Nat. Volatiles & Essent. Oils, 2021; 8(4): 7918-7937

NVEO
Natural Volatiles &
Essential Oils

Contemporary Changes In Bird Fauna And Community In Northeast European Russia

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Abstract

The present study is based on relevant publications and the research results of bird population and its distribution in more than 40 locations in the region. 258 bird species from 16 orders were noticed during the research period on the continental part. There are two stages in ornithofauna studies: Stage 1 (1875-1930, 201 species) and Stage 2 (1946-present 255 species). The main changes in fauna and bird population are associated with climatic condition, anthropogenic influence and natural dynamics of areas. The climatic warming leads to changes in migration periods and to increased sedentary level for some species. Agricultural development, intensive forestry, growing urbanization and related landscape changes made species shift to the north even though their usual habitats used to be southern and western regions. Ecological structure is simplified at the extreme stages of anthropogenic landscape transformation (urbanization, deforestation at the young succession stages, farming). Decrease of native taiga habitat and increase of recreation impact reduce the quantity of birds ecologically connected with secondary forest (grouse, raptors, tits, crossbills and others). Only three species (Perdix perdix, Melanocorypha leucoptera and Anthus gustavi) no longer exist in the research area.

Keywords: birds, changes in species diversity, influence of natural and anthropogenic factors, European North-East

Introduction

The natural area dynamics and the anthropogenic influence on the natural ecosystems lead to the changes in the biocenosis. Natural landscapes of the European Northeast of Russia underwent a significant transformation, and this influenced the evolution of ornithofauna and its populations. The principle changes in the fauna and the population of birds speak of the influence of economic development on the territory, and forestry, urbanization, agricultural development, extraction and transportation of mineral resources are among the most essential factors here. Climate change is of importance as well. All this leads to the variation in the structure of the communities (species composition, population number, and ecological structure parameters).

Numerous studies focus on changes in the fauna and population of birds under the influence of climate and

various forms of economic activity in Europe (Nelson_et_al, 2016; Hanzelka et_al, 2019; .Koleček et_al, 2020; etc.). At the same time, these works indicate that climate change is hardly the only factor determining the direction of shifts in species density – species-specific characteristics and human land use also influence such changes (Lehikoinen and Virkkala, 2016).

The role of animals is crucial in the ecosystems since fauna is an essential component of all the habitats, even the most disturbed ones. The birds as the large group of species diversity among the vertebrates of anthropogenic landscapes take one of the main positions. The advantage of investigating bird communities in natural and anthropogenic landscapes is that communities speak of huge diversity of their ecological groups, being high indicators and thus possible to be used in any ecological research. Anthropogenic habitat has an ornithogeographical autonomy with reference to the region. However, the fauna of the region with its specification can have a mutual influence. In this case, the most essential method (while studying bird communities of anthropogenic landscapes) for indicating the peculiarities of ornithocomplexes interaction is parallel studies of the regional fauna and that of the territories being transformed by economical activity (Mulsow, 1982; Bezzel, 1985, Ilichov, Fomin. 1988, Konstantinov, 2002).

The present study aimed to examine the main trends of changes in the species diversity and in bird communities of the region.

1. Study area, materials and methods

Data from literature sources (starting from 1875) and modern researches on abundance and distribution of birds in more than 40 locations of the Northeastern European part of Russia makes the basis for this work (Figure 1).

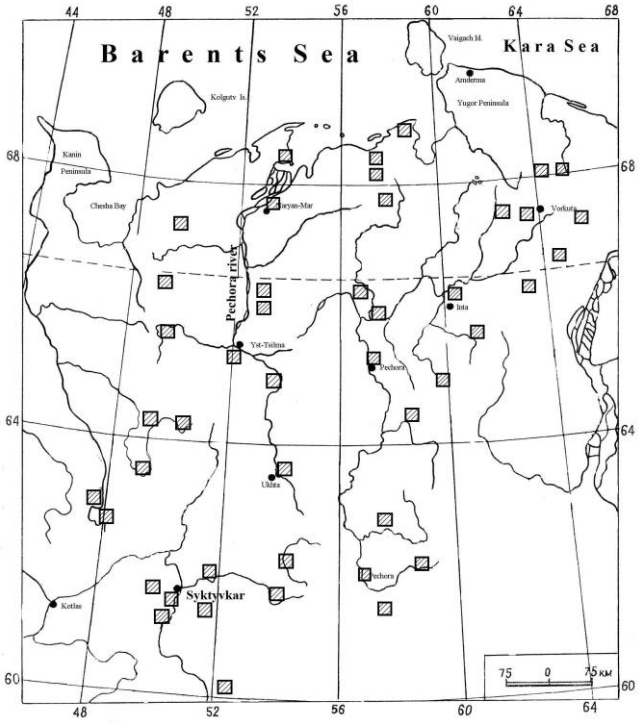

Fig. 1. The main data collected points.

