bewick's Swans X-rayed in the 21st century containing shot (Newth *et al.* 2011). Illegal shooting is of particular conservation concern for this population because its numbers

declined by 38 % between 1995 and 2010 and national trends indicate that numbers have continued to fall since then. Arctic Russia hosts the entire population from May to September each year. Conservationists' surveys across the flyway in 2012 indicated that illegal shooting was a significant threat in two areas of the western Russian Arctic. A new initiative aims to build partnerships with people living in and around one of these areas, the Pechora Delta in the Yamalo-Nenets Autonomous Okrug, and to promote dialogue and information exchange through a participatory process. The initiative will provide a baseline assessment of attitudes, knowledge and beliefs about Bewick's swans, their conservation and illegal persecution. It also aims to provide insights into the role of Bewick's Swans as a resource for residents and opportunities for alternative livelihoods. Outputs from this assessment will be used to identify the type(s) of conflict involved and practical approaches to reducing illegal shooting. This will be the first quantitative and qualitative human dimension study related to swan conservation in Arctic Russia and aims to provide a tool kit for addressing the issue at other sites across the flyway.

ANSERIFORMES OF THE PROPOSED NATIONAL NATURE PARK "VERKHNEYE POBUZHYE"

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Studies were carried out on the territory of the proposed National Nature Park "Verkhneye Pobuzhye" [Upper Bug River] (Khmelnitsky District, Ukraine) from 1990 through 2015. Water bodies in the valleys of the Yuzhnyi [Southern] Bug, Buzhok, and Volk rivers were surveyed, and included the Malomolyntsivskoye, Schedrivskoye, Letichevskoye, Yaroslavskoye, and Novostavskoye reservoirs, fishponds, village ponds, and the valleys of more than 10 small rivers. Data on the timing of spring and autumn migration, nesting, abundance in different seasons, and mortality causes were collected. In this period, 24 species of Anseriformes were recorded. Six of them (*Anser anser, Cygnus olor, Anas platyrhynchos, A. querquedula, Aythya fuligula,* and *A. ferina*) nested; four (*Anas crecca, A. strepera, A. clypeata,* and *Aythya nyroca*) probably nested. Eleven species (*Anser anser, Cygnus cygnus* (vagrant), *C. olor, Anas platyrhynchos, A. strepera, A. crecca, A. querquedula, Aythya fuligula, A. marila* (vagrant), *A. ferina,* and *Bucephala* *clangula*) overwintered in the region. Eleven species (*Anser fabalis*, *A. albifrons*, *A. erythropus*, *Anas penelope*, *A. acuta*, *Mergus albellus*, *M. merganser*, *Branta bernicla*, *Anser caerulescens*, *Tadorna tadorna*, and *Mergus serrator*) were recorded only during the migration period, the last three species as vagrants.

RUSSIAN IMPLEMENTATION OF THE PROGRAM OF THE EURASIAN REGIONAL ASSOCIATION OF ZOOS AND AQUARIUMS ON RARE AND ENDANGERED EURASIAN WATERFOWL

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Developed in 2003 and implemented in 2005, the program includes a whole host of waterfowl species. The Moscow Zoo already houses all species and the majority of subspecies of Eurasian geese of the genus *Anser*; all swans and *Branta* of the world, except the Brent Goose or Brant; three of the five members of the genus *Chloephaga* (Sheldgeese); more than 20 species of the genus *Anas*; and a host of other waterfowl species, and especially focuses on maintaining breeding populations of rare species. In the past 30 years, for example, more than 500 pure-blooded individuals of the Swan Goose (*Anser cygnoides*) have been raised in the zoo, after beginning with 10 birds caught in eastern Mongolia in 1981 and a further 10 added in the 1990s from the Amur region. In 2012, Aleutian cackling geese (*Branta canadensis leucopareia*) from the highly successful and long-standing Kamchatka breeding nursery were transferred to the Moscow Zoo under the new joint program. The birds adapted successfully and continued to breed, resulting in a current population of more than 40 at the zoo. Recently, the zoo participated in the program of the Goose, Swan, and Duck Study Group of Northern Eurasia and the Government of Sweden to reintroduce the extirpated Scandinavian population of the Lesser White-fronted Goose (*Anser erythropus*). The Tundra Swan (*Cygnus bewickii*) has bred well in both the Moscow and Tallinn zoos. As of 1 January 2015, there were 30 Tundra swans in total in 12 collections of the former USSR. The Novosibirsk Zoo, together with the Institute of Systematics and Ecology of Animals of the Russian Academy of Sciences, has successfully created a breeding nucleus of White-headed ducks (*Oxyura leucocephala*) at its Karasuk branch for subsequent reintroduction onto steppe lakes, where the species has been sporadically encountered nesting. In the Far East, numbers of the Baer's Pochard (*Aythya baeri*) and the Falcated Teal (*Anas falcata*) recently dropped sharply, and the numbers of the Baikal Teal (*A. formosa*) and the Scaly-sided or Chinese Merganser (*Mergus squamatus*) are unstable. These and several other species are fully worthy of the creation of artificial, reserve populations.

A PHYLOGENETIC ANALYSIS OF TRUE GEESE WITH AN EMPHASIS ON EURASIAN *ANSER* SPECIES

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The phylogeny of the True Geese (tribe Anserini, Anatidae, Anseriformes) remains contentious. The phylogenetic relationships and the timing of divergence between the different goose species of the genera *Anser* and *Branta* have not been resolved until now. We sequenced the nuclear and mitochondrial genomes of nineteen goose (sub)species and applied several phylogenetic tools to unravel the evolutionary history of this bird group. Different phylogenetic approaches (concatenation and consensus methods) yielded identical results, with the exception of the relationships within the Bean Goose complex (*A. fabalis*, *A. serrirostris* and *A. brachyrhynchus*). Moreover, the results from the consensus method suggest that the diversification of the genus *Anser* is heavily influenced by rapid speciation or hybridization, or both, which can explain the failure of previous studies to resolve the phylogenetic relationships within this genus. The timing of divergence between the two genera, *Anser* and *Branta*, was dated to approximately 9.5 million years ago, which is in agreement with other recent estimates. The majority of subsequent speciation events took place in the Late Pliocene and Early Pleistocene (between two and four million years ago), likely driven by continuing global cooling and the establishment of a circumpolar tundra belt.

WATERFOWL AS INDICATORS OF LOW ARCTIC ECOSYSTEMS IN WESTERN SIBERIA

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Data on waterfowl distribution and abundance in the tundra and taiga zone of West Siberia were analyzed to determine the number of species typical for the Low Arctic biogeographic belt — a latitudinal geographic category. The Low Arctic in West Siberia is especially pronounced, owing to the area's expansive, and on the whole wet, plain. Two waterfowl species, the Pintail (*Anas acuta*) and the Teal (*A. crecca*), are the most characteristic for the West Siberian Low Arctic ecosystems. These species are much more abundant on the southern tundra, and especially on the forest-tundra and in the northern taiga, than on the more southerly and northerly areas. The Pintail nests at high densities primarily on flood plains of various sizes, from the island-filled extensive flood plain of the Ob′ River to the ribboned landscapes of the flood plains of medium-sized and small rivers all over the Low Arctic. The Teal is a more precise indicator, due to its high-density nesting in all types of Low Arctic landscapes, in forests, and swamps and on flood plains. The moulting areas of both species are situated mainly on the flood plains of large rivers, above all the Ob′ River. Extended northern bog complexes are very typical for the southern part of the West Siberian Low Arctic. They take up half of the entire territory. Their ecosytems are very similar to those of the tundra. Reliable indicators of this similarity to tundra and difference from taiga are two arctic species of waterfowl: the abundant Long-tailed Duck (*Clangula hyemalis*) and the Scaup (*Aythya marila*). Thus, the waterfowl community of the West Siberian Low Arctic is a clear indicator of both the latitudinal belt as a whole and of its particular features — a high diversity of both landscapes and ecosystems.

WATERFOWL UNDER CONDITIONS OF THE ACTIVE ECONOMIC DEVELOPMENT OF NORTHEASTERN YAMAL (SOUTH TAMBEY GAS FIELD)

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It is considered that any anthropogenic burden has a negative impact on the state of Arctic ecosystems as a whole and on avian populations in particular. However, currently in a host of areas, the converse situation is observed — the gravitation of birds to some areas of oil and gas production. In 2013 and 2014, we conducted multifaceted ornithological studies on the territory of the South Tambey gas field, in the vicinity of Sabetta, one of the largest centres of modern economic development of the Arctic. Waterfowl are commonly encountered here, both on spring and autumn migration and nesting. In the spring migration period, geese in this region are not numerous, but quite large flocks of ducks have been noted. Thus, in the environs of the marine-port (Sabetta) construction, which was initiated here at the beginning of June 2014, we have observed mixed flocks of up to 300 individuals of Long-tailed ducks (*Clangula hyemalis*) and King eiders (*Somateria spectabilis*) on a small lake. Besides the usual common species, we have observed groups of Steller's eiders (*Polysticta stelleri*) here each year. On autumn migration, the most common species of waterfowl in this area is the White-fronted Goose (*Anser albifrons*). The most important migration stop-over of the species on the South Tambey Field territory is located in the lower reaches of the Sabettayaha and Nedarmayaha rivers in close proximity to the construction site. The number of geese here in September 2013 was approximately 700–1000, and in 2014 reached 4000–5000. In the nesting period, the most numerous species was the Long-tailed Duck; a maximum number of broods was observed on the water intake lake right in Sabetta. Over the course of the entire summer, we did not observe any kind of avoidance of the environs of the construction site by the birds, and a tendency for an even greater concentration of birds in the area is projected for the migration period. This situation is likely linked with the complete ban on hunting on the territory of the gas field, since in other regions hunting is a major disturbance factor, especially during migration. In the nesting period, the greatest benefit of the area of the gas field is the ban on the keeping of domestic animals, especially dogs, which, in the vicinity of traditional Arctic settlements, occupy the niche of one of the most important predators influencing the success of nesting birds.

