The role of certain types of habitats in conservation of rare bird species inhabiting the northern border of the taiga zone of Europe

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Abstract. In the process of local biodiversity formation in conditions of the North, the anthropogenically transformed areas serve an important element. Some of them, according to their structural and functional characteristics (for example, agricultural areas), have no counterparts in indigenous ecosystems. The anthropogenically transformed areas are inhabited by a small number of local species which are characteristic of the natural ecosystems of the North. At the same time, they are homes to many "new", non-aboriginal, species, serving as initial habitats for the "newcomers" and channels for their distribution and settlement.

1. Introduction

Structurally, the system of biodiversity conservation encompasses a number of interrelated, fundamental challenges it is designed to address. These challenges deal with, among others, interpretation of ecosystem formation mechanisms; evolution of the living organisms communities and their historical turnover during the succession; reaction of individual components of a biological system to external impacts such as anthropogenic influence. The efforts to conserve biodiversity of the selected components thereof, rely on the approaches used for assessing the role of the areas in question. Thus, by recognizing the importance of the role of economic development within the local biodiversity formation process we also recognize that any anthropogenic impact represents a special, successional, unnatural mechanism that ushers a given natural the area into the general system of succession in a transformed way.

Our research targeted identifying the role the anthropogenically transformed areas play in maintaining rare bird species biodiversity at the Northern boundary of the taiga zone of Europe.

2. The region under study, materials and methods

This article presents an analytical review the field ornithological studies undertaken by the authors during 2003-2018 in the north-western part of Murmansk Region. It features the materials published previously [1, 2, 3, 4, 5, 6] and archived materials. During the years indicated, the territory of Pasvik Nature Reserve, as well as the areas adjacent to it on the North, East and South, the parts of the Pechenga Sistrict between settlements of Pechenga and Prirechny, received careful investigation.

The territory of Pechenga District combines natural and transformed areas. The largest among the transformed areas are mining areas, dump sites, sludge pits, clear cut blocks, overgrown agricultural fields, quarries, and those of the existing and former settlements. The valley of the Pasvik River takes...
up a large area and has been transformed greatly. The flow off of this river is regulated by dams operated by hydroelectric stations. The line structures are represented by roads and railways, lines of communication and power lines, engineering and technical structures [1, 7].

Generally, the territory of this district represents a mosaic of natural ecosystems, which are fragmented heavily as a result of anthropogenic impact.

3. Results
Undoubtedly, the biological diversity of the natural areas under study is higher than that of all other sites transformed by man previously. However, the lack of knowledge about the role the anthropogenically-modified areas play in the formation of local biodiversity leads to their importance being underestimated and excluded from the whole system of biodiversity conservation. Despite the fact that the current approaches to dealing with such important challenges as biodiversity maintenance and conservation of valuable rare species do constitute the relevant conception, they seem to remain unimplemented. The current conservation conception very often fails to account of certain types of areas (for example, developed areas). Nor does it consider any direct or indirect impact of the developed areas on adjacent natural areas and their level of biodiversity. The majority of the systems responsible for protected natural areas conservation do not account of agricultural areas, industrial areas (landfills, dumps, sludge pits and quarries), linear structures (roads, power lines, main gas and oil pipelines), centers of population and other developed areas.

Thus, it is presently impossible to provide any comprehensive evaluation of the importance of different types of developed areas in biodiversity conservation efforts in certain parts of the region. This leads to lacking understanding of the fundamental processes of settling by living organisms of the transformed ecosystems, as well as of how these ecosystems evolve and what role they play in maintaining the overall biodiversity. In particular, it is unclear whether an area in use or previously used by a community should be recognized as a part of biodiversity conservation system? What function does such an area have? Is it involved directly in conservation of a certain species (group of species) or does it help preserve it in the surrounding natural area?

The so far conducted research [1, 3, 4, 5] shows that the rare bird species inhabiting the northern taiga zone of Europe may can be divided into several groups. The first group can be native species that are rare in their natural habitats and do not occur on anthropogenically-transformed areas. The second group could be native species that are rare in natural ecosystems but are increasing in number due to settling in anthropogenically-transformed areas. The third group could be species which are untypical of the natural ecosystem of a given area and introducing themselves, gradually, anthropogenically-transformed and the areas adjacent to them. The fourth group could be rare species occurring on a given area only occasionally. As can be seen from this classification, not all of the rare bird species occurring on the northern border of the taiga zone, are able to inhabit anthropogenically-transformed areas.

