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Colonization ecology of European bird species in the Sub-Polar Urals

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Abstract – The unique peculiarity of mountain landscapes in the Sub-Polar Urals is that there lies the border between European and Asian bird faunas. This feature allows us to determine basic tendencies in colonization of European bird species. The Sub-Polar Urals region is impacted by human activity to a lesser extent than other areas of the Urals due to three reasons: undeveloped infrastructure; severe climate conditions and most of the territory is a part of the national park "Yugyd Va". However, anthropogenic landscape transformation, especially development of infrastructure and logging of dark coniferous forest in plains adjacent to the Urals, leads to formation of ecological corridors in the taiga woodland that are represented by mixed and small-leaved forests, floodplain meadow-bush belts, gas and oil pipeline tracks. These corridors, in turn, promote non-taiga bird species irruption. Beginning from the 1970s 12 European bird species new for the region were registered in the Sub-Polar Urals. Such irruption may be caused not only by the anthropogenic landscape transformation but also by a climate amelioration. But the problem needs further special investigations.

INTRODUCTION

Set in the contact area of the Northern and Extreme Northern sub-zones of the taiga, at the interface of the European and Siberian types of fauna, where the latitudinal zoning and vertical stratification closely intertwine, the Sub-Polar Urals presets a unique natural area to study specific features of the zonal and vertical distribution of various natural components. These features allow us to determine basic tendencies in colonization of European bird species.

The Sub-Polar Urals region is impacted by human activity to a lesser extent than other areas of the Urals due to three reasons: undeveloped infrastructure, severe climate conditions and most of the territory is a part of the national park "Yugyd Va" (Chikishev, 1968; Taskaev, 2005). However, anthropogenic landscape transformation, especially development of infrastructure and logging of dark coniferous forest in plains adjacent to the Urals, leads to formation of ecological corridors in the taiga woodland that are represented by mixed and small-leaved forests, floodplain meadow-bush belts, gas and oil pipeline tracks. These corridors, in turn, promote non-taiga bird irruption (Fig. 1).

The Sub-Polar Urals combine expressed vertical belts of both soils and vegetation that supersede each other as one proceeds upwards. Within the mountain landscapes one may identify the mountain forest, elfin forest, mountain tundra and stony placer vegetation belts, the latter three limited to mountain peaks, are actually fragmented, and separated by forested valleys. Specific features of mountainous landscapes find their reflection in the mountainous avifauna, so that each vegetation belt has its own set of species (Beme, Banin, 2001). The dominant types of forests in the foothills are mixed fir and spruce sprinkled with birch and marshes found along the river valleys and lakeshore lowlands.

MATERIALS AND METHODS

We have taken into account available information on avifauna and bird communities in the Sub-Polar Urals from published sources (beginning from 1856) and our own data obtained in 1968-1974 and 2000-2006 years. The main method used was fixed wide route bird census (Danilov, 1956). The method was used both for multiple (station) and for one-time routes (Table 1). The first data on birds of the Northern part of Urals were collected by the expedition of the Russian Geographical Society, headed by E. Hoffman (1856). A major study on the bird fauna is a monograph by L.A. Portenko «Bird Fauna of the Extra Polar Part of the Northern Urals» (1937). General information about non-Passeriformes, is presented within the multivol-

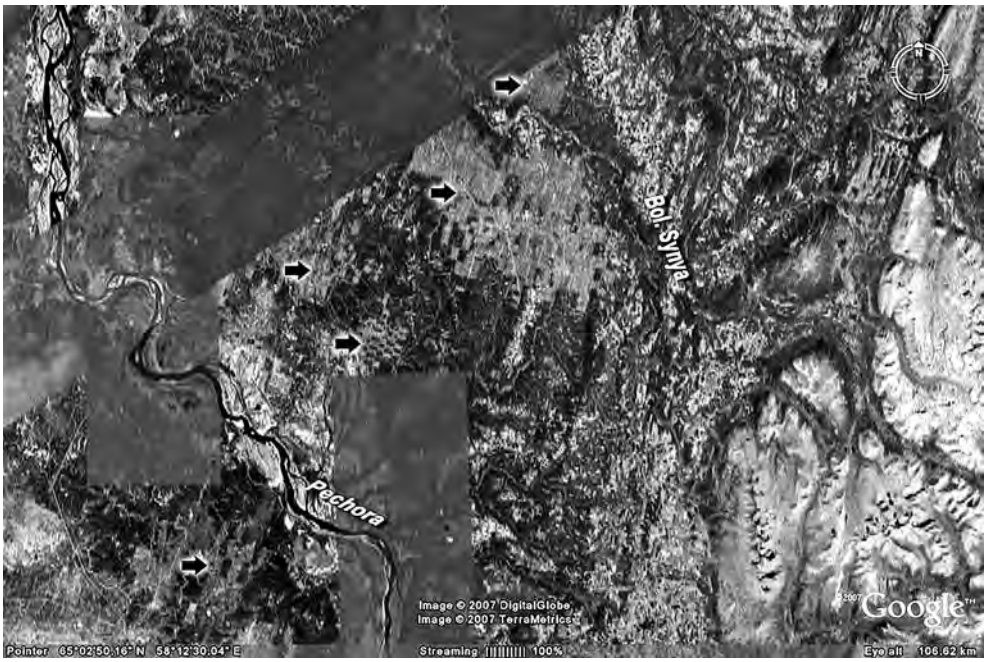

Figure 1. Evidence from anthropogenic landscape transformations, in the taiga foothills of the Sub-Polar Urals. The arrows show wide clear-felling stands of taiga woodland.