MODELLING OF THE GEOGRAPHIC DISTRIBUTION OF WATERFOWL IN NORTHWESTERN SIBERIA USING THE METHOD OF MAXIMUM ENTROPY

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The modelling of the geographic distribution was carried out with the help of the specialized free software MaxEnt and the database *WorldClim – Global Climate Data*, containing data on the distribution of relief and climate variables for the surface of the Earth. Altogether, 59 different variables were employed. Several different expeditions were organized for the collection of data on the geographic distribution of Anseriformes in the Yamalo-Nenets Autonomous Okrug (YaNAO) and the Khanty-Mansi Autonomous Okrug (KhMAO). In addition, we used data from the literature in which it was possible to pinpoint precisely the location of nests or of individuals who exhibited nesting behaviour. All data on individuals were entered into the program *QuantumGIS*. Later these data (a layer of information on individuals, as well as layers of climate-change data) were imported into *MaxEnt*. As a result, an algorithm of maximum entropy was created by *MaxEnt*, taking into account climate changes and relief data, and a map model reflecting the probability of the presence of a species within the given territory was constructed. The map constructed in this way could be employed in the feasibility-study design of Natural Protected Territories of Russia to delineate the most valuable territories for a particular species, where studies had not been conducted or would be too difficult because of remoteness of the area. The method of maximum entropy enables delineation of the core of an area and the parts where encounters with the species are unlikely, and also the ranking, in order of importance, of the environmental factors determining the geographical distribution of the species.

MORE ON THE STELLER'S EIDER (*POLYSTICTA STELLERI*)

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After the publication of new works on the breeding biology of the Steller's Eider, carried out in the deltas of the Indigirka (1999) and Lena (2000) rivers, monitoring of the species in the Lena delta continued to the present time. These observations are summarized in the current communication. Focus is on the sythesis and interpretation of novel behaviours, in comparision with previous data. It was shown that the Lena delta is the heart of reproduction of the species, since up to 50 % of the Pacific population may breed here. The Steller's Eider is amongst the last of the waterfowl species to arrive on the delta, doing so in the first half of June. The general direction of migration is from east to west. The migration period depends on the nature of the spring, lasting from 7 to 14 days, but most eiders arrive within 1–4 days. The Steller's Eider nests over the entire territory of the delta. However, the greatest concentration is found on polygonally ridged boggy tundra up to 20–30 km from the coast. In these areas, the nesting density may reach 70 pairs/km^2, and 160 pairs/km^2 in spots. The pre-nesting period lasts 4–16 days, on average 10,6 ± 1,3 (n = 8). The date of the laying of the first egg is 10 June — 2 July, on average 18 June (n = 11), correlated with the mean temperature in the pre-nesting period: the warmer, the earlier the beginning of breeding. The general length of the period of the start of egg-laying in any given year is 10–16 days. There are 4–10 eggs in a full clutch. The biggest clutches are recorded in years with a warm spring and minimal predation pressure. We cannot support the position that there is a three-year cycle of nesting success in the Steller's Eider. Successful nesting was recorded not only in peak lemming years, but also in periods between peaks. In the four-year cycling of lemming numbers on the Lena delta in the past quarter century, the Steller's Eider nested successfully in the third year after the peak, when the abundance of its main predator — the Arctic Fox — was minimal. These observations also refute the position that nesting success in the species is possible only with the defence of the Pomarine Skua (*Stercorarius pomarinus*).

THE GREAT SIBERIAN RIVERS: MIGRATION CORRIDORS OR CUL-DE-SACS?

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The Eurasian taiga and tundra, comprised of those of Siberia and European Russia, cover millions of square kilometres where birds, especially waterfowl, can breed. This vast terrain, however, freezes over in autumn and millions, if not billions, of birds have to leave for places where they can survive to return the next spring. Some bird species typically migrate over broad fronts, but others follow more restricted pathways, which often follow major river systems, where, for instance, geese and ducks can rest and where stopover sites with abundant food can be found. In Siberia, a number of vast river systems are of importance for north-south migrations, namely the Ob, the Yenisei and the Lena.

Here are the first findings of White-fronted geese (*Anser albifrons*) that have been satellite-tracked from the Yangtze River, China, to the East Siberian tundra. The viability of the Yenisei River system as a route for migration toward the Gobi Desert, the Pamir Mountains and points farther south is discussed, as is the possibility of the Ob River system as an alternative route for the migration of geese toward Western Europe.

POPULATION DYNAMICS OF ANSERIFORMS DURING SPRING MIGRATION ON THE EVORON-TUGUR LOWLANDS (LOWER AMUR RIVER)

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During the springs of 1986, 1988, and 2014, counts of migrating birds were made from a permanent observation point in the southern Evoron-Tugur Lowlands. In the present communication, observational data on migrating waterfowl obtained each day over four hours (two hours in the morning and two in the evening) have been utilized. In these years (1986, 1988, 2014), a fixed transect of 500 m width was used, resulting in 1627, 2162, and 1213, respectively, movements of geese in various directions. The migration of geese in the study area experienced a weak decline. In differenct years, the proportion of birds in this group within the migrating waterfowl comprised from 0.05 to 3 %. The sparseness of migrating geese did not enable us to follow their population dynamics. In 2014 — 28 and 26 years after our previous observations — we noted a decline in the abundance of the Eurasian Teal *Anas crecca* (66.7 and 83.3%, respectively), Falcated Duck *A. falcata* (37.5 and 63%), Pintail *A. acuta* (95.5 and 97.6%), Garganey *A. querquedula* (96.9 and 94.7%), Northern Shoveler *A. clypeata* (83.3 and 90%), Common Goldeneye *Bucephala clangula* (0 and 85.7%), Smew *Mergus albellus* (83.3 and 96%), and Goosander *M. merganser* (80 and 85.7%). In 2014, the Mallard *A. platyrhynchos* and Eurasian Wigeon *A. penelope* maintained numbers between those of 1986 and 1988. An increase in abundance was recorded for the Baikal Teal *Anas formosa* (140 and 1750%, respectively), Mandarin Duck *Aix galericulata* (0 and 300%), and Tufted Duck *Aythya fuligula* (300 and 50%). It should be noted that the single spring period of 2014 is insufficent for the detection of a long-term trend in the abundance of migrating birds. Furthermore, the relatively small overall number of migrants characteristic for this migratory route does not allow objective confirmation of noted shifts in this route. At the same time, multiple changes in the quantity of numerous species are confirmed to a certain extent by data obtained in 1989 on the Tunguska River floodplain and in 2005 on the lower Ussuri River.

DEVELOPMENT AND IMPLEMENTATION OF A SINGLE SPECIES ACTION PLAN FOR THE NW EUROPEAN BEWICK'S SWAN (*CYGNUS COLUMBIANUS BEWICKII*) POPULATION

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The Northwest European Bewick's Swan population is of conservation concern because its numbers are in decline. There was an increase in population size during the 1960s–1990s, but a coordinated international census in January 2005 recorded a total of approximately 21,500 birds, a 27 % decrease from the peak count of 29,277 made in January 1995. The January 2010 census (which recorded approximately 18,100 birds) and national totals indicate that the decline has continued since then. A Bewick's Swan Action Planning Workshop was held in St. Petersburg in 2009, during which 27 experts from 10 range states identified major threats to the swans and developed a plan for the monitoring, research and conservation work required to halt and reverse the population decline. It was evident that no single issue could explain the decrease in numbers and that a combination of factors, such as weather and habitat changes, that affect the swans' survival and productivity should be examined in further detail. The Bewick's Swan Species Action Plan (BSSAP), which resulted from the meeting, was adopted by the African-Eurasian Waterbird Agreement (AEWA) in May 2012. The immediate aim of the BSSAP is to halt the decline and begin the recovery of the population to its 2005 level (approximately 21,500 birds), with the long-term goal of maintaining the population at its 2000 level at the very least (*i.e.* 23,000 birds). Key actions listed in the plan include maintaining key sites for the species along the flyway; assessing variation in population trends, demography and distribution; determining the influence of individual sites on population development; reducing mortality attributable to illegal shooting; and reducing other mortality risks, such as collision with infrastructure, lead poisoning and oil spills. Several initiatives for taking proactive steps identified within the BSSAP are described, both those within range states and those involving international cooperation.

TRACKING SWAN AND GOOSE MIGRATION IN RELATION TO WIND-FARM SITES

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Assessing serial development of wind farms along migration routes is important for determining their potential cumulative effect on migrating waterfowl populations, but the extent to which both offshore and onshore wind farms occur along flyways has received relatively little attention. The Wildfowl and Wetlands Trust (WWT) therefore tracked individuals from the Icelandic Whooper Swan (*Cygnus cygnus*) and Svalbard Barnacle Goose (*Branta leucopsis*) populations in 2006–2010, to determine the frequency of movement across offshore and onshore wind-farm footprints. Of 20 Whooper Swans tagged at Martin Mere (NW England) and 15 on the Ouse Washes (SE England), 39 % and 21.5 %, respectively, crossed at least three wind-farm sites during migration from Britain to Iceland. Moreover, flight lines for 81 % of 26 tagged Barnacle Geese tracked from

SW Scotland to Svalbard passed across at least one proposed or operational wind farm during migration, with 50 % of tracks crossing site(s) in Britain and 60 % crossing site(s) in Norway. More recently, location data recorded for 22 Bewick's Swans (*Cygnus columbianus bewickii*) fitted with GPS/GSM loggers in the winters of 2013–2014 (n = 8) and 2014–2015 (n = 14) have illustrated the swans' movements across wind-farm sites in NW Europe. Additionally, new information was gained on the swans' migration patterns. Although 10 of 14 individuals tracked into Russia (at the time of writing) followed the well-described migration along the Baltic coast to Estonia and across Karelia to the White Sea, four followed a more southeasterly route through Russia. Lake Ladoga proved an important staging site for several tagged birds in both autumn and spring; farther east Lake Ilmen and the Sheksna Reservoir were also used by tagged Bewick's Swans. The tracking studies not only emphasize the importance of ensuring that potential cumulative effects are taken into account during risk assessments for wind-farm development, but provide valuable information on migration routes and staging areas used along the flyway.

