



DOI 10.23859/estr-221211

EDN IPVPTU

UDC 598.2

Article

Avifauna of the specially protected natural areas Chelyabinsk (city) and Kashtak forests (Chelyabinsk Oblast) and problems of their protection

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Abstract. Based on original data obtained in 2017–2022 on the territory of two specially protected natural areas of regional significance, as well as literary sources and information from respondents, faunistic lists of birds were compiled, dominants and subdominants were identified. In the Chelyabinsk (City) Forest with adjacent territories 151 species were recorded from 1987 to 2022, of which 74 are reliably assumed to be nesting. In 2017–2022 the dominants in the nesting period were Chaffinch and the Wood Warbler, the group of subdominants was made up of the Great Tit, the Willow Tit and the European Pied Flycatcher. Transformation of the ecosystem of the Chelyabinsk forest from the 1980s to the 2010s led to the disappearance of Black Grouse, Eurasian Nightjar, Golden Eagle, Red-footed Falcon, and in adjacent territories – Common Moorhen, Eurasian Oystercatcher, Grey Partridge, Common Quail, Short-eared Owl. Under the influence of recreational activities, there was a reduction in the number and abundance of ground-nesting species: the Yellowhammer has disappeared; the Tree Pipit is not numerous and comprises up only 2% of the total bird population. A number of nesting species (Northern Goshawk, Ural Owl, Eurasian Bullfinch, Chaffinch) showed ethological adaptations indicating synurbization. In the less anthropogenically disturbed Kashtak Forest for the period 2018–2022 more breeding and presumably nesting species were found (81), including urbophobic species (Common Buzzard, Black Grouse, Western Capercaillie); the total list of birds was 101 species. During the nesting period, the Chaffinch, the Wood Warbler and the Tree Pipit dominated, the group of subdominants included the Great Tit, the European Pied Flycatcher and the Common Redstart.

Keywords: avifauna, natural monument, dominant species, nesting, synurbization, urbophobic species

Acknowledgements. We express our sincere gratitude to bird lovers E.A. Popov and I.N. Guseva for the information provided on the birds of the City Forest, to a Chelyabinsk Zoo employee N.A. Luzyanin,

as well as N.M. Samoilova for up-to-date information about the boundaries of the natural monuments of the Chelyabinsk (City) and Kashtak forests.

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To cite this article: Gashek, V.A., Krasutsky, B.V., 2024. Avifauna of the specially protected natural areas Chelyabinsk (city) and Kashtak forests (Chelyabinsk Region) and problems of their protection. *Ecosystem Transformation* 7 (2), 87–125. <https://doi.org/10.23859/estr-221211>

Received: 11.12.2022

Accepted: 27.01.2023

Published online: 17.05.2024

DOI 10.23859/estr-221211

EDN IPVPTU

УДК 598.2

Научная статья

Авифауна памятников природы Челябинский (городской) и Каштакский боры (Челябинская область) и проблемы их сохранения

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Аннотация. На основе оригинальных данных, полученных в 2017–2022 гг. на территории двух ООПТ регионального значения, а также литературных источников и сведений респондентов составлены фаунистические списки птиц, выявлены доминанты и субдоминанты. В Челябинском (городском) бору с прилегающими территориями с 1987 по 2022 гг. зарегистрирован 151 вид, из них достоверно и предположительно гнездящихся – 74. В 2017–2022 гг. доминантами в гнездовой период были зяблик и пеночка-теньковка, группу субдоминантов составили большая синица, пухляк и мухоловка-пеструшка. Трансформация экосистемы бора за период с 1980-х по 2010-е гг. привела к исчезновению тетерева, обыкновенного козодоя, беркута, кобчика, а на сопредельных территориях – камышницы, кулика-сороки, серой куропатки, перепела, болотной совы. Под действием рекреации произошло сокращение числа и обилия наземно-гнездящихся видов: исчезла обыкновенная овсянка, лесной конек стал немногочислен и составляет всего 2% от населения птиц. У ряда гнездящихся видов (тетеревятник, длиннохвостая неясыть, обыкновенный снегирь,

зяблик) отмечены этологические адаптации, свидетельствующие о синурбизации. В менее антропогенно нарушенном Каштакском бору за период 2018–2022 гг. обнаружено больше гнездящихся и предположительно гнездящихся видов (81), в число которых вошли урбофобные (канюк, тетерев, глухарь), общий список птиц составил 101 вид. В гнездовое время доминировали зяблик, пеночка-теньковка и лесной конек, в группу субдоминантов входили большая синица, мухоловка-пеструшка и обыкновенная горихвостка.

