

Comparative chorological analysis of the avifauna of the forest-steppe mountains of Southern Siberia and Central Siberia in summer

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Abstract. The article provides a chorological analysis of the avifauna of the forest-steppe using the example of the Khentei-Chikoy upland in the mountain region of Southern Siberia. In terms of comparison with the neighboring region of Central Siberia, a system of chorological approach is used, which has proven itself in the analysis of the avifauna of Northern Eurasia, including Central Siberia [1]. In the course of the analysis, the types of habitats and the zonal-landscape affiliation of the avifauna of the region of the mountains of Southern Siberia were determined in comparative terms with the avifauna of Central Siberia. General chorological characteristics are in many ways close to those of Central Siberia, but have their own differences and features.

1 Introduction

Issues of arealogy (chorology) have always been relevant for zoogeographical research. For a long time, ornithology has used faunal analysis to determine whether the birds being studied belong to a particular type of fauna, in order to generally determine, among other things, their origin, range and distribution [2-7]. Modern chorological analysis provides a more accurate approach to determining the ranges of birds. For each bird, in this regard, its range is briefly described as belonging to one or another zoogeographical type of range and landscape affiliation [8-11]. The purpose of the study is to determine which birds of which habitats and zonal-landscape affiliation form the avifauna of the forest-steppe in one of the regions of the mountains of Southern Siberia in comparison with data on the chorology of the avifauna of Central Siberia.

2 Materials and methods

Studies of the avifauna of the forest-steppe in the south of Eastern Transbaikalia, as a part of the region of the mountains of Southern Siberia, were carried out using the example of the Altano-Kyrin intermountain steppe basin (900-1000 m above sea level) on the eastern outskirts of the Khentei-Chikoy upland (49°35'53.1"N 111 °54'38.7"E).

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The key area of the forest-steppe included such typical habitats as a settlement (the village of Kyra), steppes of the Daurian type with small reservoirs, a steppe lake and its coastal zone, a section of the Kyra River and a birch-larch-poplar floodplain with shrubs and steppe glades. Population counts were carried out in the summer from the beginning of May to the end of August 2023. To collect data, the route accounting technique was used [12]. Counts were carried out every half month at a rate of 5 km in several approaches.

Chorological analysis in the south of Eastern Transbaikalia was carried out for the first time. This makes it possible to understand the arealological formation of the avifauna of a given region. A comparative analysis of the avifauna of the forest-steppe region of the mountains of Southern Siberia was carried out in comparison with data on the forest-steppe of Central Siberia [1]. Both geographic regions are in contact in the south, where they have similar physical and geographical conditions, which makes it possible to determine the similarities and differences in the areal composition of the avifaunas of the two bordering regions.

Chorological analysis was carried out on the basis of the hierarchical chorological classification of V.S. Zhukov. [1, 11-14]. With this approach, the most important element of chorological analysis is the determination of habitats in accordance with zoogeographical zoning and simultaneously with zonal-landscape typology. The name of the species corresponds to the list for Northern Eurasia. The order of presentation of species in the text corresponds to their representation in the chorological classification according to the order of analysis [1].

3 Results

A chorological analysis of the avifauna of the forest-steppe in the south of Eastern Transbaikalia, as the eastern part of Southern Siberia, showed that this avifauna is formed by birds of various types of habitats and zonal-landscape occurrence. Comparative data with forest-steppe in Central Siberia are presented in Table 1.

Table 1. Comparative data on the chorology of the avifauna of the forest-steppe territory of the Khentei-Chikoy Highlands and Central Siberia.