Identification of species, their numbers and status of their stay were carried out using generally known field research methods (Kuzyakin, Rogachova, Ermolova, 1958; Naumov, 1965, Ravkin, 1967). To determine the changes which happen in the communities of birds under the influence of economical activities, the data on the structure of bird communities in the intact (including virgin forests) (n=47, length of routes 750 km), semi natural, including yang-middle forests stands, agriculture landscapes, suburban areas (n=40, length of routes 505 km) and urban habitats (n=45, length of routes 520 km) was analyzed. The fauna types are cited according to Schtegman (1938). The data on bird figures was entered and processed in the database of collective users of the Biological Institute of the Siberian Division of RAS (the city of Novosibirsk).

2. Results

At present, the European North-East research on ornithology (Andreev, Bianki, 1910; Dmokhovsky, 1933; Portenco, 1937; Teplova, 1957; Gladkov, 1962; Uspenskiiy,1965; Rubinschtein, 1976; Estafiev,1977, 1981, 1984, 1989; Lobanov, 1978; Danilov, 1982; Demetriades, 1983, 1985; Kochanov, 1983, 1987, 1992; Mineev, 1987; Morozov,1987, 1989; Estafiev, Mineev, Voronin et al., 1995; Estafiev, Mineev, Kochanov et al., 1999, Seebohm, 1880) shows that the continental part of the region was inhabited by 258 bird species from 16 modern orders identified within these 2 time intervals. 200 species belonging to 14 orders occurred at Stage 1 (with an increase due to the appearance of Coconiformes and Coraciiformes), and up to 255 species at Stage 2 (Table 1).

Table 1 Representation of orders of the birds (breeding birds) marked in the study areas

Orders	Years			
	1875–1930		1946–2005	
	n	%	n	%
Gaviiformes	2	1	3	1.2
Podicipediformes	1	0.5	5	2
Ciconiformes	0	0	5	2
Anseriformes	25	12.5	32	12.5
Falconiformes	17	8.5	18	7
Galliformes	6	3	7	2.7
Griuformes	3	1.5	5	2
Charadriiformes	37	18.5	44	17.2
Columbiformes	3	1.5	5	2
Cuculiformes	2	1	2	0.8
Strigiformes	8	4	10	4
Caprimulgiformes	1	0.5	1	0.4

Apodiformes	1	0.5	1	0.4
Coraciiformes	0	0	2	0.8
Piciformes	5	2.5	7	2.7
Passeriformes	90	44.5	108	42.3
Total:	201	100	255	100

Compared with the beginning of the XX century, the modern day representation grows, ranging from 1 to 18 species. For instance, with Falconiformes, the number of species went up from 17 at the beginning of the century to 18 at its end. The most significant increase was observed with Passeriformes (from 90 to 108), while with other orders (Anseriformes and Charadriiformes), the rise amounted to 7 (from 25 to 32 and from 37 to 44, respectively). At present, grey partridge (P. perdix), white-winged Lark (M. leucoptera) and Pechora Pipit (A. gustavi Swinh.) no longer exist in the research area.

The comparison of ornithofauna according to the main centers of their origin shows that the bird diversity in the region increased, first of all, due to the widespread and European species and then due to Siberian and Arctic species (Table 2).

Table 2. The changes of composition of bird fauna of the European North-East of Russia (types of fauna according to Schtegman, 1938)

Geographo-genetic type of bird fauna	Years			
	1875-1933		1946-2005	
	n	%	n	%
Artic	35	17.5	43	16.9
Siberian	46	23	56	22
European	34	17	58	22.7
Mediterranean	1	0.5	2	0.8
Chinese	3	1.5	4	1.5
Turkestanian	1	0.5	1	0.4
Tibetian	1	0.5	1	0.4
Transpalearctic	79	39.5	90	35.3

At the end of the 19th – beginning of the 20th centuries the status of numerous species was 23, of common 77 species and of rare 43 species in the region (Appendix 1). The 4 species (Mareca, Anas acuta, Larus marinus, Emberiza aureola) previously in the numerous group are now common. On the other hand, the status of many common birds is changed: 6 species (Turdus pilaris, Poecile montanus, Fringilla montifringilla, Loxia, Corvus cornix and Pica pica) became numerous, and 11 species (Cygnus columbianus

bewickii, Pandion haliaetus, Falco rusticolus, Falco peregrinus, Haliaeetus albicilla, Coturnix coturnix, Grus grus, Tringa erythropus, Arenaria, Bubo bubo, Bubo scandiacus) became rare. At present 21 of the 43 rare species (Spatula querquedula, Anas platyrhynchos, Spatula clypeata, Milvus migrans, Crex crex, Porzana porzana, Vanellinae, Numenius phaeopus, Columba palumbus, Columba livia, Caprimulgidae, Alauda arvensis, Hirundinidae, Turdus viscivorus, Parus major, Sitta, Emberiza citrinella, Fringilla coelebs, Sturnidae, Corvus frugilegus, Garrulus glandarius) are common and even numerous species in some habitats.