CENTRAL EURASIA — THE LAST *TERRA INCOGNITA* OF GOOSE RANGES

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The distributions of the majority of goose populations have been studied rather well around the globe. Questions remain above all in the region of the Yenisei zoogeographic boundary [which divides Eastern from Western Palearctic]. The widespread idea is that geese of various populations fly to wintering grounds in Europe and Eastern Asia approximately from the Yenisei River. But is this actually the case? For the past 50 years there has been practically no ringing and satellite-marking of geese flying deep into the continent, despite significant changes in their numbers. The abundance of geese wintering in China has been reduced by orders of magnitude, while their abundance on European and Central Asian wintering grounds has significantly grown. The configurations of the ranges have changed, some populations have replaced others; many unanswered questions remain. How many ***Western tundra bean***

geese (*Anser fabalis rossicus*) are on wintering grounds in Asia? While it is not yet understood where and how many of them are encountered in China, it is known that part of the subpopulation reaches there by flying across the south of Krasnoyarsk Krai. It is not known where the 40,000 Bean geese that have been appearing in autumn in Xinjiang Uyghur Autonomous Okrug in China (Ma Ming, pers. comm.) nest, nor how they fly there (only 10,000 fly across Khakassia). It is not clear whether these Bean geese overwinter on known wintering grounds in the Yangtze River basin or on unknown wintering grounds in the Huang He (Yellow River) basin or in India. It is necessary to elucidate where the small numbers of ***White-fronted geese*** (*A. albifrons*) regularly encountered in Evenkia are flying from and to. It is not understood where the boundaries between the nesting grounds of the ***Western*** and ***Eastern*** (*A. f. serrirostris*) ***tundra bean geese*** and the ***White-fronted Goose*** are on the Taimyr Peninsula. The ranges of the western populations stretch to Yakutia, but it is not known just how far. The western limit of the nesting range of the ***Eastern Tundra Bean Goose*** is not known: does it still nest on the Taimyr Peninsula, and in the basins of the Anabar and Olenyok rivers? The nesting grounds of the geese overwintering in India, Uzbekistan and other regions of Central Asia need to be ascertained. How were the wintering grounds formed in these regions, having become relatively well used only 30 years ago? We call upon goose researchers to pay attention to these last pieces of the puzzle with regard to goose ranges and to intensify their studies, including massive marking with transmitters. This will help answer important scientific questions and preserve many populations of critically endangered Asian geese.

FORMATION OF POPULATIONS OF ANSERIFORMES IN SUBARCTIC ALPINE CONDITIONS (PUTORANA PLATEAU, NORTHWESTERN SIBERIA, RUSSIA)

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The population of Anseriformes of the Putorana Plateau 1988–2013 was analyzed. Anseriformes were represented in the nesting fauna of Putorana by 23 species (16.8 %). Water level during spring, dependent on the continental climate, determines the geography of migration; the main anseriform flyway is along the fullest rivers of the western region, is significantly less intensive in the central plateau, and is virtually not seen in the east. Different vectors of change in abundance of nesting Anseriformes with elevation were identified. A decline in abundance of the Long-tailed Duck (*Clangula hyemalis*), Common Scoter (*Melanitta nigra*), and Velvet Scoter (*M. fusca*) from the subalpine zone to the forest and alpine zones suggests that their optimal habitat in the Alpine Subarctic lies in the Subalpine zone, and that Forest and Alpine zones are suboptimal. These ducks, ecologically closely tied to subarctic landscapes, in alpine conditions master the predominantly alpine analogues of these landscapes prevailing in the subalpine zone. The Common Goldeneye (*Bucephala clangula*), Merganser (*Mergus serrator*) and Goosander (*M. merganser*), although sometimes encountered on the upper plateau, are always more abundant in the Forest zone. The Eurasian Teal (*Anas crecca*), Eurasian Wigeon (*A. penelope*), Pintail (*A. acuta*), Common Goldeneye, and Goosander predominantly inhabit rivers, the Whooper Swan (*Cygnus cygnus*) and Long-tailed Duck lakes. The Bean Goose (*Anser fabalis*), Common and Velvet Scoters, and Merganser are indifferent to the type of aquatic environment, and have similar indices of abundance on both rivers and lakes. The Goldeneye and Merganser demonstrate stable abundance from year to year in different habitats. Their maximum abundance, both on lakes and on rivers, never exceeds the minimum by more than 3–16 times. The abundance of other ubiquitously distributed species fluctuates to a greater extent. The maximum abundance of the Teal is 33 and 40 times greater than the minimum (on rivers and lakes, respectively), of the Long-tailed Duck 160 and 500 times, and of the Goosander 26 and 100. The Goosander leads the waterfowl population of the Forest zone, the Long-tailed Duck and Scoters the Subalpine zone, and the Common Scoter the Alpine zone. Small post-nesting vertical (elevational-zonal) migrations of waterfowl are widespread on the Putorana Plateau. Groups of male Long-tailed ducks and Common and Velvet scoters on the moult move to lakes of the Alpine and Subalpine zones in July-August. Family groups of the Lesser White-fronted Goose (*A. erythropus*) in the pre-migration period fly from the large lakes of the Forest zone to Alpine tundra (900 m above sea level), where they feed on the shores of glacial lakes.

PERSPECTIVES ON THE PRESERVATION OF POPULATIONS OF THE GREYLAG GOOSE (*ANSER ANSER*) THROUGH CAPTIVE-REARING

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The Greylag Goose is currently experiencing a strong decline in Russia. A decrease in abundance of the species has also been noticed on its wintering grounds in China, India, Iran, Iraq, Azerbaijan and southern Kazakhstan. The majority of the southern population nests in the Manych system, on the deltas of the Volga and Don rivers, and on the plains of the Eastern Azov Sea Region. Local populations of Greylag geese in the Southern Federal District (SFD), Stavropol Kray and Dagestan, showed declines in the 1990s. The decrease in abundance of the Greylag Goose resulted not only from the disappearance of nesting habitat, but also from spring hunting, the duration of which coincided with the start of nesting. The long autumn hunt limited the entrainment of young birds into the population. The recovery of the Greylag Goose population would be possible under a complete ban on spring hunting of this species and specific measures, for example, the introduction to the wild of goslings raised in captivity. Nine young Greylag geese, marked with ECOTONE collars, were released in August-September 2014 in Rostov Oblast within sight of a flock of wild Greylag geese. By the beginning of winter, seven of the released birds had been shot, but two individuals reached wintering grounds, one in Azerbaijan (on the border with Iran) and the other in Iraq, where they overwintered successfully. The nature of their movements indicates that they migrated with and remained with a flock of wild geese. The transmitter on the bird wintering in Iraq stopped sending signals on 18 March. The first movements from the wintering grounds of the bird wintering on the border of Azerbaijan and Iran were recorded on 6 March, when there was a preliminary attempt at northern migration. However, the goose quickly returned to the south and spent about three weeks in the Lankaran Lowland. On 27 March, this bird left Azerbaijan and flew to the area of the Chogray Reservoir (Kalmyk Republic), stopping 350 km from its place of hatching. It is evident that the captive-raised geese released into the wild were able to return to their natal region, and the method of raise and release might be employed in the recovery both of the southern population of the Greylag Goose, and of other populations of this species in Russia.

INTEGRATING EXPERIENCES FROM NORTH AMERICA INTO CONSERVATION PRACTICES FOR GOOSE POPULATIONS IN WESTERN SIBERIA

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In contemporary Russia, the most effective means of implementing conservation measures is through the creation of hunting-free zones. Justifying the creation of such zones requires knowledge of the abundance and trends of goose populations and the key areas they exploit. We chose to create a model for these variables in the Yamalo-Nenets Autonomous Okrug of Western Siberia. Based on North American experiences, we used ultra-light aircraft to count waterfowl and applied GSM-GPS transmitters to determine goose migration patterns and highlight the key sites exploited in these areas of migration. In the spring and autumn of 2012 through 2014, we conducted more than 50,000 km of aerial-survey transect flights to count 24 species of waterfowl and confirm these numbers by photography. We estimated population abundance for each species, accounting for differential densities in 16 selected habitat types, classified from Landsat imagery. By extrapolation, we determined the total number of counted birds for each species in each selected habitat type, calculated the mean density within each habitat type in the survey area and from this determined the estimated number in the entire study area. Using anonymous questionnaires, we were able to make preliminary assessments of the size of the hunting bag and the extent of illegal shooting. The results indicated declines in many hunted species. Based on these data, we recommended the creation of 10 hunting-free zones, defined their boundaries, and recommended amendments to the existing hunting regulations. GIS layers were compiled to show the routes of the aerial surveys, the boundaries of key sites, the main migration routes, the distribution of detected birds along each transect and the locations of rare species. These techniques offer a vital basis for longer term continued monitoring and development of a system to support the wise use of goose populations in the region and can be used in other regions of Russia.

MONITORING OF GOOSE POPULATIONS OF THE NORTHERN KAZAKHSTAN MIGRATION STOPOVER

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The results of autumn goose counts on the North-Kazakhstan staging area are presented. This unique area is the single place where we can estimate the status of goose populations, because the geese concentrate in huge numbers on a small area of lakes. Analysis of the results of autumn goose counts in Northern Kazakhstan for the period 1996–2014 proved that the entire Red-Breasted Goose (*Branta ruficollis*) and Lesser White-fronted Goose (*Anser erythropus*) populations, as well as the majority of the Eastern European White-fronted Goose (*A. albifrons*) population and the Eastern European subspecies of the Greylag Goose (*A. anser*), use this area. During the course of different projects undertaken since the 1990s, key areas for the geese were determined. We outline and discuss the deficiencies of the former methods of counting and describe our current method of monitoring, in which a combination of questionnaires and analysis of data from birds marked with transmitters was used to determine the optimal dates and locations for field counts. Since 2008, we have used photography for the estimation of species and age ratios in goose flocks. We give proof that this method is more precise than that of visual estimation. Combining these methods enabled us to find previously unknown key stopover sites for the Red-Breasted and the Lesser White-fronted Goose and to expand the study area. The main result was the detection in Northern Kazakhstan and in the Orenburg and Omsk districts of Russia of 10 major stopover sites, on which we should concentrate conservation and monitoring efforts. Since the territory of the study region is characterized by great variability, owing to the unstable hydrological regime of the lakes of the steppes, a complex of criteria was used to identify these key locations. This experience could be extended to other stopover sites on the steppes for other flyways.