Ключевые слова: орнитофауна, ООПТ, доминант, гнездование, синурбизация, урбофобные виды

Благодарности. Мы выражаем искреннюю благодарность за предоставленную информацию по птицам Городского бора любителям птиц Е.А. Попову и И.Н. Гусевой, сотруднику Челябинского зоопарка Н.А. Лузянину, а также Н.М. Самойловой за актуальные сведения о границах памятников природы Челябинский (городской) и Каштакский боры.

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Для цитирования: Гашек, В.А., Красуцкий, Б.В., 2024. Авифауна памятников природы Челябинский (городской) и Каштакский боры (Челябинская область) и проблемы их сохранения. *Трансформация экосистем* 7 (2), 87–125. <https://doi.org/10.23859/estr-221211>

Поступила в редакцию: 11.12.2022

Принята к печати: 27.01.2023

Опубликована онлайн: 17.05.2024

Introduction

Anthropogenic impact on ecosystems, especially urban and suburban ones, transforms landscapes and affects all components of biota. At the same time, the state of knowledge of many such ecosystems often leaves much to be desired. If scientific research is carried out in such territories, it is within the framework of various kinds of government assignments emanating from regional ministries and departments, and reports on their results are not available to a wide audience.

To fill one of these gaps in relation to two unique forest ecosystems located in the center and on the northern outskirts of the industrial metropolis of Chelyabinsk, we set the goal of studying the avifauna of the Chelyabinsk (City) and Kashtak forests – territories that are practically unexplored in ornithological terms.

We found the first mentions of the birds of the Chelyabinsk City Forest in the popular publication of A.D. Sysoev “Chelyabinsk Forest” (1968). Throughout the 1950s – 1990s. observations of forest birds were conducted by naturalist and local historian S.B. Kuklin, who left notes about them in diaries, several newspaper essays and scientific articles (1996, 2002). In the late 1980s – early 1990s, field ornithological research in the forest was carried out by E.A. Shaigorodsky. The result of these studies was a list of 118 bird species and data on the dynamics of their population density by season (Shaigorodsky, 1993, 1996, etc.). In the 2000s, materials on the avifauna of the forest were published in several works by I.N. Eremenko and V.E. Polyakov (Eremenko, 2001, 2002; Eremenko and Polyakov, 2003; Polyakov, 2002). Over the past 10 years, many birdwatchers and animal photographers have been observing the birds of the Chelyabinsk City Forest. Their materials, partially published, significantly complement the existing data on the avifauna of the forest (Popov, 2014, 2015; Popov and Rassomakhina, 2016, 2017).

The fauna and bird population of the Kashtak Forest have been much less well studied than that of the Chelyabinsk (City) Forest. The reason for this is that Kashtak Forest is located at a greater distance from the city center, is biotopically more uniform and was therefore less interesting to ornithologists and birdwatchers. In the 1980s – 1990s, the study of the fauna and bird population of this natural monument was carried out by E.A. Shaygorodsky; Unfortunately, his data remained unpublished. In the work of this author, “Species composition and dynamics of bird population density in the Chelyabinsk Forest” (1996), it is said that 122 species of birds were identified in the Kashtak Forest. Unfortunately, the lack of a complete list of bird species makes comparisons with our data difficult.

Materials and methods

Geographical and environmental characteristics of the Chelyabinsk (City) and Kashtak forests

The Chelyabinsk (City) and Kashtak pine forests are located in the northeast of the administrative territory of the Chelyabinsk Oblast: the first is in the western part of the municipal territory of the city of Chelyabinsk (Fig. 1), in the Central district; the second occupies the northern part of the Chelyabinsk urban district and the eastern part of the Sosnovsky municipal district (Fig. 2). The territory of the Chelyabinsk (City) Forest is located between the parallels N 55°16'88" and N 55°12'38" and the meridians E 61°30'70" and E 61°36'90", the territory of the Kashtak Forest is between the parallels N 55°21'51" and N 55°15'32" and meridians E 61°20'25" and E 61°26'53".

Both forests received the legal status of natural monuments of regional significance in 1969¹. The area of the protected area "Chelyabinsky (City) Forest" is 1184.61 hectares, the area of the protected area "Kashtaksky forest" is 2772 hectares.

The restriction of economic use of the Chelyabinsk (City) Forest (hereinafter referred to as the City Forest) can be traced back to the 18th century; this tradition continued into the 19th century. The network of clearings and the forest protection system probably developed before 1917². However, its area has declined significantly compared to the beginning of the 18th century, and continues to decline at present.



