

Soviet Studies in the Northward Movement of Birds

While actively engaged in the development of northern areas, the Russians and other Soviet nations, quite naturally, have observed that the boundaries of animal habitats are gradually being extended northward. Since birds are the most mobile animals, they have set an example in the opening of new frontiers, and therefore most of the observations and studies of the shifting boundaries deal with birds. The investigations cover not only the arctic belt, but the southern regions as well, because boundary shifts in one area involve shifts in adjacent areas to balance the changing situation.

In search of data on the extent and rate of the movement, its variations with geographical areas and the causes that induce the changes, I have examined most of the Soviet papers discussing the phenomenon. So far a comprehensive study covering all the aspects of the subject has not been written. But there are numerous reports discussing observations in specific areas, such as Franz Josef Land, Yugorskiy and Yamal peninsulas, Taymyr, Baltic republics, etc. Other papers discuss definite species and groups of mammals and birds that have changed or are changing the boundaries of their habitats, the effect of climate and man's activity on bird life, and related topics.

Changes of zoogeographical boundaries in northern Russia and Siberia have been studied in some detail by Uspenskiy^{1,2,3} and Syroechkovskiy^{4,5}. Uspenskiy participated in several expeditions which investigated the fauna and flora of the arctic belt in 1941, from 1948 to 1950, in 1957 and in 1958 from the estuary of the Pechora in northeastern Europe to the estuary of the Yenisey in northern Siberia. The latitude of the belt extended from the Arctic Circle to the south to the northern tip of Novaya Zemlya and Novosibirskiye Ostrova in the north. Thus all of the arctic biomes from the so-called arctic deserts through moss-lichen and shrub tundras to the forest or taiga belt were investigated. In addition, Uspenskiy consulted studies written by earlier Arctic explorers, namely, Jackson⁶ and Pearson.⁷

It appears that, step by step, the tundra is advancing into the arctic desert, and the taiga is moving into the tundra. In line with plants, the mammals and birds are moving northward too. The prime cause of this race is the warming of the Arctic. The temperature data compiled by Vize⁸ and others⁹

show that the warming trend has become clearly pronounced since the 1920's in the arctic belt from Iceland and Spitsbergen to Taymyr and Severnaya Zemlya. The average difference in temperature between the beginning of this century and the 1950's is about 7 deg. C. for winter, 5 deg. C. for autumn, and only about 1 deg. C. for the spring and summer.

As a consequence, the vegetation period is extended, and more birds and other animals as well are lured north. In this connection, Uspenskiy cites lemmings as an illustration since they constitute an important food item for larger birds and mammals. During the most intense warming period on Yamal Peninsula in northwestern Siberia (1930 to 1949) the mass development of lemmings was observed every year, not once in three or four years, which is the usual cycle for the mammals in the area.

Because of such favourable conditions, some birds have extended their ranges northward by 2 degrees latitude (210 km. or 130 miles) during the last 50 years. The record for this area is held by the willow warbler (*Phylloscopus trochilus*), meadow pipit (*Anthus pilaris*) and possibly by the fieldfare (*Turdus pratensis*). The last-mentioned is extending its range not only northward

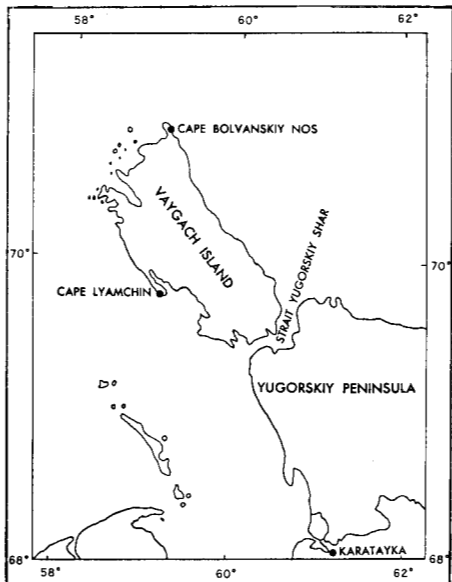


FIG. 1. Extension of northern boundary by the Willow Ptarmigan from Karatayka river delta in 1899 (lat. 68°N.) to Cape Lyamchin parallel (lat. 69°5'N.) on Vaygach Island in 1957.

but also westward. A permanent colony has recently been established in Greenland. This event is described in detail by Salomonsen,¹⁰ a Danish ornithologist, who has been observing fieldfares since their appearance in Greenland in 1937. Now they have also been observed on Baffin Island and the Labrador Peninsula.