WINTERING AND MIGRATION OF WATERFOWL ON THE SEA OF AZOV

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The study of Anseriformes in winter was carried out by the coastal and marine expedition of the Murmansk Marine Biological Institute of the Kola Scientific Centre and the Institute of Arid Zones of the Southern Science Centre of the Russian Academy of Sciences during the winters of 2000–2014 on the Research Vessel *Professor Panov* in the absence of ice conditions and by the icebreaker *Kapitan Demidov* when the Sea of Azov was frozen, as well as a decade of observations on the Taganrog Bay coast (northeastern Sea of Azov) from 2003 to 2014. Shipboard surveys of birds were conducted along transects, coastal ones by linear transects and point counts. The studies encompassed the marine area and the coast of Taganrog Bay, and the coastal territories and estuaries of the Taman Peninsula at the entrance to the Black Sea. During the migratory period, a significant number of waterfowl and waterbirds are concentrated here, and these are becoming vulnerable owing to human activities. Most numerous are the Common Pochard (*Aythya ferina*) and Greater Scaup (*A. marila*). The Common Goldeneye (*Bucephala clangula*) and Smew (*Mergus albellus*) are also common in winter, the latter sometimes even numerous. The Greylag Goose (*Anser anser*), Tufted Duck (*Aythya fuligula*), and Goosander (*Mergus merganser*) are few in number. The Whooper Swan (*Cygnus cygnus*), Garganey (*Anas querquedula*), and Northern Shoveler (*A. clypeata*) are rare, the Gadwall (*A. strepera*) very rare. Every year 10–15 Mute swans (*C. olor*) are seen mixed in with other species in the Kerch Strait. Mallards (*A. platyrhynchos*) are only seen in ice-free areas. When the Sea of Azov is completely frozen in winter, the waterfowl keep to the leads formed by passing ships, but the majority of the birds are concentrated in ice-free waters. Here some birds have been noted moving between polynyas. The majority of Anseriformes form huge flocks in the Black Sea, Kerch Strait and lead-in to the strait. During warm winters, waterfowl remain on the wintering grounds of Taganrog Bay and the Sea of Azov, forming monospecific (Smew) and mixed (Common Merganser, Smew, *Aythya* species, and Common Goldeneye) flocks of thousands of individuals.

EAST ASIAN MIGRATION ROUTES OF THE SPOT-BILLED DUCK (*ANAS POECILORHYNCHA*) TRACKED USING THE WT-200

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The Spot-billed Duck is a common resident and abundant winter visitor in South Korea. The duck's major breeding area is in Eastern China and Russia. The Spot-billed Duck migrates in the spring and autumn. For tracking Spot-billed ducks, the WT-200 (GPS mobile-phone-based telemetry), was used. When attached to wild animals the device will record GPS coordinates at a predetermined time interval and transmit geographic coordinates at a set time of the day using the public network of the mobile-phone system. Researchers can acquire individual tracking-location data at a web site. We captured the ducks using cannon-nets on two different wintering grounds, and attached the WT-200 to 7 Spot-billed ducks in the winter of 2013–2014. We studied their migration routes, distribution of stopover and breeding areas, and timing of migration movements. The ducks departed Korea individually, with the first data log for departure recorded on 8 April and the last on 22 May. The marked Spot-billed ducks arrived individually on the breeding grounds, from May 9 to June 7. The ducks spent on average 17.5 days (SD = 8.2, n = 6) on migration. The mean total migrated distance was 1,007 km (SD = 270.3, n = 6). The maximum distance was 1,426 km and the minimum distance was 622 km. The mean daily migration distance was 276 km (SD = 125.9, n = 6), and the maximum was 817 km. The ducks used several stopover areas (SD = 7.6, n = 6), and they stayed for 12.5 days (SD = 7.6, n = 6) on average. The breeding areas were in northeastern China and in the estuary of the Aprok River in North Korea.

THE CONSERVATION OF WATERFOWL SPECIES OF THE ERKUTA RIVER (SOUTHWESTERN YAMAL PENINSULA)

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We have studied the population of birds in the Erkuta River valley on the southwestern Yamal Peninsula since 1999. Several species of waterfowl that are in the Red Book at different levels are encountered here. The first nest here of the Red-breasted Goose (*Branta ruficollis*) was found in 2001. At the present time, we know of three colonies, in which we have counted from 1 to 5 breeding pairs in different years. At least one of the colonies is occupied each year. In our region, known colonies are located exclusively inside occupied territories of nesting peregrine falcons (*Falco peregrinus*). In 2014 the first nest was found on flat, boggy tundra 2.5 km from the nearest peregrine nest. Judging by the published data, the Erkuta basin is the southwesternmost point of the regular nesting range of the Red-breasted Goose. This species is common during autumn migration and often makes a stopover in the river basin. The first nest here of the Lesser White-fronted Goose (*Anser erythropus*) was found in 2006. Nearly every year broods are encountered on the river. The Bewick's Swan (*Cygnus bewickii*) is abundant here. Every year it breeds successfully; up to several hundred are counted in moulting flocks. The Velvet Scoter (*Melanitta fusca*) is rare, but is presumed to nest here each year. There has been a single encounter of a brood on the river.

SUMMER MIGRATION OF GEESE ON THE NORTHERN YAMAL PENINSULA

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In the course of a focused search of data on summer "migration" of geese on the Yamal published in the scientific literature, we encountered references to these only in the records of V. Slodkevich *et al*. from the area of the Mordyyakha River in 2006. We had recorded the direction of movement of numerous goose flocks in 1992 on the Mordyyakha River (70°20´ N), in 2006 on the Naduy River (70°60´ N), and in 2014 on the Sabetta River (71°20´ N). In all observed places in all years, the geese flew ′round-the-clock during the first ten days of July in a northeasterly direction in flocks of two to 200 birds, at an altitude 2–200 m. The goose flocks flew with breaks from 5 minutes to several hours. The vast majority of birds in the flocks were Greater White-fronted Geese (*Anser albifrons*). However, on the Sabetta, in photographs taken with the aid of a telephoto lens, we noticed Bean Geese (*A. fabalis*) as well. We suggest that each year, at the beginning of July, in latitudes from Mordyyakha to Kharasaveyi, at the very least several tens of thousands of geese, the majority of which are white-fronts, cross the Yamal Peninsula from west to east. Most likely, the above described is the migration of geese from the European part of Northern Eurasia to the moulting ground on the Gydan and Taimyr peninsulas. This is in agreement with our observations on the Naduy, with migrating geese who left the study area, as well as the presence of numerous non-breeding geese until the start of migration. Our observations confirm, too, the data of satellite telemetry of other researchers, which have been published with open access on the World Wide Web. It seems to us important to specify the latitudinal boundaries of the summer migration corridor of geese on the Yamal Peninsula and the goose species diversity, but also to intensively follow this flight in different years.

DYNAMICS OF SPECIES RICHNESS OF ANATIDAE IN THE RUSSIAN ARCTIC

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Global warming is particularly pronounced in the Arctic. How this change is impacting the diversity of birds there is not yet sufficiently understood. We used 156 datasets on 38 species of swans, geese and ducks recorded from 1999 through 2014 from the database of the Arctic Birds Breeding Conditions Survey to study changes in the number of anatid species in the Russian Arctic. A warming trend in this period was marginally significant for May, but not significant for June across both Typical and Southern Tundra subzones. The best statistical model of the species richness of Anatidae contained two explanatory variables, mean monthly temperature for May and tundra subzone, and the interaction between them. The effect of this interaction on Anatidae richness manifests itself as a decrease in species with increasing temperature in the Southern Tundra subzone and an increase in species in the Typical Tundra subzone. Similarly, species richness significantly decreased with time in the Southern Tundra subzone and increased in the Typical Tundra one. However, the fit to the data of models with time rather than temperature was less close, indicating that the temporal trend in Anatidae richness was explained by the trend in temperature, that is, by the increase in spring warming. Increased spring temperatures apparently resulted in increased frequency of visits to the Typical Tundra subzone by species from southern regions. The concurrent decrease in species richness in the Southern Tundra subzone is more difficult to explain; the species lost from here were not the same ones gained by the Typical Tundra subzone. Richness of breeding species generally varied with environmental factors in a manner similar to that of total species. However, while total species richness had similar means in Southern and Typical Tundra, and varied more greatly with temperature in the latter, mean breeding species richness was significantly higher in the Southern Tundra subzone compared with the Typical Tundra subzone, and varied with temperature to a similar degree in the two subzones. These differences probably mean that "southern" species of Anatidae are visiting the more northerly Typical Tundra subzone, but not breeding there, owing to the additional constraints placed on the birds by the different environmental conditions encountered there.

NESTING RANGE AND ABUNDANCE OF THE SCALY-SIDED MERGANSER (*MERGUS SQUAMATUS*)

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Large-scale spring surveys of pairs of the Scaly-sided Merganser were carried out from 2000 through 2012 in all areas of the supposed nesting range of the species in Russia and China. On the whole, the current nesting range is represented by five isolated enclaves, amongst which the main focal points are the Sikhote-Alin Range in the Russian Federation and the Changbai Range on the border of China and North Korea (84.9 % and 13.9 %, respectively, of the world population). The southern border on the Sikhote-Alin Range extends along the Partisan River and the upper Ussuri River; the northern border on the eastern and western slopes of the catchment basins of the Koppi and Gur rivers, respectively, which together contain 92 rivers. Two isolated enclaves exist on the left bank of the Amur: on all three rivers of the Jewish Autonomous Oblast' and on the Gorin River of Khabarovsk region. In China the species nests on the entire Changbai Range and in isolated enclaves on the Bishui River in the Lesser Hingan Range. It is supposed that this species also nests in the eastern part of the Changbai Range, in North Korea, but this was not included in the survey. According to the literature, the nesting range extends to the right tributaries of the Zeya River, but this is recognized as an error; it is shown that the Scaly-sided Merganser has never inhabited areas so far to the west. The global population of the Scaly-sided Merganser was estimated at 1937 pairs, or 4660 individuals in the spring before commencement of the breeding season. Of these, 1651 pairs nested in Russia, 165 in China, and an estimated 115 in north Korea. The largest nesting population — an estimated 1640 pairs — is in the Sikhote-Alin Range. There was no difference between the mean nesting densities in

Russia (0.259/km^2) and China (0.269/km^2). The greatest known densities were 0.918/km^2 on the Fuerkhe River in the Changbai, and 0.63/km^2 on the Pavlovka River in Sikhote-Alin.