ume «Fauna of the European North-East Russia» (Estafiev *et al.* 1995, 1999). The "Akademia" permanent research station of the Institute of Biology, Komi Scientific Center, Urals Branch, Russian Academy of Sciences, was situated 15 km off the source of the Bolshaya Synya River on the border of the foothills and mountain areas (64°58' N, 58°56' E).

RESULTS

The present avifauna of the Sub-Polar Urals includes 162 species belonging to 12 orders. Among them 139 are breeding and 31 wintering. The richest order is that of Passeriformes (48% of total species), followed by Charadriiformes (18%), Anseriformes (10%) and Falconiformes (9%). The remaining eight orders, pooled together, account for the remaining 15%. According to their origin the bird fauna is inhomogeneous. Considering the common species (35%) it embraces representatives of the Arctic, Siberian, European, Mediterranean, Tibetan and Chinese faunas. The share of the Siberian species reaches 32%, that of the European ones is 16%, while that of the Arctic is 12%. According to the number of species present, the Chinese, Mediterranean and Tibetan types of fauna occupy subordinate positions.

Beginning from the 1970s, 28 bird species new for the region were more and more commonly detected in the Sub-Polar Urals. Eight among them became breeders, 15 were summering species, three visitants and one migrant. The largest part of them is of European origin, including those that may be now considered as common species (75%). The Siberian and Arctic species yielded 11% each, while the Chinese account only for the 3% (Fig. 2 A). Species mainly penetrate the mountains along the forested and bushy habitats in the mountain forest and elfin forest. Visitant species were only encountered within the mountain forest belt. Breeding species and summer visitors were noticed in all the altitudinal belts, with the exclusion of the stony placer one that featured no new bird species (Fig. 2 B).

12 new European bird species were registered in the Sub-Polar Urals. All these species are referred to as breeding or probably breeding, with the exception of Jay (*Garrulus glandarius* L.; nomadic species) and Blackbird *(Turdus merula* L.; a vagrant species). Looking eastwards, from the Urals to the Ob River, the Pied Flycatcher (*Ficedula hypoleuca* Pall.) is a common breeding species, whereas the Siskin (*Carduelis spinus* L.) is common as a nomadic one (Vartapetov, 1984, 1998; Table. 2). In Western Siberia the Swift (*Apus apus* L.), Jay, Whitethroat *(Sylvia communis* Lath.), Spotted Flycatcher *(Muscicapa striata* Pall.), Whinchat *(Saxicola rubetra* L.), Chaffinch *(Fringilla coe-*

Table 1. Details on the bird researchers carried out by the authors in the Sub-Polar Urals.

Date [month(s), years]	**District** (river watersheds)	**Researcher**(s)	**Type of census**
VII-IX 1968	Voivoch-Synya, Kydz'ras'yu, Bol. Synya	Estafjev A.	station, route
IIX-XI 1969	Voivoch-Synya	Estafjev A.	station
IV-VIII, X-XI 1970	Voivozh-Synja, Kydz'ras'yu , Bol. Synya	Estafjev A.	station, route
III-VIII, X-XI 1971	Syod'yu, Bol. Patok	Estafjev A.	station, route
VI-XI 1972	Voivoch-Synya, Bol. Synya	Estafjev A.	station, route
III 2000	Balban'yu, Manaraga, Nidysey	Selivanova N.	route
III 2001	Syod'yu, Vangyr, Kos'yu, Syv'yu	Selivanova N.	route
VI-VIII 2001	Voivoch-Synya, Vangyr	Estafjev A., Selivanova N.	station
III 2002	Balban'yu, Manaraga, Hobeyu, Kos'yu	Selivanova N.	route
III 2003	Syod'yu, Vangyr, Manaraga, Kos'yu	Selivanova N.	route
VI-VII 2003	Voivoch-Synya	Selivanova N.	station
X-XI 2003	Voivoch-Synya, Bol. Synya	Estafjev A., Selivanova N.	station
III 2004	Syod'yu, Voivoch-Synya, Bol. Aranec	Selivanova N.	route
VIII-IX 2004	Voivoch-Synya, Bol. Synya	Selivanova N.	station
VIII 2005	Koghim	Selivanova N.	route
VI-VII 2006	Voivoch-Synya	Selivanova N.	station