Zonal-landscape location of the nesting area	Area									
	cosmopolitan and subcosmopolitan	Neogean-Arctogean	Palearctic-Palaeocean-Notogean	Palearctic-Palaeocean	arctogean					Total
					Holarctic	palearctic				
						translongitude-	western-	mid-	eastern-	
polyzonal	2[2]	[1]			2[2]	2[2]		[1]		6[8]
eoarctic									1[1]	1[1]
hemiarctic					[2]	1[1]			[1]	1[4]
hypoarctic					1[3]	2[7]			2[1]	5[11]
hypoarctic-temperature					[3]	[1]				0[4]
boreal-hypoarctic						2				2[0]
boreal					1[5]	4[10]	[2]	1[1]	7[9]	13[27]
hypoarctic-boreal						1				1[0]
boreo-montane					1[1]	[2]			1[1]	2[4]
temperamental				2[2]	2[2]	9[13]	2[15]	[3]	[6]	15[41]
temperature-subtropical			2[2]	6[9]	3[7]	13[21]	[11]		6[7]	30[57]
partially installed						1				1[0]
hypoarctic-temperature					2	2				4[0]
subboreal	1			[1]	1[2]	5[7]	[11]	1[6]	6[3]	14[30]
subtropical-subboreal						2				2[0]
mounted						1			1	3[0]
subboreal-subtropical	[1]		1[2]	2[2]			1	2[4]	2	8[9]
Total	3[3]	[1]	3[4]	10[14]	13[27]	45[64]	3[39]	5[15]	26[29]	108 [196]

Note: data for Central Siberia is indicated in brackets [].

4 Discussion

As can be seen from the table, the birds of the Arctogeon type of habitat are most represented in the formation of the avifauna in both cases, and representatives of the Holarctic and Palearctic subtypes are especially pronounced in it.

In quantitative terms, the number of species in Central Siberia exceeds the number of bird species in the mountains of Southern Siberia; in percentage terms, the difference is comparable. Accordingly, in Central Siberia and South - 1.5% and 3% are occupied by cosmopolitans, 2% and 3% by representatives of the Palearctic-Palaeogean-Notogaeon, 7% and 9% by representatives of the Palearctic-Palaeogean and 89% and 85% by Arctic types of habitats.

Following the widely represented species of the Arctogeon type of range, an important role also belongs to the Palearctic-Palaeogean type of range. Single representatives include cosmopolitans and subcosmopolitans, as well as the Notogean-Arctogeon and Palearctic-Palaeogean-Notogean types of habitats.

Cosmopolitans are expressed by the same number of species such as peregrine falcon, great cormorant and black-necked grebe. The only representative of the Notogey-Arctogeon type of habitat (short-eared owl) was recorded in Central Siberia, although this species is also found in the Khentey-Chikoy highland.

Representatives of the Palearctic-Palaeogean-Notogean type of habitat coincide in 3 species in both cases, these are the great grebe, the black kite and the coot.

The Palearctic-Palaeogean type of habitat in Southern and Central Siberia is formed by temperate species such as the great bittern and the spiny tail; as well as temperate-subtropical ones - common kestrel, little plover, tree sparrow, great dove; In the forest-steppe on the territory of Central Siberia, stonechat, quail, and crested buzzard are also recorded.

The species of the Arctogeon type of habitat are most diverse in both regions. As the analysis showed, in percentage terms, in Central Siberia and, accordingly, in Southern Siberia, species of the Holarctic subtype (15% and 14% each), translongitudinal-Palaeogean (37% and 49%), Western Palearctic (22% and 3%) are expressed here.), mid-Palaeogean (9% and 6%), as well as eastern Palearctic (17% and 28%).

Birds of the Holarctic subtype, such as the raven, the common wheatear, the common goldeneye, the pintail, the snipe, the shoveler, the hen harrier, the barn swallow, and the gray duck, inhabit the territory of both regions. In Central Siberia, representatives of this subtype are expressed by such waders as dunlin; birds of prey such as rough-legged buzzard, merlin; passerines - Lapland plantain, spruce crossbill, gray shrike, sand martin, also living in Southern Siberia, but in this case, not recorded in the studied habitats.

Palaeogean birds, such as translongitudinal-Palaeogean birds, are diversely expressed both in Central Siberia and in Southern Siberia. Species such as white wagtail, goldfinch, little bunting, bean goose, fife, teal, hazel grouse, brown-headed chickadee, finch, wigeon and others live in both regions. Only in Central Siberia are recorded bluethroat, sandpiper-sparrow, turukhtan, green snapper, morodunka, and water rail. The ratio of species here is presented as 45 in Southern Siberia and 64 in Central Siberia.