Fig. 1. Location of the Chelyabinsk (city) forest.

¹ Decree of the Government of the Chelyabinsk Oblast dated February 15, 2007 No. 27-P "On the natural monuments of the Chelyabinsk Region Chelyabinsk (city) and Kashtaksky forests (with amendments and additions)".

² United State Archive of the Chelyabinsk Oblast. F. I-46. Op. 1. D. 550. L. 9.

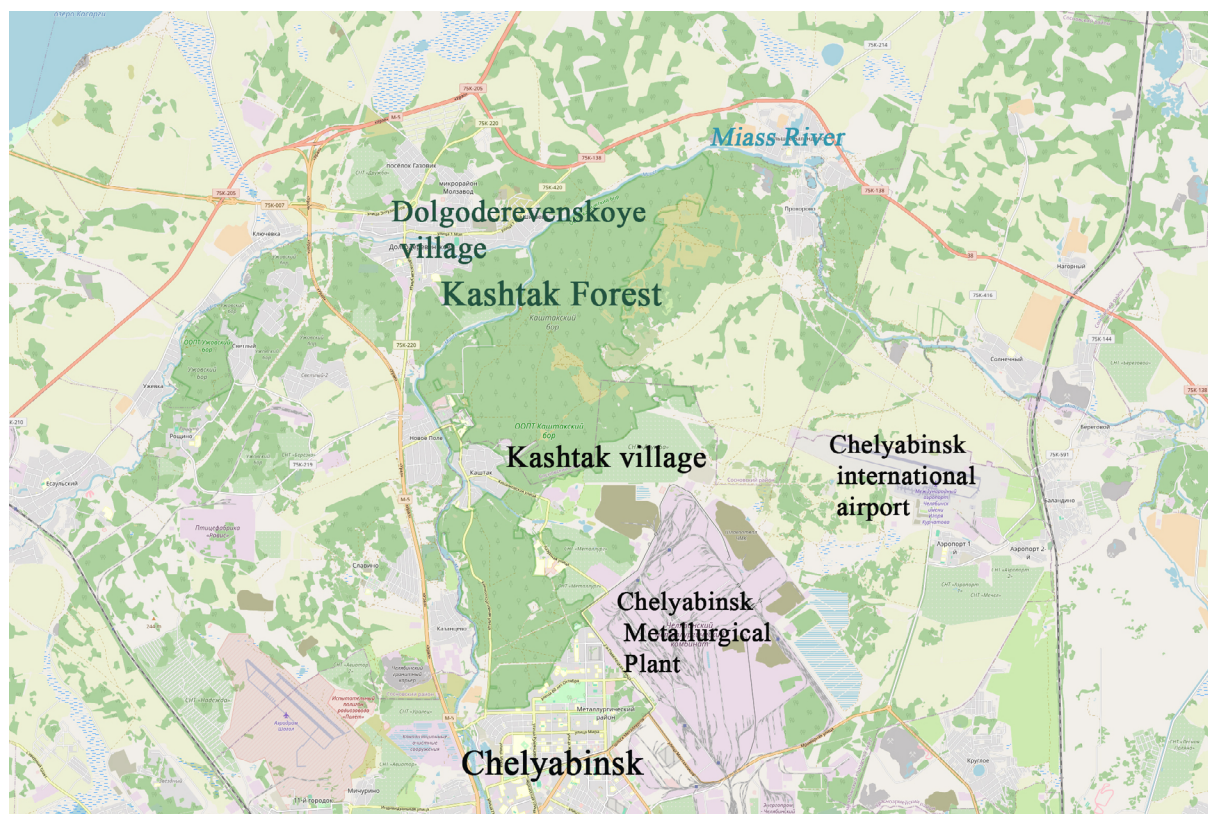


Fig. 2. Location of Kashtak pine forest.

Professor A.D. Sysoev states in “Chelyabinsky Forest” (1968): “During the period from 1736 to 1966, that is, over 230 years, the territory of the City Forest decreased by more than two-thirds, and this reduction was especially intense over the last 20–30 years due to the growth of the city and its population. From 63 blocks in 1940, there are now 49 remaining.”

Both forests are relict ecosystems that formed at the Upper Pleistocene-Holocene boundary of the (about 10 thousand years ago) during a period of climate aridization and the retreat of the continuous forest zone to the north. These are so-called relicts of periglacial forest-steppe (Krasheninnikov and Krasheninnikova, 1905; Samarin and Volgin, 1983).