While researching the ornithofauna, the appearance and enlargement of the area to the north was noticed in 30-40s of the 20th century for such species as Streptopelia turtur, Numenius arquata, Turdus atrogularis, Prunella atrogularis and Falco vespertinus, in 50-60s for Anthus hodgsoni Richm., Columba oenas, Chroicocephalus ridibundus, Hydrocoloeus minutus, Podiceps cristatus, Mareca strepera, Podiceps auritus, Podiceps nigricollis C.L.Brehm, Ardea cinerea, Upupa epops, Picus canus Gm., Ficedula hypoleuca, Locustella naevia Bodd., Hippolais icterina Vieill., Zoothera aurea, Troglodytes troglodytes, Melanocorypha leucoptera, and Anser anser.

Later, in 70-80s Netta rufina, Cygnus olor, Fulica atra, Calidris canutus, Gallinago stenura, Strix aluco, Asio otus, Luscinia calliope, Phylloscopus inornatus Blyth., Ficedula parva Bechst., Coccothraustes coccothraustes, Carduelis carduelis, Luscinia luscinia, Circus aeruginosus, Limosa limosa, Lophophanes cristatus, Cyanistes caeruleus, Iduna caligata, Locustella lanceolata Temm., and Chloris chloris were detected; some species were noticed randomly. Until 1960s, ornithofauna researches were large-scale, therefore, certain species, especially the ones common in the Urals and the extreme North-East of the region, were not registered before.

3. Discussion

3.1. Climatic changes.

The analysis of meteorological data shows that contemporary climate warming is well-defined in the Arctic and especially Subarctic latitudes (Pavlov, Ananjeva, 2004). In the European North and in the North-East, the climate warming is not pronounced (up to 0.5-0.7ºC). These regions are characterized by the least trends of contemporary air temperature increase – 0.06-0.08ºC/year. While analyzing the data on temperature changes over the year (1888-1940 and 1941-1993), two periods of air temperature increase and decrease can be distinguished, and starting in the third decade of May until the end of November, the decline in the air temperature is observed (Brattsev, 2011) – accumulated temperature drops by 79 ºC. This time interval covers the whole vegetation period; air temperature tends to go up in winter and early spring (accumulated temperature increase is 86 ºC).

It is known that an increase in the ambient temperature of migratory birds is associated with earlier arrival to breeding sites, which allows for earlier breeding and leads to an increase in their numbers and

changes in their habitats (Gienapp et al. 2007; Lehikoinen and Sparks 2010; Pearce-Higgins et al. 2014; Koleček et al. 2020, etc.).

Thus, some bird species changed the period of their spring arrival. For example, in 1951-1955 the average arrival date in Syktyvkar was the 31st of March (Nature of Syktyvkar and its environs, 1972), while in 2001-2005 it was the 16th of March. The wintering ground boundaries were removed to the north (C. cornix, C. frugilegus, Passer montanus, etc.) more than 400 km. The degree of sedentary for some species increased (the part of populations of Sturnus vulgaris, C. frugilegus and E. citrinella wintering in the neighborhoods of Syktyvkar). All new species recorded in the region since the beginning of the twentieth century have expanded their habitat, mainly in the north-east direction.

3.2. Forestry.

For the last 60 years, about 1.5 billion m^3 of timber was cut down on the area of 14-15 million ha (Obuhov, Larin, 2000). That makes almost half of the area of the Komi Republic, which is covered with forest (29 million ha) (Table 3).

Table 3 **Quantity indicators of deforestation, millions of hectares (data from Obuxov, Larin, 2000)**

Age	Years			
	1950	1961	1997	2003
up to 40 years	1.4	2.6	4.5	4.5
40-60 years	1.6	1.6	4.5	4.6
60-80 years	2.0	1.1	1.4	1.4
more than 100	19.8	21.8	18.4	18.3

Almost all the southern and central areas have sites of continuous and concentrated deforestations (fig. 2). The role of young growths and deciduous trees has increased more than three times during this period. This secondary southern type forest developed in the regions of intensive forestry turned out to be the reason of new bird species development, common in southern and western areas.