Birds of the Western Palearctic subtype differ most greatly in their species composition. There are few common representatives, these are species such as the yellow wagtail and the red-headed duck. Most species have habitats that extend into the territory of Central Siberia. Among them are species such as the badger warbler, garden warbler, pied flycatcher, green mockingbird, common dove, garden bunting, etc. The ratio of species here is presented as 3 in Southern Siberia and 39 in Central Siberia.

Birds of the mid-Palaeogean subphylum also differ greatly between representatives of both regions. Common representatives include species such as black-throated blackbird,

firebucket, dancing wheatear, and bearded partridge. Most species are represented in Central Siberia, including the falcon, garden warbler, steppe harrier, laughing gull, northern warbler and others. The ratio of species here is presented as 5 in Southern Siberia and 15 in Central Siberia.

The most comparable data are represented by the eastern Palaearctic subtype of the area. Here the ratio of species is 26 in Southern Siberia and 29 in Central Siberia. There are more common species here, and among them are such species as red-rumped (single sighting in spring), Asian snipe, king warbler, white-capped bunting, brown warbler, eastern crow, white-rumped swift, spotted pipit, Siberian shrike, grey-headed bunting and others. Only in Central Siberia have the long-toed sandpiper, the red-necked flycatcher, and the Siberian thrush been recorded.

An important part of the analysis is the representation of the avifauna of the compared regions according to the zonal-landscape location of the nesting area.

Birds of polyzonal origin are represented by 6 species in Southern Siberia and 8 in Central Siberia. Among them are such species as the common wheatear, raven, white wagtail, bluethroat (present in Central Siberia), and yellow-headed wagtail.

There is only one Eoartic species – the redshank, which is a vagrant in Southern Siberia with sporadic sightings in the summer.

Hemiarctic species are represented by Holarctic birds of the Arctogeian subtype of range mainly in Central Siberia, in a ratio of 4 to 1 to Southern Siberia. These are the Asian brown-winged plover and dunlin as migratory species; as well as eastern Palaearctic species such as Lapland plantain. In Southern Siberia, the translongitudinal-Palaearctic hemiarctic species is represented by the little swan, which in recent years has increased its presence in this region, especially during the spring migration.

Representatives of the hypoarctic zonal landscape in both regions are the Holarctic arctogeian (herring gull in Southern Siberia and the rough-legged buzzard, round-nosed phalarope in Central Siberia); translongitudinal-Palaearctic (finch, little bunting in Southern Siberia and Central Siberia; white-tailed sandpiper in Central Siberia); eastern Palaearctic (brown blackbird for both regions).

Representatives of the hypoarctic-temperature zonal landscape are Holarctic species (pintail, snipe) and translongitudinal-Palaearctic species (whooper swan).

Boreal-hypoarctic species, also noted in Southern Siberia, are translongitudinal-Palaearctic species - bean goose and fifi (in Central Siberia also turukhtan and wild mushroom).

Birds of the boreal zonal landscape are of the Holarctic-Arctogeian type of range (common goldeneye), as well as all Palearctic subtypes. Translongitudinal-Palaearctic species of grouse, hazel grouse, great snail, brown-headed chickadee, and finch were recorded for both regions; for Central Siberia, black grouse, morodunka and others are also noted. Boreal mid-Palaearctic species are represented throughout Central Siberia (capercaillie and white-browed capercaillie). Most boreal species are eastern Palaearctic for Southern and Central Siberia. Common species here are Red-throated Thrush, Common Blackbird, King's Warbler and White-capped Bunting. For Central Siberia, the long-toed sandpiper, northern lightning, red-necked flycatcher, and Siberian thrush have been recorded.

The hypoarctic-boreal species of the translongitudinal-palaearctic subtype of the range is the wigeon, widespread in both regions.

Birds of the boreo-montane zonal-landscape distribution are of the Holarctic arctogeian type of range (crossbill-spruce in Central Siberia and the great merganser in Southern Siberia). Translongitudinal-Palaearctic species of boreo-montane occurrence were recorded in Central Siberia (nutcracker, yellow-headed wren); The eastern Palaearctic is represented here by the brown warbler, which is characteristic of both regions.

Temperature species are widely represented in the Palaearctic-Palaeogean type of range (great bittern everywhere), translongitudinal-Palaeartic (black stork, teal, tufted duck, common crane, black scutum, carrier, curlew, black-headed gull, yellowtail - characteristic of both regions). Western, mid-, and eastern Palaearctic birds are more pronounced for the region of Central Siberia (the total ratio is 15 species for Southern Siberia and 42 for Central Siberia).