THE ANSERIFORM FAUNA IN THE ENVIRONS OF MALIYE KARMAKULY (SOUTHERN ISLAND, NOVAYA ZEMLYA)

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Southern [Yuzhnyi] Island of the Novaya Zemlya Archipelago is one of the well-known locations of nesting and moulting anseriforms. However, investigation in this area has been fragmentary. We conducted a transect count of birds in the environs of the polar station Maliye Karmakuly [Little Karmakuly] (72°22´ N, 52°43´ E) in the period from 17 June to 11 August 2015. The area of the studied territory was 50.5 km^2, of which 10 km^2 was water (3.7 km^2 fresh water and 6.3 km^2 marine waters). During the study, nine species of Anseriformes were noted: the Bewick's Swan (*Cygnus bewickii*), Barnacle Goose (*Branta leucopsis*), Bean Goose (*Anser fabalis)*, White-fronted Goose (*A. albifrons*), Common Eider (*Somateria mollissima*), King Eider (*S. spectabilis*), Long-tailed Duck (*Clangula hyemalis*), Harlequin Duck (*Histrionicus histrionicus*), and Goosander (*Mergus merganser*). The dominant species was the Barnacle Goose, which numbered 910 individuals in the study area. This species was encountered on all large lakes and on the majority of small water bodies, as well as in the sea near river mouths or in locations with gently sloping shores. Multiple times flocks of feeding geese were noted at a distance from water bodies. The majority of *Anser* geese were noted on large water bodies and in the sea, which made identification difficult. Of 700 members of the genus *Anser*, 212 were identified (202 Bean geese, 10 White-fronted geese). The Tundra Swan kept to groups of 2–4, which were on identifiable territories for two to three days, after which they moved to a new feeding site. The birds used paths of travel that coincided with the lowland relief. Altogether there were about 10 individuals. During the study, 244 members of the genus *Somateria* were encountered, of which 88 were Common eiders, seven were King eiders, and 149 were not identified to species. The Long-tailed Duck was encountered rather rarely; primarily males (15) were sighted, and a single female with a brood. A single male Harlequin Duck was encountered on 17 and 18 July. There were multiple encounters with the Common Merganser, both on lakes and on the sea coasts; in total 16 individuals were sighted.

EAST ASIAN SPRING MIGRATION OF THE WHITE-FRONTED GOOSE (*ANSER ALBIFRONS*) TRACKED USING THE WT-200

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The main breeding areas of the White-fronted Goose are in Russia. In winter, they are among the dominant species of geese in South Korea and inhabit a large lake located on its western coast. South Korea is an important wintering ground for the White-fronted Goose. For tracking these birds, the WT-200 (GPS mobile-phone-based telemetry) was used. This new telemetry device combines GPS (Global Positioning System) with the WCDMA (World Code Division Multiple Access) mobile-phone system. We studied the migration routes, distribution of stopover and breeding sites, and timing of White-fronted goose migration. We captured the geese using cannon-nets, and attached the WT-200 in the winter of 2014–2015. The marked geese did not all depart their wintering grounds in Korea at the same time. The first data-log departure was recorded on March 15 and the last on March 25. The geese used several stopover sites, in North Korea and in the interior of the Russian Far East.

ANSERIFORMES OF THE NAKHCHIVAN AUTONOMOUS REPUBLIC, AZERBAIJAN

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The Nakhchivan Autonomous Republic is largely comprised of mountainous terrain and has an extremely continental climate. Formerly, the absence of extensive water bodies limited the attraction of this region for waterbirds, Anseriformes among them. However, in the Soviet period a great number of water reservoirs were constructed in the republic and construction works are in progress to this day. As a result, the abundance and diversity of waterbirds has noticeably increased in the republic. Our studies were carried out both in winter and in the breeding period, from 2004 through 2015. Included in our surveys were the Aras Reservoir (the largest reservoir in Nakhchivan), the Arpachay, Gyumyushli, and Negram reservoirs and their environs, as well as the wetlands in the vicinity of Sadarak and Lake Batabatskoye in the mountainous part of the republic. A total of 19 Anseriform species was recorded. Twelve species (63 %) overwinter in the region (*Anser albifrons, A. erythropus, Cygnus cygnus, Tadorna tadorna, Anas strepera, A. crecca, A. acuta, A. clypeata, Aythya ferina, A. fuligula, Oxyura leucocephala*, and *Mergus albellus*), two are seen only on migration (*Anas penelope* and *A. querquedula*), and two are rare (*Tadorna ferruginea* and *A. plathyrhynchos*). Three species (*Anser anser, Anas angustirostris,* and *Aythya nyroca*) nest in the region. Three species are on IUCN Red List (*Anser erythropus, Anas angustirostris,* and *Oxyura leucocephala*), five species are listed in the Red Data Book of Azerbaijan, and six in the Red Data Book of Nakhchivan Autonomous Republic. Anseriformes usually make up 70 to 90 % (and even more sometimes) of all waterbirds wintering in the region. They comprise a much smaller proportion of the nesting waterbirds.

THE WINTERING GROUND OF THE LESSER WHITE-FRONTED GOOSE (*ANSER ERYTHROPUS*) IN THE ARAS RIVER VALLEY, NAKHCHIVAN, AZERBAIJAN

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The study was carried out 20–24 January 2015. The Aras Reservoir (Aras Hydroworks) was built in 1972 10 km to the south-southwest of Nakhchivan, at an elevation of 777 m asl. It is 14,500 ha in area. Some 100–500 m from the reservoir lie winter pastures and fields surrounded by woods. The Aras Reservoir has the status State Nature Refuge and was placed on the list of potential Key Territories of Azerbaijan by the Azerbaijan Ornithological Society. Surveys began at sunrise and continued during the cool part of the day, ending from 11:00 to 13:00. The surveys were not conducted later in the day, owing to heat shimmer and the unfavourable direction of illumination. On the expansion of the Aras River in Sadarak District, 11 Lesser white-fronted geese were noted in a flock of 233 geese, of which the majority were White-fronted geese (*Anser albifrons*). On 21 January, two groups, numbering 162 and 400 geese, were found in the littoral zone of the reservoir, a little higher than its dam. Both groups included both Greater and Lesser white-fronted geese. Calculation of the number of geese in the smaller flock and subsequent analysis of photographs showed that 80 % of these birds were Lesser white-fronted geese. The second mixed group of Greater and Lesser white-fronted geese was noted across from the village of Karachug. On average (of three successive counts) there were 470–480 Greater white-fronted geese in this flock and 30–32 Lesser white fronts (6.5 %). The most populous species in the vicinity of Sadarak were, first of all, the Greylag Goose (*A. anser*), and then the Greater white-fronted goose. There were substantial numbers of mallards *(Anas platyrhynchos)* and Ruddy shelducks *(Tadorna ferruginea)*. There was a rather significant diversity of shorebirds (10 species), including the White-tailed Lapwing (*Chettusia leucuara)*. In the shallow waters of the Aras Reservoir, ducks of the genus Anas, above all the Mallard and the Eurasian Teal (*A. crecca*), were the most numerous wintering species. In second place were the Ruddy Shelduck and large white-headed gulls *(Larus spp.)*. At the same time, the number of shorebird species (6) and individuals was lower. Thus, on the Aras Reservoir, on the Azerbaijan side alone (Iran is on the other side), more than 25,000 waterfowl and waterbirds — 3846 in the Sadarak area — overwinter. Based on these data, the Aras Reservoir might be included in the list of Ramsar sites.

TRENDS OF GOOSE POPULATIONS BREEDING IN SIBERIA AND THE RUSSIAN FAR EAST IN CONNECTION WITH CHANGES ON WINTERING GROUNDS

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During the last 50 years, the distribution of geese wintering in East Asia changed radically and their numbers dropped drastically. Following catastrophic declines in population numbers, Eastern Palearctic goose populations were left with contracted and fragmented breeding ranges; a significant part of their territory on the Taimyr Peninsula and in western Yakutia "taken over" by geese from Western Palearctic populations. However, the nadir in abundance likely has passed; some groups of geese have begun to slowly increase in abundance, although population levels overall are very low in comparison with those in the mid-twentieth century. Many local groups of geese in Asia have disappeared or are nearly extinct. The increase in population is mainly due to expansion of birds from safer wintering grounds. Numbers are far from historic optima.

During the twentieth century, East Asian goose populations reached their lowest numbers at different times, beginning with those in Japan. Geese almost disappeared from Japan in the 1970s, but returned in the 1980s and 1990s, following cessation of hunting and implementation of serious measures of protection. In Korea, after later, similar measures, goose numbers began to increase over the past decade. Currently, geese are in the most difficult position in China, the former location of most geese overwintering in East Asia. Only a few small protected areas in the Yangtze River basin still have many overwintering geese; elsewhere they are disappearing.