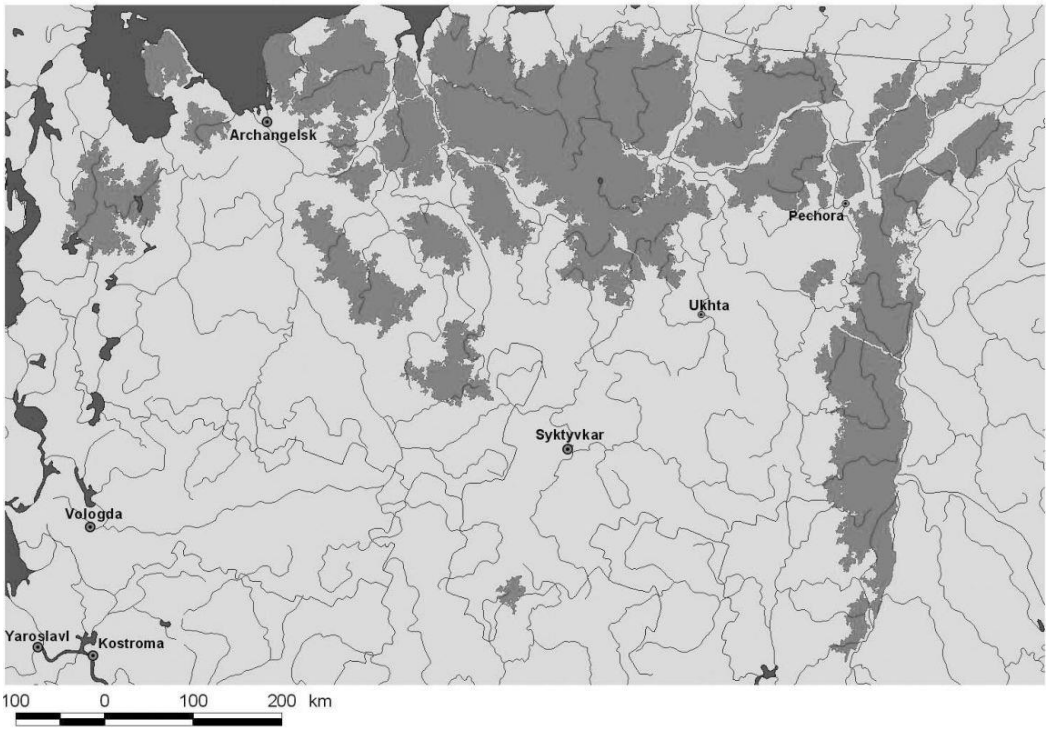

Fig. 2. Intact forest landscapes in study area (data from Acsyonov D.E., Dobrynin D.B., Dubinin M.Y., et al., 2003)

Changes in the configuration, composition, and volume of mature forest cover can have serious consequences for natural populations and communities (Rempel et al. 2007). Research on the impact of forest management on the environment shows that the conversion of habitat to forestry can be an important factor in changes in bird communities, it is established that as the forest cover decreases in the landscape, the communities and dominant species (Corkery et al. 2020), and in some cases, habitat loss may explain the decline in the number of P. montanus observed in Finland in recent decades Siffczyk et al. 2003).

Quantitative analysis of bird communities shows that the change of forest structure and its age influences the diversity and density of the bird population. Continuous deforestation in the large areas deeply decreases not only the species diversity but the common biomass and energy transformed by birds (Anufriev, 1987, 1989; Kochanov, 1987, 1996). During the secondary successions the change of quantitative index of population has a common trend applied to the taiga zone of the European North. Bird species population and their composition increase from the recent deforestation through the young growths to the secondary deciduous forest.

Succession stages were characterized by a higher number of bird species of young forest (like Phylloscopus trochilus), but after 15 years the density of this species decreased strongly. Densities of species such as F. montifringilla and Phylloscopus borealis were low in forests of less than 15 years of age and had larger densities in 50-100 or 200-year-old forests (Kochanov et al. 2004).

3.3. Urbanization.

Urbanization is an extreme variant of the impact on bird community (Mulsow, 1982). The urban gradient (from natural to urban areas) of the bird communities shows a clearly defined tendency towards the increase of the population (fig. 3), but at the same time the diversity of bird species is decreasing significantly (fig. 4).