Forests are located within the Ural mountainous physical-geographical country in its southeastern part (the eastern slope of the Southern Urals). In azonal terms, this territory is represented by a denudation-basement plain (Trans-Ural Peneplain). The natural features of forests are largely determined by the background landscapes characteristic of the upland areas of the denudation-basement plains of the middle forest-steppe.

From the west and north, the City Forest goes around the Miass River. The length of the river (with meanders) within the forest is about 4 km, the width is 50–80 m, in the area of the Kommunar pond, located north of the forest, up to 150 m. The area of the Shershnevsky Reservoir, built on a section of the Miass River and the forest adjacent to the southwestern part is 39 km², its maximum depth is 14 m, the average is 4.5 m. To the Kashtak Forest of the Miass River is also adjacent in the western and northern parts. The length of the river within its boundaries is about 9 km, width – 50–80 m. Small rivers flow through the forests, flowing into the Miass River (Chikinka – in Gorodsky, Bezymyannaya and Bol. Klyuch – in Kashtak); in dry years they almost dry out and form a chain of separate reaches. In the western part of the City Forest there are three small swampy lakes with an area of 0.5 to 1.6 hectares, as well as several basins filled with water, which dries up almost completely in the summer. In addition, on the territory of this forest there are three large (with an area of 1.4, 5.2 and 10.5 hectares) and

11 smaller anthropogenic lakes formed on the site of granite quarries. On the territory of the Kashtak Forest, anthropogenic morphosculpture represented by old mine workings is widely developed.

According to the scheme of botanical and geographical zoning of the Chelyabinsk Region, developed by B.P. Kolesnikov (1961, 1964), with modifications by P.V. Kulikov (2005), the territories of both forests are located within the forest-steppe zone of the Trans-Urals and the West Siberian Plain, the subzone of the northern forest-steppe, the northern forest-steppe region of the Trans-Ural Peneplain.

The basis of the natural vegetation cover of the forests is made up of pine (forest-forming species – Scots pine *Pinus sylvestris* L.) forb, forb-fern, less often lingonberry, and birch (with the participation of Downy birch *Betula pubescens* Ehrh.) forb forests. In the City Forest, pine plantations, including as a crop, are the dominant type of ecosystem (more than 80% of its area, according to the 2015 afforestation plan). In the Kashtak Forest, pine plantations have been preserved in the central part of the protected area (no more than 50% of its area, according to the 2014 afforestation plan); in the southern and northeastern parts birch forests predominate.

In areas occupied by indigenous species, there are derivative mixed plantations (birch-pine, pine-birch, aspen-birch), as well as parcels, in which the dominant tree species are aspen *Populus tremula* L. and linden *Tilia cordata* Mill.

Intrazonal biotopes are dominated by tree and shrub species of willows (*Salix alba* L., *S. aurita* L., *S. caprea* L., *S. cinerea* L., *S. viminalis* L., etc.), black alder *Alnus glutinosa* (L.) Gaertn., bird cherry *Padus avium* Mill., silver birch *Betula pendula* Roth., balsam poplar *Populus balsamifera* L., aspen, Siberian elderberry *Sambucus sibirica* Nakai.

Vast spaces are occupied by artificial plantings, in which the first tier is dominated by smooth elm *Ulmus laevis* Pall. and wych elm *U. glabra* Huds., maple ash *Acer negundo* L. and norway maple *A. platanoides* L., English oak *Quercus robur* L., Arkhangelsk larch *Larix sukaczewii* Ledeb., Siberian spruce *Picea obovata* Ledeb., Siberian crab apple *Malus baccata* (L.) Borkh., mountain ash *Sorbus aucuparia* L. are less common and in the second tier – caragana tree *Caragana arborescens* Lam., forest honeysuckle *Lonicera xylosteum* L. and Tatarian honeysuckle *L. tatarica* L., cotoneaster brilliant *Cotoneaster lucidus* Schldl., rowan-leaved *Sorbaria sorbifolia* (L.) A. Braun, etc.

Adjacent to the City Forest from the northeast is the Yu.A. Gagarin central park of culture and recreation, as well as the Chelyabinsk Zoo, which are part of the territory of the forest, but not included in the boundaries of the protected area.

The position of the City Forest in the center of an industrial metropolis with a population of millions leads to an extremely high level of recreational load, in some of its sections significantly exceeding the permissible values: III and IV stages of recreational digression on a 5-point scale (Kazanskaya et al., 1977) – and much more impressive than in the Kashtak Forest, which is located at a greater distance from the city center and is almost 2.5 times larger in area than City Forest. Recreational digression of most of the territory of the Kashtak Forest corresponds to stages I–II. Currently, on the territory of the protected area there are the residence of the governor of the Chelyabinsk Oblast, sports and educational institutions, health centers, offices and other real estate, a total of 54 business entities.