Changes in goose numbers on Asian wintering grounds are impacting those on Russian breeding grounds. Currently, the West Yakutia-Chinese group of the ***Eastern Tundra Bean Goose*** (*Anser fabalis serrirostris*) is at low levels and the Kamchatka-Japanese group is decreasing. Only the Korean-Okhotsk Sea-Kolyma group is increasing. The ***Taiga Bean Goose*** (*A. f. middendorffi*) has disappeared from many former breeding sites and most of those still existing continue to decrease in numbers; the species range has become strongly fragmented. The Taiga populations of the ***White-fronted Goose*** (*A. albifrons*) of the Sea of Okhotsk and Eastern Yakutia are small and vulnerable, and the Tundra Yakutia-Chinese population continues to decline. However, the East Chukotka-Kamchatka-Japanese population is increasing; its growth is limited only by wintering-habitat capacity. Concentrations of the species in Korea have begun to increase. The population trend of the ***Lesser White-fronted Goose*** (*A. erythropus*) is known only for the Kyttyk Peninsula (Chukotka) group, and it is decreasing; its range is much fragmented. The breeding grounds of ***Asian Black Brant*** (*Branta bernicla nigricans*) overwintering in Japan and migrating across the Sea of Okhotsk remain unknown. The status of those overwintering on the Yellow Sea is not clear; they may well be nearly extinct. The northern limit of the range of the main population of the ***Swan Goose*** (*A. cygnoides*) is fluctuating under the influence of climatic and anthropogenic factors. The Amur-Korean population is near extinction, as are some groups of the ***Greylag Goose*** (*A. anser rubrirostris*) still existing in southern Siberia.

CURRENT STATUS OF THE WATERFOWL RESOURCES ON THE TOBOL-ISHIM FOREST-STEPPE

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The Tobol-Ishim forest-steppe interfluve, full of lakes and swamps, is a region of profuse nesting of waterbirds, and through which passes one of the largest migratory flyways of these birds. For the territory itself, the periodic cycles of the lake levels, accompanied by flooding and drying out, have a length of 20–50 years. In the second half of the twentieth century, the minimum level of high water in the lakes was observed in the mid-1980s. In the following 20 years, against a background of an increased water level, the numbers of nesting anseriforms, contrary to expectation, did not increase, but remained at approximately the same levels. In that period in the region a new nesting species appeared, the Red-crested Pochard (*Netta rufina*), and the Velvet Scoter (*Melanitta fusca*) ceased nesting; these changes, in all likelihood, were related to climate change. In the mid-2000s, with the development of the lake-drying phase of the hydrological cycle, there was a sharp drop in the numbers of nesting ducks. The quantity of the most abundant species — the Mallard (*Anas platyrhynchos*), Garganey (*A. querquedula*), and Common Pochard (*Aythya ferina*) — was reduced by 66–80 %; the abundance of the Greylag Goose (*Anser anser*) was reduced to the same extent. However, the abundance of swans — the Mute (*Cygnus olor*) and the Whooper (*C. cygnus*) — remained stable, and even grew. One of the reasons for the decline in the number of ducks was the widespread breeding of planktivorous fish (coregonids) and bottom-feeders (carp), which led to a depletion of the biomass of plankton and benthos. An increase of fish production in lakes of the forest-steppe in the past two decades caused significant growth in the numbers of piscivorous birds: the Steppe or Baraba Gull (*Larus barabensis*) and the Great Black Cormorant (*Phalacrocorax carbo*). Fishermen, faced with the problem of driving these birds off their water bodies, shoot them on unprotected lakes, and on protected ones (and in reserves) scare them away with a variety of noisemakers. These measures have led to the disappearance of traditional resting spots for migrating geese: the White-fronted Goose (*Anser albifrons*), Lesser White-fronted Goose (*A. erythropus*), and the Red-breasted Goose (*Branta ruficollis*); a reduction in the area of cereals near large *Phragmites* lakes also contributes to this. As a result, in autumn the geese with increasing frequency pass through the steppe-forest zone in transit, and stop for rest only in Kazakhstan.

THE IMPACT OF SPRING HUNTING ON THE WATERFOWL IN THE SOUTHEAST OF WESTERN SIBERIA

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At the beginning of the twenty-first century, a significant decline in the abundance of waterfowl was noted in many regions of Russia. This decline was an order of magnitude greater in the southeast of Western Siberia (Tomsk region), according to our investigations. One of the most important factors acting on the abundance of waterfowl was hunting. In connection with this, we posed the current question as to just how much of an impact it has on waterfowl numbers. The work was based on the results of an inspection of trophies of hunters, analysis of hunting licences, and field counts in Tomsk Oblast. A comparison of the species composition of waterfowl in hunter bags (n = 283) and seen in flight (n = 8986) in the springs of 2008 through 2011 identified sure differences for the majority of species. The proportions of mallards (*Anas platyrhynchos*) and Eurasian teals (*A. crecca*) amongst the hunter-killed birds (10.6 and 32.9 %, respectively) were significantly higher than those in flight (2.9 and 15.5 %). This is primarily connected to hunting on the nesting grounds of the ducks, and not to flight groupings. Furthermore, despite the ban on the taking of females in the spring, their proportion in the bag was 6.4 % on average, and up to 11.1 % for individual species. In 2002, on the floodplain of the upper Ob', a known stopover for waterfowl, a tenfold blip in flight intensity at the opening of the hunting season was noted. This correlated with the number of shooters. As a result, the majority of birds spent less time at the stopover before continuing their migration. Over the course of 10 years of flight observations, there was a decreasing trend in males in the majority of species of ducks, a drop from 1.6–1.8 to 1.0–1.3 males per female, evidently as a consequence of the prolonged spring hunt over the course of many years. Analysis of the licences given to hunters in Tomsk Oblast' in spring 2009 (n = 1236) showed that despite the lengthening of the official hunting season (to 26 days), individual hunters (79 %) did not hunt for more than 4–5 days, the majority on only two. Thus, in practice the long spring hunt in the study area was not only inappropriate from the position of environmental management, but it was not supported by the local hunters.

MIGRATION AND POPULATION OF THE GREATER WHITE-FRONTED GOOSE (*ANSER ALBIFRONS*) IN JAPAN

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The Greater White-fronted Goose is an increasingly abundant species in Japan and is well monitored on its wintering grounds on the main island of Japan. In spring 2015, coordinated counts were initiated at its stopover sites in Hokkaido, the northern island of Japan. Fewer geese were counted here than on the wintering grounds, which suggests that some proportion of the geese may be migrating directly from the main island to the continent. Such a direct route was not apparent in the 1990s, when the entire overwintering population was observed at a single stopover site (Miyajimanuma) on Hokkaido. The population status and the recent changes in distribution and migratory behaviour are discussed based on the available data. We also present preliminary results of attempts to monitor the geese using Unmanned Aerial Vehicles (UAVs or drones) for remote roosts, where visual counts are difficult.

THE EVROS DELTA (GREECE): THE NEW PLACE TO BE FOR THE BEWICK'S SWAN (*CYGNUS BEWICKII*)

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The numbers of Bewick's swans (*Cygnus bewickii*) overwintering traditionally along the North Sea shore has shown a decrease from 29,000 in 1995 to 18,000 in 2010. This alarming and continuous trend remains largely unexplained. Before 1997, only eight records (21 individuals in total) of the Bewick's Swan were listed for Greece. Since then, the species has been recorded every winter in Evros Delta National Park, on the Mediterranean (Aegean) Sea. This flock has regularly increased in number, reaching as many as 4200 individuals in February 2015. The Bewick's Swan overwinters in the Evros Delta with large numbers of the Whooper Swan (*C. cygnus*) and the Mute Swan (*C. olor*). The total combined winter population of swans may exceed 10,000 individuals. More recently, several hundred Bewick's swans were observed in Kerkini Lake National Park, in the Rhodope Mountains, 250 km west of the Evros Delta. What is the source of the Bewick's Swans overwintering in Greece? Do they belong to the North Sea population? Are we observing a shift from the North Sea to the Mediterranean Sea? Three visual sightings in Greece of individuals marked in the Pechora Delta, Russia (one individual) and in the Netherlands (two individuals) could support this possibility. On the other hand, the Bewick's Swan has also in recent years been encountered frequently along the Ob River in autumn, on southward migration. Were they heading for southeastern Europe?

CHANGES IN WATERFOWL ABUNDANCE AT A FLYWAY "BOTTLENECK": INDICATOR OF STATUS IN THE ENTIRE MIGRATORY RANGE

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Aggregate data obtained in the period 1995–2014 on two key flyways in the regions of the Sulak (1080 ha) and Turali (250 ha) lagoons of Dagestan (western coast of the Middle Caspian Sea). The lagoons are located in a narrow migratory corridor, a "bottle neck", through which passes the largest flyway of Trans-Palearctic migrants in Russia included in the Western Siberian-East African migratory range. Long-term observations from a single location on the flight paths was used in evaluating the status of populations of migrating Anseriformes and the complex of reasons causing the long-term fluctuations in their numbers. During the 19-year period of monitoring, 750 counts — 3078 hours of survey time — were conducted over a total distance of 4515 km. A year-'round survey of waterfowl was conducted during daylight hours on standard transect lengths of 5 to 14 km. The surveys were carried out three to six times per month. The territories of regular monitoring covered 40-80 % of the areas of the lagoons, the marine coast and a contiguous band of dry land from the continental part of the bay to the front ranges of the Eastern Caucasus. Of the 31 waterfowl species recorded in the lagoons, 18 were identified as sample species. On the basis of an original method, and data of the Bird Ringing Centre of Russia, maps of the migration routes of 14 species were constructed. The periods of seasonal migration and of winter sojourn of Anseriformes in the study area were defined. The abundance of the sample group of Anseriformes during the 19-year period was determined according to the number of recorded individuals. Of the 18 studied species, numbers decreased in 15 and increased or remained the same in three. Analysis of the data suggests that the current status of the population of Anseriformes is the result of the integrated impacts of five regulating factors: 1) *hydrologic and climate regime* (changes in the boundaries of the migratory range depending on the phase of the water and climate cycles); 2) *anthropogenic factors* (redistribution of the birds within their range depending on the destruction of natural landscapes and hunting pressure; 3) *food* (depression of food capacity of the Caspian Sea under the impact of the ctenophore *Mnemiopsis*); 4) *synurbization* (the growth of populations of freshwater-loving species on account of their adapting to anthropogenic landscapes); and 5) *weather* (redistribution of birds within their range depending on the weather conditions of the given year). The data form the basis for the development of a unified strategy for the conservation of Eurasian waterfowl.