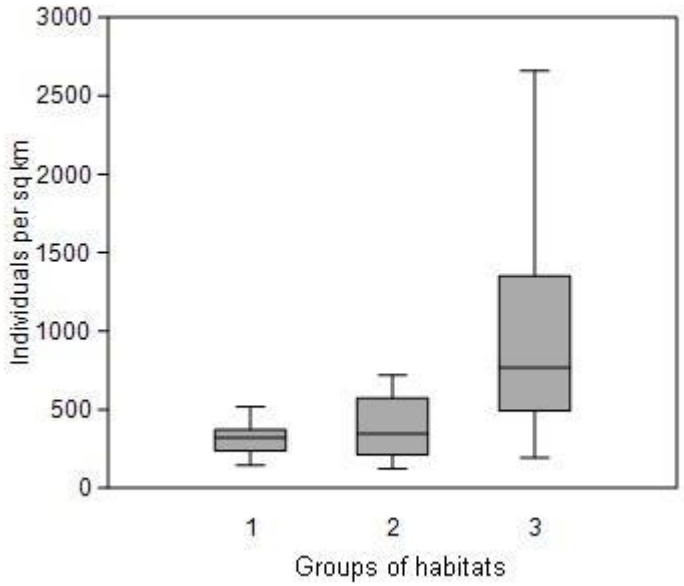

Fig. 3. Density of bird communities in the intact (1), semi natural (2) and urban (3) habitats

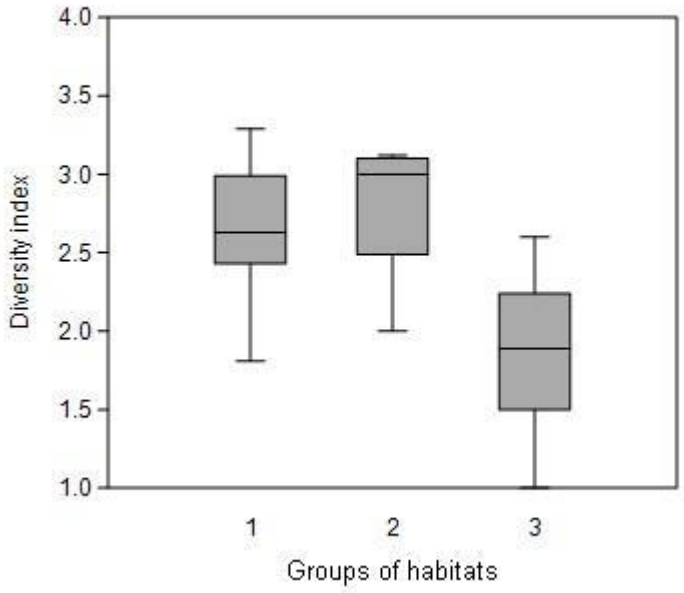

Fig. 4. Diversity index of bird communities in the intact (1), semi natural (2) and urban (3) habitats

The infringed mosaic habitats can influence the attraction of different groups of birds and improve the general diversity of the regional fauna (which could be typical for suburban zones of the region). The mosaic increase and creation of new habitats, non-typical for the north taiga zone, fostered the representatives of mixed and larch forests moving to the north. The virgin habitats show, on the average basis, the great species diversity of typical taiga bird communities. There is an insignificant decrease in the average value of these indices with regard to the natural and anthropogenic habitats. In some cases (Figure 5), the upper figures even surpass these indices in the natural biotopes. This means that moderately infringed and especially mosaic habitats can attract the bulk of the birds. A relatively sharp decline in the indices of species diversity of bird communities is typical for urban zones and results both from the decrease of species selection in communities and from the low population figures of the majority of species in their habitats.

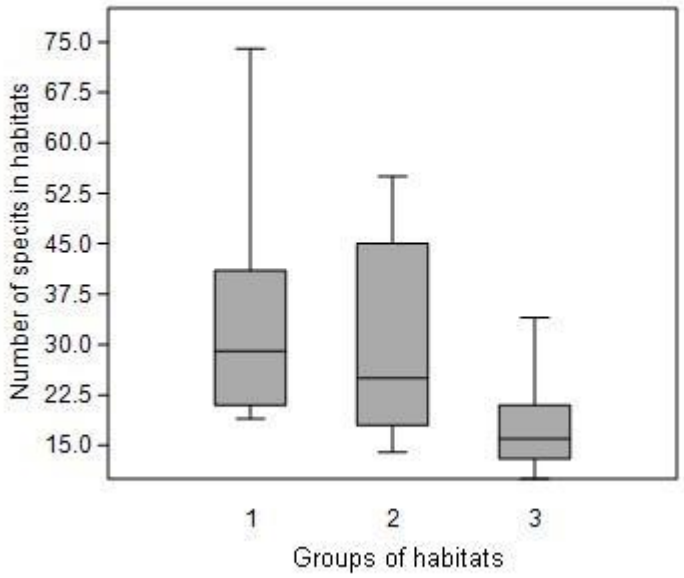

Fig. 5. Number of bird species in communities in the intact (1), semi natural (2) and urban (3) habitats

The calculation results show that the majority of indices of summer bird population have the differences in maximum adequacy while comparing the bird communities of intact and semi natural habitats with urban habitat (Table 4).