The main sources of negative anthropogenic impact on the City and Kashtak pine forests are recreational pressure, silvicultural activities, the influence of urban infrastructure (building roads, communications) and complex pollution (chemical, physical, biological) of the atmosphere, surface and groundwater, and soil. All of these factors are especially evident in forest areas adjacent to settlements and various institutions located in the territories of forests. The long-term impact of anthropogenic factors within the boundaries of natural monuments, primarily such as the functioning of children's health institutions, country houses, recreation, vehicle passage, littering with household waste, fires, could not but affect the condition of pine forests, their flora, fauna and mycobiota.

Within the boundaries of the natural monuments, anthropogenic modification of plant communities is evident. Its manifestations include digression in certain areas; high density of plantings associated with the spread of adventitious species of woody plants previously introduced into the forest areas; significant cluttering of certain areas with dead wood after fires; high soil compaction in areas adjacent to populated areas and the of Chelyabinsk City, associated with a dense road and path network.

Many areas along the perimeter of the forests are currently beginning to turn into uniform ruderal forest types with sparse tree stands and poor ground cover, which is typical of forest areas of urban recreational areas.

Scope and methods of research. Basic concepts and terminology

We conducted ornithological research in the City Forest in 2017–2022, and in the Kashtak Forest in 2018–2022. Observations were carried out mainly during the nesting period – from late April to late June. They visited pine forests less often in July – September. Birds were detected visually on unfixed routes, as well as by calls, nests and remains during excursions during daylight hours. At the same time, all encountered individuals were recorded without recording the distance to the bird. In total, the City Forest was visited for 27 days, Kashtak – 26; the total length of the routes in the City Forest was about 130 km, in the Kashtak Forest – about 200 km. To distribute bird species into categories of relative abundance, the following scale was used:

- very rare – encountered no more than 5 times during all the years of work;
- rare – encountered 1–2 times during the research period;
- small – encountered 3–5 times during the research period;
- few – encountered regularly, but not every day;
- common – observed 1–10 times per day tour;
- numerous – encountered more than 10 times per day excursion.

Species which comprised a proportion of at least 10% of encountered individuals of all bird species were considered dominant, while subdominants were considered to be 3–9%.

The reliability of nesting was determined in accordance with the criteria proposed by the Committee of the European Ornithological Atlas (EOA) (The EBCC Atlas..., 1997). Nesting was considered proven when nests, eggs, broods were found, birds were observed with food for chicks, presumed – when birds were observed demonstrating elements of nesting behavior (lekking, mating, disturbance at nests), as well as in permanent areas in conditions suitable for nesting in the nesting area period. The order of listing and names of species are given according to E.A. Koblik et al. (2006).

Results and discussion

An annotated list of bird species of the City and Kashtak forests, including species found in the riverbed areas of the Miass River, adjacent to the forests, in the period 1987–2022 is given in Table 1. Information on the birds of the City Forest is provided based on our own and previously published data, as well as information provided by our respondents; for birds of the Kashtak Forest – only by our data, with the exception of the Great White Egret (Popov and Rassomakhina, 2016). Photographs of some species are included in the Appendix.

For the period 1987–2022 in the City Forest and adjacent territories, 151 species of birds from 13 orders and 36 families have been registered. Of these, 74 species reliably and presumably nest on the territory of the forest and in its immediate vicinity, 34 species were observed on migration, 6 vagrant species, 17 species were observed on seasonal migrations and wintering (Table 1). Eighteen species visited the forest and adjacent territories during nesting time; the status of two more species has not been established. In addition, in a water-filled quarry located in the Yu.A. Gagarin park, in the fall of 2020, a male Mandarin Duck *Aix galericulata* (L., 1758) and a female Wood Duck *Aix sponsa* (L., 1766), which flew away from a private collection, stayed for several weeks in the fall of 2020. In the Kashtak Forest for the period 2018–2022 we recorded 101 species from 13 orders and 31 families. Of these, nesting has been established or suspected for 81, four were encountered on migration, seven on seasonal migrations, two vagrant species, seven visit the forest and adjacent territories during nesting time.