The rare indigenous species that use developed areas include Greylag Goose Anser anser, Common Crane Grus grus, Northern Shoveler Anas clypeata, Peregrine Falcon Falco peregrinus, Common Kestrel Falco tinnunculus, Great Grey Owl Strix nebulosa, Great Grey Shrike Lanius excubitor, and Sedge Warbler Acrocephalus schoenobaenus. Occurring in the natural areas of the district under study, Greylag Goose and Common Crane tend to inhabit vast wetlands, while during spring and autumn migrations they might make stops on agricultural fields. Northern Shoveler occurs on vast ranges of shallow waters overgrown by aquatic vegetation, tending also to inhabit fields with dense network of soil reclamation canals on developed territories.

While Common Kestrel, Great Grey Owl, and Great Grey Shrike tend to hunt in shrubs-free field, Peregrine Falcon in towns. Sedge Warbler tends to inhabit overgrowing former fields. A more numerous group introducing themselves into local ecosystems, primarily into anthropogenically-transformed areas.

The agricultural areas are inhabited by Hen Harrier Circus cyaneus, Stock Pigeon Columba oenas, Common Wood-Pigeon Columba palumbus, Sky Lark Alauda arvensis, Garden Warbler Sylvia borin,
Whinchat Saxicola rubetra, European Robin Erithacus rubecula, and Yellowhammer Emberiza citrinella, some of these species occurring also in natural ecosystems.

The vast upland swamps are inhabited by Hen Harrier, Sky Lark and Whinchat. Garden Warbler occurs in birch forests in the valleys of rivers and streams and in mountainous areas in the zone of birch forests. European Robin occurs in dense, coniferous-broad-leaved forests in valleys of rivers and streams. Smaller towns and the vicinities of the abandoned settlements are inhabited by Spotted Woodpecker Dendrocopos minor, Barn Swallow Hirundo rustica, Eurasian Jay Garrulus glandarius, Common Chiffchaff Phylloscopus collybita, European Robin, Long-tailed Tit Aegithalos caudatus, Chaffinch Fringilla coelebs, European Greenfinch Chloris chloris and Yellowhammer. Recently, the majority of these species, with exception of Barn Swallow and Yellowhammer, have been spotted also in natural conditions – in mixed forests in river valleys.

The analysis of distribution of the species that are untypical of the Northern areas [1, 2, 3, 4, 5, 6] allows identifying stages in their settlement within indigenous ecosystems. The birds inhabiting open ecosystems first tend to settle on cultivated agricultural lands before spreading into upland grassy swamps, while the species typically occurring in trees and shrub vegetation first tend to inhabit smaller towns, abandoned settlements and their vicinities before spreading into the transformed areas along roads, clearances, and other linear objects. In the next stage of their distribution, birds tend to inhabit deciduous and mixed forests in the valleys of small river and streams, and, later, the adjacent natural areas. However, not all of the bird species that are introducing themselves into the ecosystems of the North, will be able to find their place in the natural environment. For instance, Rock Pigeon Columba livia and House Sparrow Passer domesticus live in the cities year-round and do not occur outside of populated areas. Similarly, Common Wood-Pigeon Columba palumbus and Stock Pigeon Columba oenas inhabit agricultural areas and are unlikely to be inhabit the areas outside of anthropogenically-modified ones.

4. Conclusions
Therefore, the developed Northern areas serve as an important part of the evolution of local biodiversity systems. Some of them (for instance, agricultural areas) have the structural and functional characteristics that cannot be found in any of the indigenous ecosystems. Created or developed by humans, such areas become inhabited by a smaller number of local species that are typical of the natural ecosystems of the North, serving also as homes to a multitude of “new” species that are untypical of the local environment. For these “new” species the anthropogenically-modified areas often serve as habitats from which the species distribution starts.

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