Table 4 Adequacy of qualitative and quantitative indices of summer bird population in the intact (1), semi natural (2) and urban (3) habitats

(according to Student index (T-test)

Indices	Compared pairs		
	1/2	1/3	2/3
	0.951520	**0.000130**	**0.000050**
Numbrt of species			
Density	0.092890	**0.000005**	**0.000270**
Diversity index (Sheenon, 1949)	0.601485	**0.000005**	**0.000001**

According to the data on abundance and distribution of 160 bird species, the authors of the present study determined (Figure 6) that approximately 40% of birds decrease their quantity when anthropogenic influence increases. Among these 70% are Passeriformes, 43% are sedentary and 46% are Siberian species, and 60% of all bird abundance in the tundra zone are Arctic species.

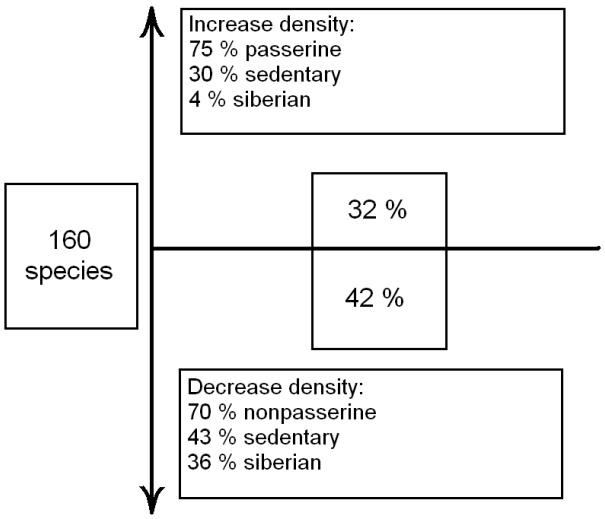

Fig. 6. The tendency of the population changes of birds according to the urban gradient

However, 30 % of species give positive response to anthropogenic changes and, thus, increase in abundance. 75% of Passeriformes and 30% of sedentary represent the latter group. At the same time, the ratio of parameters of ecological community structure changes. Rejuvenation of forest (as a result of clear cutting and selective logging) and agricultural land use cause decrease in bird species that inhabit mature forests and nest on branches and in cavities in trees, although the number of species nesting on ground and in shrubs goes up. Increased mosaic and creation of uncommon habitats for taiga bird species promotes irruption to the North of typical representatives of mixed and deciduous forests.

3.4. **Agricultural development**

In Europe, farm bird populations declined markedly during the last quarter of the 20th century, posing a serious threat to biological diversity (Donald et al., 2001, 2002). At the same time, it is argued that organic farming is a way to counteract the decline in agricultural land biodiversity (Hole et al., 2005). In Finland, bird diversity declined since the 1970s due to changes in agricultural land use (Rintala & Tiainen, 2007; Laaksonen & Lehikoinen, 2013). In the UK, land-use changes are more important factors affecting agricultural bird species than climate factors (Eglington & Pearce-Higgins, 2012).

The beginning of the active agricultural development of the territory started in the 17th century. The prosperity of its development came in 1990s when the crops of perennial herbs were planted even in tundra (in the neighborhoods of Vorkuta). At that time the sown area comprised 100510 ha. Agricultural development promoted the shift of some bird species to the north. The reason for P. perdix having been widely spread in southern areas until 1960s was the cultivation of wheat and rye crops. Afterwards, wheat and rye were no longer planted, and P. perdix disappeared (Ostroumov, 1972). C. palumbus, Vanellinae and A. arvensis settled up to the area of Vorkuta and Inta. S. turtur, C. oenas, Oriolus oriolus, I. caligata and others became common in the southern areas (Kochanov, 1992). An abrupt decrease of sown area was registered after 1990s. At present, the sown area is accounted for 55200 ha; this affected the population and distribution of numerous species associated with agrolandscapes. A significant decrease of Columbidae and an increase of Scolopacidae and Laridae was registered in the research site located in the suburb of Syktyvkar during the research period (Table 5).

Table 5 Population (individuals per sq. km) of some birds in agrolandscape

	1990.	2005
Columba palumbus	4.5	1.5
Streptopelia turtur	9	-
Columba oenas	0.5	-
Limosa limosa	-	3
Larus canus	2	8
Tringa totanus	-	0.5

The main reason of the decrease of pigeon population is a 65% reduction of bean-oats crops which are used as nourishment by these species. The increase in the number of waders and gulls is associated with both the expansion of their ranges and the development of new territories suitable for breeding (Table 5).