The dominant species in the City Forest over an average of six years (2017–2022) during the nesting period were the Chaffinch with a share of the total bird population of 20% and the Common Chiffchaff (19%). The subdominant group consisted of the Great Tit (9%), Willow Tit (6%) and European Pied Flycatcher (4%) (Fig. 3). In 1987–1996 Chaffinch, Common Rosefinch and White Wagtail dominated (Shaigorodsky, 1996). The dominance of the latter two species during that period is probably explained by the passage of the survey route near clearings and quarries filled with water.

Over the entire history of ornithological research in the City Forest, its avifauna has undergone significant changes. Since the 1940s Black grouse has disappeared (Sysoev, 1968). Development of territories adjacent to the forest and an increase in recreational load led to the disappearance of the Gray Partridge, Common Quail, Short-eared Owl, and Eurasian Nightjar, which were recorded in the 1980s. (Shaigorodsky, 1996). Since the 1980–1990s, the Golden Eagle, Red-footed Falcon, Common Moorhen, and Eurasian Oystercatcher have not been seen. The European Turtle-dove and the Yellow-breasted Bunting on migration, recorded by E.A. Shaigorodsky, also have not been confirmed for more

Table 1. Species composition of birds of the Chelyabinsk (City) and Kashtak forests. The residency status: ne – nesting; ne? – probably nesting; mig – transient species; mig? – possibly transient species; vag – vagrant; win – wintering; nom – nomadic; vis – visitor during nesting period; ? – status unknown. Abundance: num – numerous; com – common; few – few; un – uncommon; rare – rare; vr – very rare; ? – residency status unknown.

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
The order Ciconiiformes			
<i>Casmerodius albus</i> (L., 1758)	vag (in the floodplain of the Miass River)/rare	Generalov, 1989; Shvarev and Tausamzhi, 1989	vag (in the floodplain of the Miass River)/rare
<i>Ardea cinerea</i> L., 1758	vis (in the floodplain of the Miass River)/com	own data, data from other researchers	vis (in the floodplain of the Miass River)/com
The order Anseriformes			
<i>Anas platyrhynchos</i> L., 1758	ne/com	own data, data from other researchers	ne/com
<i>Anas crecca</i> L., 1758	mig/few	Shaygorodsky, 1996	—
<i>Anas strepera</i> L., 1758	ne, mig/rare (ne), un (mig)	own data, data from other researchers	ne?, mig/rare
<i>Anas querquedula</i> L., 1758	ne?/small	own data, data from other researchers	—
The order Falconiformes			
<i>Pernis apivorus</i> (L., 1758)	vis/rare	own data, data from other researchers	vis/rare
<i>Milvus migrans</i> (Bodd., 1783)	ne?/com	own data, data from other researchers	ne/com
<i>Circus aeruginosus</i> (L., 1758)	ne/few	Shaygorodsky, 1996	ne? in adjacent territories/un
<i>Accipiter gentilis</i> (L., 1758)	ne/few	own data, data from other researchers	ne?/few
<i>Accipiter nisus</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Buteo lagopus</i> (Pontopp., 1763)	mig/?	own data, Shaygorodsky, 1996	—
<i>Circaetus gallicus</i> Gm., 1788		—	vag/vr
<i>Buteo buteo</i> (L., 1758)	vis/few	own data, data from other researchers	ne/few
<i>Aquila chrysaetos</i> (L., 1758)	vag/rare	Shaygorodsky, 1996	—
<i>Haliaeetus albicilla</i> (L., 1758)	mig/rare	Eremenko, 2001; Kuklin, 1996; Popov, 2015; Shaygorodsky, 1996	mig/small
<i>Falco peregrinus</i> Tunst., 1771	mig (in the floodplain of the Miass River)/rare	own data, Popov, 2014	—
<i>Falco subbuteo</i> L., 1758	vis/rare	E.A. Popov (oral communication)	ne?/rare
<i>Falco vespertinus</i> L., 1766	vis/rare	Shaygorodsky, 1996	—
<i>Falco tinnunculus</i> L., 1758	vis/rare	Shaygorodsky, 1996	vis/rare
The order Galliformes			
<i>Lagopus lagopus</i> (L., 1758)	win/vr	Eremenko and Polyakov, 2003	—