Detailed information for a time span of 60 years is given by Uspenskiy¹ for Yugorskiy-Vaygach-Novaya Zemlya sector where the shrub tundra in the south transits into the moss-lichen tundra and arctic desert in the north. By consulting the books written by earlier explorers who had investigated this area (Jackson;⁶ Pearson;⁷ Buturlin¹¹), Uspenskiy obtained information on changes of plant and animal life since the end of the last century.

To cite an example, between 1899 and 1957 the willow ptarmigan (*Lagopus lagopus*) extended its northern boundary from Karatayka river delta (68°N.) to Cape Lyamchin (69°5'N.) on Vaygach Island (Fig. 1). Occasionally the species has been observed on Novaya Zemlya as far as lat. 74°N., although no breeding pairs have been noted on Novaya Zemlya. Thus the willow ptarmigan extended its breeding range by about 1.5 degrees or 160 km. in 58 years.

Syroechkovskiy^{4,5} has investigated changes of faunal boundaries in the taiga and forest-tundra belts of Central Siberia, notably, along the Yenisey river from 62°N. to 69°N. In 1956 he headed the Zoogeographical section of the Biogeographical expedition organized by the Institute of Geography. For 5 months the group carried out investigations in the Yenisey valley from Podkamennaya Tunguska in the south to Dudinka in the north.

This area has also been investigated by Middendorf¹² in the 1860's and by Tugarinov and Buturlin¹³ at the beginning of the twentieth century. Thus for some of the species of birds the data on habitats were available for a period of almost one hundred years. The climatological data for this area show that, in contrast to the European and West Siberian north, the warming trend is felt in all the seasons of the year, not just in the autumn and winter.

In addition, the activity of man is very pronounced in this area: forests have been cleared, virgin land has been tilled, buildings and roads have been constructed. As a result of these combined developments, the house sparrow (*Passer domesticus*), for example, has extended its boundary northward by about 800 km. during the last hundred years or so, from Vorongovo (lat. 61°N.) in 1844

to Turukhansk (lat. 66°N.) in 1911, and to Nikol'skoye (lat. 70°N.) in 1960. The chaffinch (*Fringilla coelebs*), which prefers woodland margins and partially cleared forests, has moved northward from Krasnoyarsk to Komsa (700 km.) in 13 years. This unusual speed is explained by two exceptional conditions: the warming of the climate set the record for the Yenisey valley in that period, and at the same time the clearing of forests was very intense.

The rook (*Corvus frugilegus*), which prefers fields and clearings in forests made by man, has extended its habitat by about 700 km. northward during the last 55 years, from Krasnoyarsk to Komsa. The birds that do not depend on changes in the environment brought about by man move northward at a slower rate. They evidently are induced in this movement only by the warming of climate. Syroechkovskiy⁴ assigns to this group the black woodpecker (*Dryocopus martius*), coal tit (*Parus ater*), whooper swan (*Cygnus cygnus*), merganser (*Mergus merganser*) and some others. Their northward movement has varied from 200 to 400 km. during the last 50 years.

A valuable supplement to the investigations conducted by Uspenskiy and Syroechkovskiy is provided by the Baltic and Ukrainian ornithologists. For northern birds they record changes in southern boundaries, but for southern birds, changes in northern boundaries. Sometimes changes in boundaries are traced simultaneously by several ornithologists in various geographical areas and habitats. An interesting example of such coordinated research is the tracing of boundary changes for the willow ptarmigan in Estonia, Latvia and Lithuania.

In his paper on the variations of bird fauna in Lithuania during the last 50 years, Ivanauskas¹⁴ describes the status of the willow ptarmigan as follows. In 1903 the species was quite numerous in Lithuania, including its southern areas along the Neman river. In 1959 only small numbers of the bird could be found in the north-eastern sector of the country. He adds that the preferred habitats for the birds—the upstream swamps and woodlands—have changed little during the last 50 years, and therefore man is hardly responsible for the disappearance of the species from Lithuania.

Investigating the status of the willow ptarmigan in Latvia and Estonia, Taurins¹⁵ found that at the beginning of the 1930's about 3,000 pairs of the species inhabited the upstream swamp lands of Latvia. By the late 1950's the numbers had decreased to about a tenth, and the willow ptarmigan

could be found only in the northern and eastern areas of the country.

The number of willow ptarmigan is also decreasing in Estonia. The main reason for the decrease is considered to be the warming of climate characterized by milder winters with less snow. The white winter plumage of the ptarmigan in snowless periods exposes the bird to enemies. The field studies show that after a succession of several cold winters the numbers of the species increase. But since milder winters begin to prevail, the northward movement of the willow ptarmigan is irrevocable.