SPRING MIGRATION OF GEESE AND THE WHOOPER SWAN ON THE ONEGA PENINSULA (NW RUSSIA) IN 2014

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Monitoring of the spring migration of geese and the Whooper Swan (*Cygnus cygnus*) was conducted in the National Park "Onezhskoe Pomorye" on the Onega Peninsula in the area of Pertominsk settlement and Letnyaya Zolotitsa village (Arkhangelsk Oblast) from April through June 2014. The Barnacle Goose (*Branta leucopsis*) and the Brent Goose (*B. bernicla*) were numerous, the Bean Goose (*Anser fabalis*) and the Whooper Swan were common. The White-fronted Goose (*A. albifrons*) was rare in the area of the observations; the species probably migrates across the Onega Peninsula farther to the south, in the area of Ukhta Bay. Isolated instances of sightings of the Greylag Goose (*A. anser*) were noted. Asynchronous migration of the Barnacle Goose and the Whooper Swan on the northwestern (Letnyaya Zolotitsa Bay) and eastern (Unskaya Bay) parts of the Onega Peninsula were noted. Peak migration of the Barnacle Goose in Unskaya Bay was recorded from May 16 to 20 and in Letnyaya Zolotitsa Bay May 20–21. Peak migration of the Whooper Swan in Unskaya Bay was recorded from May 20 to 23 and in Letnyaya Zolotitsa Bay during the first half of June. It is likely that several migration routes cross Unskaya Bay, an area of goose concentration during the migration period.

IMPACT OF METEOROLOGICAL AND CLIMATIC FACTORS ON THE PHENOLOGY OF SPRING MIGRATION OF WATERFOWL IN NORTHERN MOSCOW REGION

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In northern Moscow Region, climate change during spring in the past several decades has expressed itself in a shifting of the date of the sus-

tained change of mean surface temperature through the freezing point; an earlier disappearance of snow; and an increasing mean monthly temperature. In many ways, this determined the change in the flood regime of the river (timing, during, and intensity of flooding), which cannot help but affect the phenology and course of waterfowl migration. An offset in migration date, as determined by comparison of the first observation of a given species in spring in mid-twentieth century with that at the end of the twentieth century, was expressed, mostly strongly, for all 11 waterfowl species observed, although these differences were less obvious when compared with more recent data (1996–2014) (Table). The timing of the appearance of the first birds in northern Moscow Region was significantly correlated with local weather conditions, above all the timing of the disappearance of snow, and did not depend on climatic characteristics evaluating the trend of weather changes on a broader scale (indices for the North Atlantic Oscillation (NAO) and the East Atlantic/Western Russia (EA/WR)). Climatic indices usually paint the mean monthly picture in broad strokes, while migration — a dynamic process — is often determined by a specific situation in a specific period.

Table

Dates of the spring arrival of waterfowl and their connection with the weather in northern Moscow Region

Species	Date of earliest record			Spearman's rank correlation, Rs $p < 0.05$			
	1940–1970*	1984–1998	1996–2014	March mean temperature (°C)	April mean temperature (°C)	Date of snow disappearance	Date of transition of mean temperature to >0°C
Anser albifrons	8.4	1.4	8.4		−0.39	0.48	
A. fabalis	11.4	2.4	7.4			0.53	
Anas querquedula	15.4	5.4	12.4				
A. clypeata	17.4	8.4	17.4				
A. penelope	15.4	5.4	10.4		−0.43	0.49	
A. platyrhynchos	4.4	2.4	8.4		−0.44	0.42	
A. acuta	7.4	6.4	12.4	−0.37		0.54	0.43
A. crecca	11.4	6.4	10.4			0.41	0.39
Aythya fuligula	18.4	10.4	10.4			0.52	0.44
A. ferina	21.4	8.4	12.4			0.45	

* After Dolgoshov, 1941, 1947; Parovschikov, 1941; Ptushenko, Inozemtsev, 1968.

CLASSIFICATION OF BREEDING RANGES OF ANSERIFORMES IN NORTHERN EURASIA

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In comparison with earlier published taxonomic lists of species of the Order Anseriformes of Northern Eurasia (within the confines of the former USSR), in recent years several changes have taken place. The Tundra Swan (*Cygnus columbianus*) is regarded as a Holarctic species; the delineation of the Eurasian form *bewickii* as a separate species has not been supported by molecular-genetic data. Now new species on the list for this territory include the Cotton Pygmy-goose or Cotton Shining-teal (*Nettapus coromandelianus*). Currently, the species list of Order Anseriformes in Northern Eurasia includes 70 species. Their nesting ranges are of four types, with a single species in each of three of these biogeographical regions: Notogean-Palaeogean (*Nettapus coromandelianus*), Palaeogean (*Anas poecilorhyncha*) and Palaearctic-Palaeogean (*A. zonorhyncha*). The remaining 67 species have an Arctogean range. Of these, 31 species are Palaearctic, 15 are Holarctic and Nearctic, three are North Pacific (*Somateria fischeri*, *Philacte canagica*, *Melanitta americana*), two are North Atlantic (*Branta leucopsis*, *Anser brachyrhynchus*), and one is Amphiholarctic (*Histrionicus histrionicus*). Of the Nearctic species, two are Western Nearctic (*Branta hutchinsii*, *Aythya valisineria*) and 13 Translongitudinal-Nearctic. The Palaearctic species include 11 Translongitudinal species, nine Eastern Palaearctic, six Central Palaearctic, and five Western Palaearctic. The majority of Eastern, compared to Western, Palaearctic species are evidently connected with the configuation of the boundaries of the former U.S.S.R. (much more southern in the east than in the west). This agrees with the landscape-zone affiliations of 67 Arctogean species; most are Subboreal (13), Sub-Arctic (11), Boreal (10), Temperate (10), Arctic (9), Hemiarctic (4), and Subarctic-Temperate (4). Of the nine Arctic species, one is distributed as an Arctic species only in the Atlantic Coastal region, but in the Pacific Coastal region it is a Montane-Boreal species (*H. histrionicus*). The remaining landscape-zones are encountered rather infrequently: two Subboreal-Subtropical (*Tadorna ferruginea*, *Marmaronetta angustirostris*), and one each Circumtemperate-Subtropical (*Anas platyrhynchos*), Circumboreal Montane (*Mergus merganser*) and Transalpine (*Bucephala islandica*). Those near to being recognized or recognized as separate species have the following ranges: Tundra Bean Goose (*Anser (fabalis) serrirostris*) — Translongitudinal-Palaearctic — Subarctic; (Western) Taiga Bean Goose (*Anser (fabalis) fabalis* sensu stricto) — Western Palaearctic (Central Western Palaearctic) Boreal; Siberian Taiga Bean Goose (*Anser (fabalis) middendorffii*) — Eastern Palaearctic Boreal (Siberian).

RESULTS OF OBSERVATIONS OF MIGRATION AND SEASONAL MOVEMENTS OF SEA DUCKS FROM ABOARD SHIPS ON THE NORTHERN SEA ROUTE

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As a result of long-term observations from aboard ships on the eastern Barents Sea and the western Kara Sea, the presence of a wintering ground of the Common Eider (*Somateria mollissima*) and the King Eider (*S. spectabilis*), and perhaps the Long-tailed Duck (*Clangula hyemalis*), in the polynyas and cul-de-sacs of the southwestern shore of Novaya Zemlya was confirmed. Periodically, small groups of birds of the aforementioned species were encountered in the paths of vessels in the southeastern Barents Sea (Pechora Sea), whither they might be confined by the ice from the Novaya Zemlya area. We do not currently have data on the general abundance and number of wintering birds of particular species in the area of the archipelago. In spring (April), the active movement of groups of Common and King eiders was observed in the Kara Sea, along the southeastern coast of Novaya Zemlya. At this time, migrating flocks of the Common Eider (about 900 individuals) and the King Eider (about 200 individuals) were observed near Belyi Island. Flocks of the Long-tailed Duck (up to 2,000 individuals) were recorded in the area of the island, migrating in a northwesterly direction. The visible part of the migration, over open ocean, was mainly composed of two species, the King Eider and the Common Scoter (*Melanitta nigra*), which in April move in flocks through the system of stationary polynas in the Pechora and Kara seas, crossing over the solid icy gaps between them without stopping. Furthermore, this aggregation of migrating birds skirts around Vaigach Island to the north. At the same time, groups of Common scoters were encountered close to Matochkin Shar Strait, on both the western and eastern sides of Novaya Zemlya. We assume that this segment of the birds may move by this route making periodic stops along the coasts of the archipelago. In autumn (October), the King Eider moves in large flocks (up to

1,000 individuals) from the southern shores of the Kara Sea through the Kara Strait to the southern Pechora Sea. Here they make an intermediary stop-over, forming large aggregations. Large flocks of the Common Scoter (up to 1,000 individuals) move from the southern Kara Sea, skirting Vaigach Island to the north and south.