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
<i>Lyrurus tetrix</i> (L., 1758)		–	ne?/un
<i>Tetrao urogallus</i> L., 1758		–	ne/un
<i>Perdix perdix</i> (L., 1758)	ne?/rare	Shaygorodsky, 1996	–
<i>Coturnix coturnix</i> (L., 1758)	vis/rare	Shaygorodsky, 1996	–
The order Gruiformes			
<i>Crex crex</i> (L., 1758)	mig/?	Shaygorodsky, 1996; E.A. Popov (oral communication)	ne? (in the floodplain of the Miass River)/small
<i>Gallinula chloropus</i> (L., 1758)	mig/rare	Shaygorodsky, 1996	–
<i>Fulica atra</i> L., 1758	mig, win (on the Miass River)/few (mig), rare (win)	own data; Eremenko, 2002; Shaygorodsky, 1996	–
The order Charadriiformes			
<i>Charadrius dubius</i> Scop., 1786	mig on the adjacent territory/?	Shaygorodsky, 1996	ne/un
<i>Vanellus vanellus</i> (L., 1758)	ne on the adjacent territory/?	Shaygorodsky, 1996	ne? (in the floodplain of the Miass River)/small
<i>Haematopus ostralegus</i> L., 1758	mig (in the floodplain of the Miass River)/rare	Shaygorodsky, 1996	–
<i>Tringa ochropus</i> L., 1758	ne?/rare	own data, data from other researchers	ne?/rare
<i>Tringa nebularia</i> (Gunn., 1767)		–	mig/rare
<i>Tringa totanus</i> (L., 1758)	mig/rare	own data, E.A. Popov (oral communication)	–
<i>Actitis hypoleucos</i> (L., 1758)	?/un	own data, E.A. Popov (oral communication)	ne? (in the floodplain of the Miass River)/few
<i>Calidris minuta</i> (Leisl., 1812)	mig (in the floodplain of the Miass River)/?	Shaygorodsky, 1996	–
<i>Gallinago gallinago</i> (L., 1758)	mig (in the floodplain of the Miass River)/?	Shaygorodsky, 1996	–
<i>Scolopax rusticola</i> L., 1758	mig/few	own data, data from other researchers	mig? (in the floodplain of the Miass River)/small
<i>Larus ichthyaetus</i> Pall., 1773	mig/rare	own data, data from other researchers	–
<i>Larus minutus</i> Pall., 1776	mig/rare	own data, data from other researchers	–
<i>Larus ridibundus</i> L., 1766	vis/com	own data, data from other researchers	vis (in the floodplain of the Miass River)/ com
<i>Larus barabensis</i> H. Johansen, 1960	vis/com	own data, data from other researchers	vis (in the floodplain of the Miass River)/ com

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
<i>Larus canus</i> L., 1758	vis/com	own data, data from other researchers	–
<i>Chlidonias leucopterus</i> (Temm., 1815)	vis (in the floodplain of the Miass River)/rare	Shaygorodsky, 1996	–
<i>Sterna hirundo</i> L., 1758	vis (in the floodplain of the Miass River)/com	own data, data from other researchers	vis (in the floodplain of the Miass River)/ un
The order Columbiformes			
<i>Columba palumbus</i> L., 1758	vis/rare	Shaygorodsky, 1996	ne?/small
<i>Columba oenas</i> L., 1758	vis/rare	Shaygorodsky, 1996	–
<i>Columba livia</i> Gmel., 1789	ne/com	own data, data from other researchers	ne on the adjacent territory /com
<i>Streptopelia decaocto</i> (Frisch, 1838)	vag (on the territory of the zoo)	N.A. Luzyanin (oral communication)	–
<i>Streptopelia turtur</i> (L., 1758)	ne/?	Shaygorodsky, 1996	–
<i>Streptopelia orientalis</i> (Lath., 1790)	ne/few	own data	ne?/few
The order Cuculiformes			
<i>Cuculus canorus</i> L., 1758	ne/un	own data, data from other researchers	ne/un
<i>Cuculus (saturatus) optatus</i> Gould, 1845	mig/rare	Shaygorodsky, 1996	–
The order Strigiformes			
<i>Asio otus</i> (L., 1758)	ne/few	E.A. Popov (oral communication); Shaygorodsky, 1996	–
<i>Asio flammeus</i> (Pontopp., 1763)	ne/few	Shaygorodsky, 1996	–
<i>Glaucidium passerinum</i> (L., 1758)	win/rare	E.A. Popov (oral communication)	–
<i>Strix uralensis</i> Pall., 1771	ne/few	own data, data from other researchers	ne?/un
The order Caprimulgiformes			
<i>Caprimulgus europaeus</i> L., 1758	vis/rare	Shaygorodsky, 1996	–
The order Apodiformes			
<i>Apus apus</i> (L., 1758)	ne on the adjacent territory/ com	own data, data from other researchers	ne on the adjacent territory/com
The order Coraciiformes			
<i>Merops apiaster</i> L., 1758	–	–	ne on the adjacent territory/rare