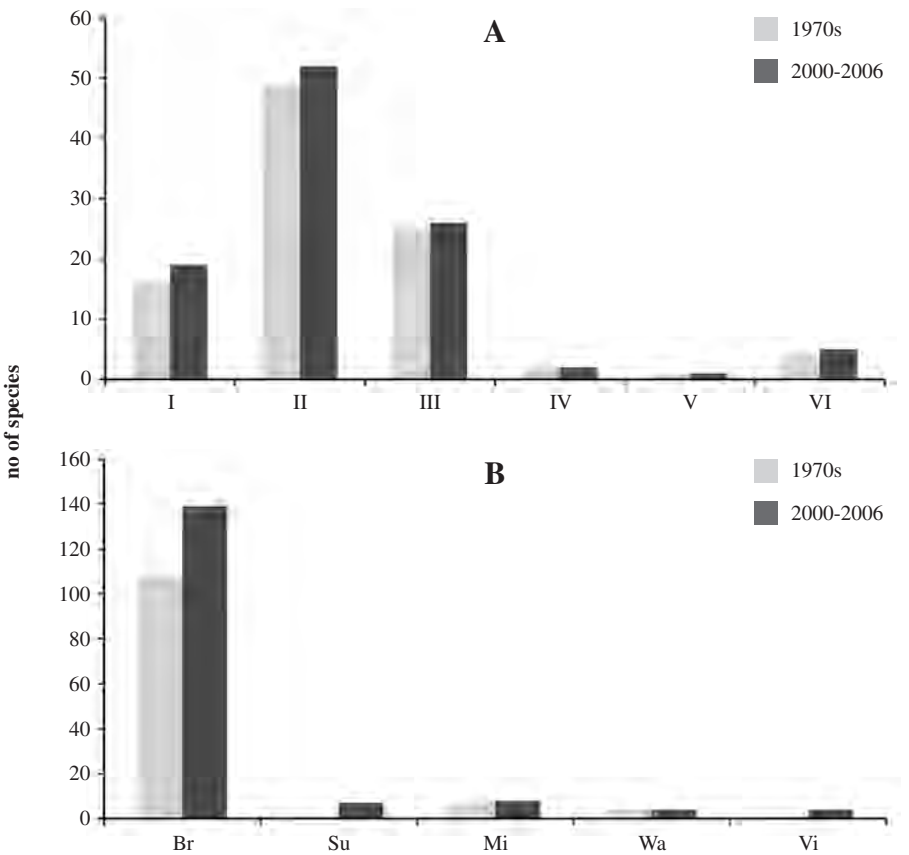

Fig. 2. The changes in the structure of fauna-genetic complexes and of ecological groups of birds in the Sub-Polar Urals. Fauna-genetic complexes (A): Arctic (I), Siberian (II), European (III), Mediterranean (IV), Tibetan (V), Chinese (VI). Ecological groups (B): breeding (Br), summering (Su), migrant (Mi), wandering (Wa) and visitant (Vi).

Table 2. Details on the status and abundance of the 12 European bird species that colonized Sub-Polar Urals, compared with that of neighboring areas. Status: ✯ breeding, ✹ possibly breeding, ◈ vagrant, ▲ wandering. Numbers: +++ common, ++ rare, + single records, – species not detected.

Species	Northeast of European Russia		Sub-Polar Urals		Western Siberia	
	Status	Numbers	Status	Numbers	Status	Numbers
Swift	✯	+++	✹	+	✯	+
Jay	✯	+++	▲	++	▲	++
Winter Wren	✯	+++	✯	+	–	–
Whitethroat	✯	+++	✹	++	✯	++
Chaffinch	✯	+++	✹	++	✯	+++
Spotted Flycatcher	✯	+++	✯	++	✯	++
Whinchat	✯	+++	✯	++	✯	++
Blackbird	✯	++	◈	+	–	–
Chaffinch	✯	+++	✹	++	✯	++
Siskin	✯	+++	✯	++	▲	+++
Parrot Crossbill	✯	+++	✹	++	–	–
Yellowhammer	✯	+++	✯	++	✯	++

lebs L.), Yellowhammer (*Emberiza citrinella* L.) are met rarely. The Winter Wren (*Troglodytes troglodytes* L.) and Parrot Crossbill (*Loxia pytyopsittacus* Brokh.) are not registered in Western Siberia, though they are common breeding species in the middle and northern taiga zone in the Northeast of European Russia. Winter Wren range extends to lat. 65° N in the Sub-Polar Urals. Thus thinned forest, shrubs and open areas in alpine forests and crooked forests of mountain belts are common habitats for European bird species in the Sub-Polar Urals.

CONCLUSIONS

Anthropogenic pressure (resulting from comprehensive exploitation of mineral, forest, agricultural and other resources of the East European Plain) changes the balance of the parameters of ecological structure of local communities. The growth in patchiness and the emergence of new habitats, atypical for the taiga zone, promote mutual exchange between the faunas of Europe and Asia. It can be stated that there is a strong tendency in the irruption of European bird species in our study area during the last 100 years. Such irruption may be caused not only by the anthropogenic landscape transformation but also by a climatic amelioration (Pape Moller *et al.*, 2006). But the problem needs further special investigations.

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