АВТОРСКИЙ УКАЗАТЕЛЬ

Авилова К. В. 5
Аверин А. А. 83
Алхайнен М. 6
Андрющенко Ю. А. 7, 8, 98
Антонов А. И. 83
Ануфриев В. В. 9
Артемьев А. В. 10, 11
Баданин Ю. А. 100
Барабашин Т. О. 12
Батбаяр Н. 35
Бианки В. В. 13
Блохин Ю. Ю. 14
Боутен В. 46
Брагин А. В. 18
Браун А. 25
Бубырева В. А. 44
Ван дер Йогд Х. 46
Ван Вирен С. Е. 63
Ван Ден Бринк Н. В. 25
Ван Хофт П. 63
Ванжелюв Д. 16
Вартанян С. Л. 83
Викельски М. 37
Вилков Е. В. 17
Волков А. Е. 18
Волков С. В. 19
Волкова Е. В. 18
Гаврило М. В. 20, 21
Герасимов Н. Н. 21
Герасимов Ю. Н. 21
Глазов П. М. 29, 37, 61
Глотов А. С. 22
Головатин М. Г. 23
Горошко О. А. 35
Горяев Ю. И. 100
Грёнен М. А. М. 63
Гринченко О. С. 19
Гриффин Л. 71
Грищенко М. 68
Де Йонг М. У. 25
Дебело П. В. 26, 27
Доктер А. 46
Дорофеев Д. С. 28, 29
Егорова Н. А. 97
Ежов А. В 100
Емельянов В. И. 30
Жовтюк П. И. 53
Жуков В. С. 31
Зубань И. А. 76
Иванов М. Н. 74
Иденберг Р. С. 63
Йоанидис П. 16
Йохемс Ф. 46
Казанский Ф. В. 33
Кан Т. 34, 50, 79, 85
Кан Ю. М. 34, 50, 79
Као Л. 35
Каханпяя Л. В. 36
Кёльш А. 37
Ким Х. Дж. 35
Киртаев Г. В. 74
Коломейцев С. Г. 49
Комдё Ж. 25
Кондратьев А. В. 35
Коркина С. А. 97
Коробицын И. Г. 90
Коузов С. А. 39, 40, 41, 42, 43, 44
Кояма К. 35
Кравчук А. В. 43
Краус Р. Х. С. 63
Краснов Ю. В. 100
Крукенберг Х. 37
Кузнецова Т. Б. 12
Куксанов В. Ф. 26, 27
Куречи М. 35
Ламерис Т. К. 45, 46
Лаппо Е. Г. 47

Лапшин Н. В. 10, 11
Латыпова Л. И. 48
Латыпова Ч. И. 48
Лебедева Н. В. 49
Ли Х. 34, 35, 50, 79, 85
Литвин К. Е. 28, 29
Лиу П. 83
Ломадзе Н. Х. 49
Лунен М. Дж. Дж. Е. 25
Лыков Е. Л. 51
Маммадов А. Ф. 86, 87
Маркигиани Е. 16
Мегенс Х.-Я. 63
Мельников Ю. И. 52, 53
Минеев О. Ю. 54
Минеев Ю. Н. 54
Митропольский М. Г. 55
Михантьев А. И. 56
Мищенко А. Л. 57
Моригучи С. 91
Морозов В. В. 87
Мун О. К. 34, 50, 79
Мыльникова А. Н. 58
Мюскенс Г. 37
Нагендран М. 59
Наги С. 70
Назин А. С. 27
Натальская О. В. 91
Никитина В. А. 44
Новак А. И. 97
Новак В. А. 60
Новак В. В. 60
Новак Д. Е. 97
Нолет Б. 37, 46
Нуно А. 61
Ньюс Дж. 61
Огава К. 91
Осипов Д. В. 97
Остапенко В. А. 62
Оттенбёргс Дж. 63
Пасхальный С. П. 23
Поздняков В. И. 64
Покровская И. В. 18, 65
Покровская О. Б. 45, 66
Попенко В. М. 7, 8, 98
Попов В. В. 53
Попов С. В. 67
Поповкина А. Б. 47, 82
Поссарт Е. 59
Принс Г. 63, 68
Пронкевич В. В. 69, 83
Рахимов И. И. 48
Рис Э. С. 61, 70, 71
Рогачева Э. В. 72
Рожков П. С. 62
Розенфельд С. Б. 35, 73, 74, 75
Романов А. А. 77
Савицкий Р. М. 78
Савченко А. П. 30
Свиридова Т. В. 19
Селиванова М. А. 56
Си Я. 68
Симеонов П. 59
Симонов С. А. 10, 11
Син Ю. У. 34, 50, 79, 85
Скуратов Н. И. 62
Соколов А. А. 80, 81
Соколов В. А. 80
Соколова Н. А. 80, 81
Соловьёв М. Ю. 82
Соловьёва Д. В. 83
Спицын В. М. 84
Су Ч. Х. 85
Султанов Э. Г. 86, 87
Суханова О. В. 57
Сыроечковский Е. Е. 35, 72, 88
Тарасов В. В. 89
Тимошенко А. Ю. 76
Тирлинк Х. 16
Томкович П. С. 82
Тупицын И. И. 53

Тютеньков О. Ю. 90
Ушияма К. 91
Факриадис И. 16
Федосов В. Н. 92, 93, 94
Фокс А. Д. 35
Харитонов С. П. 96, 97
Хван Ч. 85
Хьюз Б. 71
Черничко Р. Н. 98
Чжон В. 34, 50, 79
Чхой Ч. Ю. 35
Чхой Ю. 34, 50, 79
Шайбер И. Б. Р. 25
Шимада Т. 91
Шохрин В. П. 83
Штро В. Г. 81
Эббинге Б. С. 99
Эрих Д. 81
Юн Х. 34, 50, 79
Ямада Х. 91

AUTHOR INDEX

Alhainen M. 105
Andryushchenko Yu. A. 106, 107, 116
Antonov A. I. 181
Anufriev V. V. 108
Artemyev A. V. 109, 110
Averin A. A. 181
Avilova K. V. 110
Badanin Yu. A. 195
Barabashin T. O. 112
Batbayar N. 115
Bianki V. V. 113
Blokhin Yu. Yu. 114
Bouten W. 146
Bragin A. V. 192
Braun A. 119
Bubyreva V. A. 145
Cao L. 115
Chernichko R. N. 116
Choi C. Y. 115
Choi J. 135, 150, 177
De Jong M. E. 119
Debelo P. V. 117, 118
Dokter A. 146
Dorofeev D. S. 120, 121
Ebbinge B. S. 122
Egorova N. A. 138
Ehrich D. 178
Emelyanov V. I. 123
Ezhov A. V. 195
Fakriadis Y. 190
Fedosov V. N. 125, 126, 127
Fox A. D. 115
Gavrilo M. V. 129, 130
Gerasimov N. N. 130
Gerasimov Yu. N. 130
Glazov P. M. 121, 139, 159
Glotov A. S. 131
Golovatin M. G. 132
Goroshko O. 115
Goryaev Yu. I. 195
Griffin L. 168
Grinchenko O. S. 192
Grischenko M. 167
Groenen M. A. M. 162
Hughes B. 168
Hwang J. 183
Ioannidis P. 190
Ivanov M. N. 174
Jeong W. 135, 150, 177
Jochems F. 146
Kahanpää L. V. 134
Kang T. 135, 150, 177, 183
Kang Y. M. 135, 150, 177
Kazanskiy F. V. 136
Kharitonov S. P. 137, 138
Kim H. J. 115
Kirtaev G. V. 174
Koelzsch A. 139
Kolomeitsev S. G. 149
Komdeur J. 119
Kondratyev A. 115
Korkina S. A. 138
Korobitsyn I. G. 188
Kouzov S. A. 140–145
Koyama K. 115
Krasnov Yu. V. 195
Kraus R. H. S. 162
Kravchuk A. V. 144
Kruckenberg H. 139
Kuksanov V. F. 117, 118
Kurechi M. 115
Kuznetsova T. B. 112
Lameris T. K. 146, 147
Lappo E. G. 147
Lapshin N. V. 109, 110
Latypova Ch. I. 148

Latypova L. I.	148
Lebedeva N. V.	149
Lee H.	115, 135, 150, 177, 183
Litvin K. E.	120, 121
Liu P.	181
Lomadze N. Kh.	149
Loonen M. J. J. E.	119
Lykov E. L.	150
Makrigianni E.	190
Mammadov A. F.	183, 184
Megens H.-J.	162
Melnikov Yu. I.	151, 152
Mikhantyev A. I.	153
Mineev O. Y.	155
Mineev Y. N.	155
Mishchenko A. L.	156
Mitropolskiy M. G.	157
Moon O. K.	135, 150, 177
Moriguchi S.	189
Morozov V. V.	184
Muskens G. J. D. M.	139
Mylnikova A. N.	158
Nagendran M.	159
Nagy S.	168
Natalskaya O. V.	138
Nazin A. S.	118
Newth J. L.	159
Nikitina V. A.	145
Nolet B. A.	139, 146
Novak V. A.	160
Novak V. V.	160
Nowak A. I.	138
Nowak D. J.	138
Nuno A.	159
Ogawa K.	189
Osipov D. V.	138
Ostapenko V. A.	161
Ottenburghs J.	162
Paskhalny S. P.	132
Pokrovskaya I. V.	163, 192
Pokrovskaya O. B.	146, 164
Popenko V. M.	106, 107, 116
Popov S. V.	165
Popov V. V.	152
Popovkina A. B.	147, 179
Possardt E.	159
Pozdnyakov V. N.	166
Prins H. H. T.	162, 167
Pronkevich V. V.	167, 181
Rakhimov I. I.	148
Rees E. C.	159, 168, 169
Rogacheva E. V.	170
Romanov A. A.	171
Rozenfeld S. B.	115, 173, 174, 175
Rozhkov P. S.	161
Savchenko A. P.	123
Savitskiy R. M.	176
Scheiber I. B. R.	119
Selivanova M. A.	153
Shimada T.	189
Shin Y. U.	135, 150, 177, 183
Shokhrin V. P.	181
Shtro V. G.	178
Si Y.	167
Simeonov P.	159
Simonov S. A.	109, 110
Skuratov N. I.	161
Sokolov A. A.	178
Sokolov V. A.	178
Sokolova N. A.	178
Soloviev M. Y.	179
Solovyeva D. V.	181
Spitsyn V. M.	182
Suh J. H.	183
Sukhanova O. V.	156
Sultanov E. G.	183, 184
Sviridova T. V.	192
Syroechkovskiy E. E.	115, 170, 185
Tarasov V. V.	187

Teerlynck H. 190
Timoshenko A. Yu. 175
Tomkovich P. S. 179
Tupitsyn I. I. 152
Tyutenkov O. Yu. 188
Ushiyama K. 189
Van Der Jeugd H. P. 146
Van Den Brink N. W. 119
van Hooft P. 162
van Wieren S. E. 162
Vangeluwe D. 190
Vartanyan S. L. 181
Vilkov E.V. 190
Volkov A. E. 192
Volkov S. V. 192
Volkova E. V. 192
Wikelski M. 139
Yamada H. 189
Ydenberg R. C. 162
Yoon H. 135, 150, 177
Zhovtyuk P. I. 152
Zhukov V. S. 194
Zuban I. A. 175