3.5. Natural dynamics of ranges

Apart of changes in fauna and bird population associated with climatic and anthropogenic factors there is a natural bird population dynamics and the dynamics of areals, associated with genetic mechanisms inside the population (Mayr, 1963; Levontin, 1974). A way for species to provide their existence is to enlarge their areal. The evolution of each species has the periods of population increase and enlarging the area, and then its decrease. The best examples of population dynamics are the species settling from the East where temperature changes are more significant and the anthropogenic influence is less than in the West; these species are E. aureola, Prunella montanella, G. stenura. The first species reached Fennoscandia during the last century, other species reached the extreme North-East of the region (the western border went along the area of Vorkuta and Inta) up to the delta of the Pechora (The EBCC Atlas of European Breeding Birds..., 1997).

Conclusion

Based on the literature and modern data, the main changes in the fauna and population of birds in the European North-East of Russia since the end of the XIX century are analyzed. It has been established that these changes are associated with both changes in climatic conditions and with anthropogenic impact, as well as with the natural dynamics of the habitats. Climate change (warming) leads to a change in the timing of migrations and an increase in settlement of a number of species. Agricultural development, intensive forest management, expanding urbanization and the associated changes in the appearance of the territory contributed to the northward movement of species that were previously characteristic of more southern and western regions. Extreme variants of anthropogenic transformation of landscapes (urbanization, deforestation at early successional stages, row farming) reduce species diversity and simplify the ecological structure. Due to the reduction of indigenous taiga habitats and increased recreational loads, the stock of birds that are ecologically associated with mature forest formations (black grouse, large raptors, tits, crossbills, etc.) is decreasing.

Acknowledgements: The works carried out the state assignment No. AAAA-A-17-117112850235-2

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Appendix 1

Abundance of birds in 1875-1930

Species		
Common	Very common and numerous	Rare
Red-throated loon (Gavia stellata (Pontopp.))	Black-throated diver (Gavia arctica (L.))	Slavonian grebe (Podiceps auritus (L.))
Bewick's swan (Cygnus bewickii Yarr.	Wigeon (Mareca Penelope L.)	Mallard (Anas platyrhynchos L.)
Taiga bean goose (Anser fabalis (Lath.))	Pintail (Anas acuta L.)	Garganey (Spatula querquedula L.)
Teal (Anas crecca L.)	Long-tailed duck (Clangula hyemalis (L.))	Shoveler (S. clypeata L.)
Tufted Duck (Aythya fuligula (L.)	Willow grouse (Lagopus lagopus (L.))	Black kite (Milvus migrans (Gm.))
Scaup (A. marila (L.))	Hazel grouse (Tetrastes bonasia (L.))	Corncrake (Crex crex (L.))
Velvet scoter (Melanitta fusca (L.)	Red-necked phalarope (Phalaropus lobatus (L.))	Spotted crake (Porzana porzana (L.))
Common scoter (M. nigra (L.))	Dunlin (Calidris alpina (L.))	Dotterel (Charadrius morinellus L.)
Goldeneye (Bucephala clangula (L.)	Long-tailed skua (Stercorarius longicaudus Vieill.)	Lapwing (Vanellus vanellus (L.))
Red-breasted merganser (Mergus serrator L.)	Great black-backed gull (Larus marinus L.)	Curlew sandpiper (Calidris ferruginea (Pontopp.))
Goosander (M. merganser L.)	Citrine wagtail (Motacilla citreola Pall.)	Sanderling (C. alba (Pall.))
Osprey (Pandion haliaetus (L.)	Pied wagtail (M. alba L.)	Whimbrel (Numenius phaeopus (L.))
Goshawk (Accipiter gentiles (L.))	Red-throated pipit (Anthus cervinus (Pall.))	Black-tailed godwit (Limosa limosa (L.))
Sparrowhawk (A. nisus (L.))	Lesser whitethroat (Curruca curruca (L.))	Bar-tailed godwit (L.lapponica (L.))
Merlin (Falco columbarius (L.))	Willow warbler (Phylloscopus trochilus (L.))	Rock dove (Columba livia L.)
Gyrfalcon (F. rusticolus L.)	Chiffchaff (P. collybita (Vieill.)	Woodpigeon (C. palumbus L.)
Peregrine (F. peregrinus Tunst.)	Arctic warbler (P. borealis (Blas.)	Oriental cuckoo (Cuculus optatus)
Quail (Coturnix coturnix (L.))	Little bunting (Emberiza pusilla	Eurasian pygmy owl (Glaucidium