This displacement of the southern boundary appears to be coordinated with the displacement of the northern boundary. According to Uspenskiy,² the species has extended its northern boundary by 160 km. in the Yugorskiy-Vaygach sector. Approximately the same change has occurred in the displacement of the southern boundary during the last 60 years.

Similarly, the Baltic territories have been gradually abandoned by the snowy owl (*Nyctea scandiaca*), great snipe (*Capella media*), wood sandpiper (*Tringa glareola*) and some other species of birds. But this does not mean that the number of species is decreasing in the Baltic lands; not at all. There are many southern species that are moving in from Central Europe, the Balkans and the Ukraine.

The fastest immigrant is the collared turtle dove (*Streptopelia decaocto*). Starting out from the Balkans in the early 1930's, the species had reached the Zakarparskaya region in the early 1940's. In 1949 the bird was observed nesting on the north side of the Carpathian Mountains by Strautman.¹⁶ In 1950 it was breeding in Friesland, Germany, in 1954 in Denmark, L'vov and Kiev; a few years later it was breeding in Lithuania and White Russia, thus moving northward with a 800 km.-wide front.

Another quick immigrant to northern areas is the serin (*Serinus canaria*). During the last 200 years this species has transferred its northern boundary from southern Europe to Estonia, a distance of about 1,500 km. These two leading immigrants are followed by many other southern species, such as the black redstart (*Phoenicurus ochruros*), corn bunting (*Emberiza calandra*), penduline tit (*Remiz pendulinus*), gadwall (*Anas strepera*) and others.

Gadwall is a holarctic species which also inhabits the new world. According to Bull,¹⁷ this species is also moving northward. At the present time its northern boundary runs through upper New York State (lat. 43°N.),

Manitoba and southern Alaska (lat. 55°N.), while in Europe the Gulf of Finland marks the boundary (lat. 60°N.). This is the northern thermal boundary for the Gadwall. The difference in latitude is determined by the ocean currents: Europe is warmed by the Gulf Stream, while the east coast of America is cooled by the Labrador and Greenland currents which bring cold water masses southward. Therefore on this continent the warming trend, as well as the northward movement of birds and other animals, is less pronounced than in Europe and Asia.

The leading pioneers in this hemisphere are the eastern hermit thrush (*Hylocichla gutata*) and robin (*Turdus migratorius*). The hermit thrush has already established footholds on Greenland and Iceland, thus coming in contact with the Eurasian pioneer, the fieldfare.

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Russians in the Antarctic

During 1966 the Eleventh Antarctic Expedition carried out an extensive complex of scientific research as part of the program of the International Years of the Quiet Sun. The Expedition worked in Mirny and at the scientific stations of Vostok, Molodezhnaya

and Novolazarevskaya. Observations were also conducted at the two poles of Antarctica — the southern magnetic pole and the "cold pole". At the Vostok station, meteorologists explored the climate, the state of the ionosphere, northern lights, cosmic rays, the geomagnetic field and the source of radio waves. Deep in the mainland south of the Davis Sea coast, research was conducted to ascertain the thickness of the ice sheet by the radiolocation method. One of the main tasks of the Expedition was to inform Soviet whaling flotillas of the weather in southern latitudes. Geological and geographical research was carried out in the mountains of Enderby Land, and glaciological and hydrographic research was undertaken in Alaskeyev Bay. The program of the Expedition included medical observations of man's acclimatization to conditions in Antarctica. Oceanographic research was carried out from aboard the *Ob* in the waters of Antarctica between Pravda Coast and Queen Maud Land.

The results of the research and discoveries made by the Twelfth Soviet Antarctic Expedition were summed up at a recent session of the Learned Council of the Leningrad Research Institute of the Arctic and Antarctic, which is the Soviet Union's centre of polar exploration.

The scientists pointed out that during the expedition of a tractor-sleigh train to the Pole of Relative Inaccessibility a new method was used for the first time for the measuring by radar of the thickness of the ice cap of Antarctica. The method of seismic sounding used up till now made it necessary to drill wells in the ice and use explosives. The new method is more economical and efficient: the impulse from the signal goes through the ice and, after being reflected by the rock, is registered by instruments. It has been possible to obtain signals reflected from a depth of 2,000 to 2,200 m. Experiments have begun on using this method from a plane. If success is achieved, it will be possible to "photograph" the relief of the continental bedrock of the Antarctic simultaneously over wide areas. Soviet glaciologists have covered 260 km. in the area of Mirny observatory, and have measured the thickness of the glacier, from a plane, on a route 1,500 km. long.

It has been established as the result of investigations that the central part of the glacial cap within Eastern Antarctica is the world's biggest and almost ideal elevated plain. The central and the highest part of this plain has been named Soviet Plateau.

The polar explorers have established that the highest point of the surface of the glacial