Temperature-subtropical species are more widely represented than temperamental species. These are birds of the Palearctic-Palaeogean-Notogaeon type of range (black kite, coot, recorded in both regions); Palearctic-Palaeogean type of habitat (gray heron, rock dove, common kestrel, little plover, tree sparrow, great dove, characteristic of both regions); Holarctic birds of the Arctogean type of range (mallard, hen harrier, barn swallow for Southern Siberia; goshawk, golden eagle, long-eared owl, sand martin for Central Siberia). Most of the temperature-subtropical species were noted in the translongitudinal-Palaeartic type of range for both regions, in the ratio of 13 and 21 species, respectively, for Southern and Central Siberia. Common species here are the Common Cuckoo, Wing-neck, White-backed and Lesser Woodpeckers, Skylark, Blue-crowned Bluebird, Great Tit, Common Nuthatch, Reed Bunting, Common Rosefinch, House Sparrow and Magpie. Only in Central Siberia are representatives of the temperature-subtropical zonal distribution of the Western Palearctic subtype of the range noted: the common shrike, the gray warbler, the black swift, the common redstart, the mistletoe, the chaffinch, the hooded crow and others.

A partially montane species, the common grosbeak, with a translongitudinal-Palaeartic type of range, was recorded in Southern Siberia.

Also in Southern Siberia, hypoarctic-temperature species of the Holarctic-Arctogean type of range (pintail, snipe), as well as translongitudinal-Palaeartic type of range (whooper swan, whistling teal) were noted.

Subboreal species are widely represented both in Central Siberia and in Southern Siberia (30 and 14 species, respectively). In the Holarctic it is the black-necked grebe; in the translongitudinal-Palaeartic subtype of the range these are bustards, lapwings, white-winged terns, rooks, and blue tits. It is characteristic that subboreal species are represented by the western Palaearctic type of range in Central Siberia, and the eastern Palaearctic ones are mostly found in Southern Siberia.

Subtropical-subboreal species are noted for birds of the translongitudinal-Palaeartic type of range in Southern Siberia (herbal grass, blue magpie).

Montane species are also noted for birds of Southern Siberia: translongitudinal-Palaeartic type of range (black vulture); mid-Palaeartic (buzzard) and eastern Palaearctic (rock pigeon).

Subboreal-subtropical species are widely represented and recorded for birds of the Palearctic-Palaeogean-Notogaeon type of range in Southern and Central Siberia (great grebe); Palearctic-Palaeogean (hoopoe, spoonbill); for Western Palearctic Southern Siberia (black crow); mid-Palaeartic (shelduck, dancing wheatear, and in Central Siberia, imperial eagle, masked wagtail); eastern Palaearctic (gray starling, red-eared bunting for Southern Siberia).

5 Conclusion

A chorological analysis of the avifauna of the forest-steppe mountains of Southern Siberia using the example of the Khentey-Chikoy upland area showed that birds of different types of habitats and zonal-landscape occurrences participate in the formation of the avifauna of the highlands in the forest-steppe belt.

A comparative analysis with the forest-steppe of Central Siberia showed that over 80% of the avifauna of both regions is formed by representatives of the Arctogean type of

habitat; from 7 to 9% birds of the Palearctic-Palaeogeal type, from 2 to 3% of the Palearctic-Palaeogeal-Notogaeal type; from 1.5 to 3% are cosmopolitan and up to 1% are Neogeal-Arctogeal type.

The mountains of Southern Siberia, using the example of the Khentei-Chikoy Highlands, are characterized mainly by the predominance of representatives of similar types of habitats as in Central Siberia. There is a difference for Central Siberia with a slight predominance of birds of the translongitudinal-Palaeartic and Western Palaeartic subtypes of the range, and in Southern Siberia birds of the eastern Palaeartic subtype of the range are more widespread. Also in the mountains of Southern Siberia, birds of various zonal and landscape patterns are more widely represented (boreal-hypoaartic, hypoaartic-boreal, partially montane, hypoaartic-temperature, subtropical-subboreal and montane).

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