	Pall.)	passerinum (L.))
Common crane (Grus grus (L.))	Yellow-breasted bunting (E. aureola Pall.)	Great grey owl (Strix nebulosa J.R.Forst.)
Grey plover (Pluvialis squatarola (L.))	Lapland bunting (Calcarius lapponicus (L.))	Ural owl (S. uralensis Pall.)
Golden plover (P. apricaria (L.))	Snow bunting (Plectrophenax nivalis (L.))	European nightjar (Caprimulgus europaeus L.)
Ringed plover (Charadrius hiaticula L.)	Common redpoll (Acanthis flammea (L.))	Lesser spotted woodpecker (Dryobates minor (L.))
Oystercatcher (Haematopus ostralegus L.)	Tree sparrow (Passer montanus (L.))	Skylark (Alauda arvensis L.)
Wood sandpiper (Tringa glareola L.)		Swallow (Hirundo rustica L.)
Greenshank (T. nebularia (Gunn.)		Pechora pipit (Anthus gustavi Swinh.)
Spotted redshank (T. erythropus (Pall.))		Siberian accentor (Prunella montanella (Pall.))
Common sandpiper (Actitis hypoleucos (L.))		Black-throated accentor (P. atrogularis (Brandt))
Turnstone (Arenaria interpres (L.))		Dunnock (P. modularis (L.))
Ruff (Philomachus pugnax (L.))		Red-flanked bluetail (Tarsiger cyanurus (Pall.))
Little stint (Calidris minuta (Leisl.))		Black-throated thrush (Turdus atrogularis Pall.)
Temminck's stint (C. temminckii (Leisl.))		Mistle thrush (T. viscivorus L.)
Great snipe (Gallinago media (Lath.))		Blyth's reed warbler (Acrocephalus dumetorum (Blyth))
Common snipe (G. gallinago (L.))		Great tit (Parus major L.)
Arctic skua (Stercorarius parasiticus (L.))		European nuthatch (Sitta europaea L.)
Common gull (Larus canus L.)		Eurasean treecreeper (Certhia familiaris L.)
Glaucous Gull (L. hyperboreus		Yellowhammer (Emberiza

Gunn.)		citrinella L.)
Cuckoo (Cuculus canorus L.)		Chaffinch (Fringilla coelebs L.)
Eagle owl (Bubo bubo (L.))		Linnet (Linaria cannabina (L.))
Hawk owl (Surnia ulula (L.))		Parrot crossbill (Loxia pytyopsittacus Borkh.)
Short-eared owl (Asio flammeus (Pontopp.))		Common starling (Sturnus vulgaris L.)
Swift (Apus apus (L.))		Eurasian jay (Garrulus glandarius (L.))
Black woodpecker (Dryocopus martius (L.))		Eurasian nutcracker (Nucifraga caryocatactes (L.))
Great spotted woodpecker (Dendrocopos major (L.))		Rook (Corvus frugilegus L.)
Three-toed woodpecker (Picoides tridactylus (L.))		
Shore lark (Eremophila alpestris (L.))		
Sand Martin (Riparia riparia (L.))		
Yellow wagtail (Motacilla flava L.)		
Tree pipit (Anthus trivialis (L.))		
Meadow Pipit (A.pratensis (L.))		
Redstart (Phoenicurus phoenicurus (L.))		
Whinchat (Saxicola rubetra (L.))		
Stonechat (S. rubicola (L.))		
Northern Wheatear (Oenanthe oenanthe (L.))		
Fieldfare (Turdus pilaris L.))		
Song thrush (T. philomelos C.L.Brehm)		
Sedge warbler (Acrocephalus schoenobaenus (L.)		
Greenish Warbler (Phylloscopus trochiloides (Sund.))		
Goldcrest (Regulus regulus (L.))		

Long-tailed tit (Aegithalos caudatus (L.)		
Willow tit (Poecile montanus Bald.)		
Siberian tit (P. cinctus Bodd.)		
Rustic bunting (Emberiza rustica Pall.)		
Reed bunting (E. schoeniclus (L.)		
Brambling (Fringilla montifringilla L.)		
Hoary redpoll (Acanthis hornemanni (L.)		
Common rosefinch (Carpodacus erythrinus (Pall.)		
Pine grosbeak (Pinicola enucleator (L.))		
Crossbill (Loxia curvirostra L.)		
White-winged crossbill (L. leucoptera Gm.)		
Eurasian bullfinch (Pyrrhula pyrrhula (L.)		
House sparrow (Passer domesticus (L.)		
Siberian jay (Perisoreus infaustus (L.)		
Magpie (Pica pica (L.)		
Hooded crow (Corvus cornix L.)		
Raven (Corvus corax L.)		