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
The order Piciformes			
<i>Jynx torquilla</i> L., 1758	ne/rare	Eremenko, 2003; E.A. Popov (oral communication); Shaygorodsky, 1996	ne?/rare
<i>Picus canus</i> Gmel., 1788	nom/rare	E.A. Popov and I.N. Guseva (oral communication); Shaygorodsky, 1996	nom/rare
<i>Dryocopus martius</i> (L., 1758)	ne/few	own data, data from other researchers	ne?/few
<i>Dendrocopos major</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Dendrocopos leucoto</i> (Bechst., 1803)	ne?/rare	own data, data from other researchers	ne/rare
<i>Dendrocopos minor</i> (L., 1758)	ne, nom/few	own data, data from other researchers	ne?/un
<i>Picoides tridactylus</i> (L., 1758)	nom/rare	E.A. Popov and I.N. Guseva (oral communication); Polyakov, 2002; Shaygorodsky, 1996	—
The order Passeriformes			
<i>Riparia riparia</i> (L., 1758)	ne (in the floodplain of the Miass River)/un	own data	ne (in the floodplain of the Miass River)/ few
<i>Hirundo rustica</i> L., 1758	vis/few	own data, data from other researchers	ne on the adjacent territory/few
<i>Alauda arvensis</i> L., 1758	ne on the adjacent territory/ few	Shaygorodsky, 1996	—
<i>Anthus campestris</i> (L., 1758)	mig on the adjacent territory/ rare	Shaygorodsky, 1996	—
<i>Anthus trivialis</i> (L., 1758)	ne/few	own data, data from other researchers	ne/num
<i>Anthus hodgsoni</i> Rich., 1907	—	—	ne?/rare
<i>Anthus pratensis</i> (L., 1758)	mig/rare	Shaygorodsky, 1996	—
<i>Motacilla flava</i> L., 1758	ne (in the floodplain of the Miass River)/few	own data; E.A. Popov (oral communication); Shaygorodsky, 1996	ne (in the floodplain of the Miass River)/ small
<i>Motacilla (flava) lutea</i> (Gmel., 1774)	mig/rare	Shaygorodsky, 1996	—
<i>Motacilla (citreola) werae</i> (Buturlin, 1907)	mig/un	own data; Shaygorodsky, 1996	—
<i>Motacilla cinerea</i> Tunst., 1771	mig/few	own data, data from other researchers	—
<i>Motacilla alba</i> L., 1758	ne/com	own data, data from other researchers	ne/com

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
<i>Lanius collurio</i> L., 1758	vis/un	E.A. Popov (oral communication); Shaygorodsky, 1996	ne (in the floodplain of the Miass River)/small
<i>Lanius excubitor</i> L., 1758	nom/rare	E.A. Popov (oral communication); Shaygorodsky, 1996	–
<i>Oriolus oriolus</i> (L., 1758)	ne/rare	own data, data from other researchers	ne/small
<i>Sturnus vulgaris</i> L., 1758	ne/rare	own data; Shaygorodsky, 1996	ne on the adjacent territory/few
<i>Garrulus glandarius</i> (L., 1758)	nom/rare	E.A. Popov and I.N. Guseva (oral communication)	nom/un
<i>Pica pica</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Nucifraga caryocatactes</i> (L., 1758)	vag/vr	Popov, 2014; Shaygorodsky, 1996	–
<i>Corvus monedula</i> L., 1758	ne on the adjacent territory/com	own data, data from other researchers	ne on the adjacent territory/com
<i>Corvus frugilegus</i> L., 1758	mig/few	E.A. Popov (oral communication)	–
<i>Corvus (corone) cornix</i> L., 1758	ne/com	own data, data from other researchers	ne/com
<i>Corvus corax</i> L., 1758	ne/com	own data, data from other researchers	ne/com
<i>Bombicilla garrulus</i> (L., 1758)	nom/com	own data, data from other researchers	nom/com
<i>Cinclus cinclus</i> (L., 1758)	win (in the floodplain of the Miass River)/rare	E.A. Popov (oral communication)	–
<i>Locustella fluviatilis</i> (Wolf, 1810)	mig/rare	Shaygorodsky, 1996	–
<i>Locustella naevia</i> (Bodd., 1783)	ne?/rare	own data	–
<i>Acrocephalus schoenobaenus</i> (L., 1758)	mig/rare	E.A. Popov (oral communication)	ne?/rare
<i>Acrocephalus dumetorum</i> Blyth, 1849	ne/com	own data, data from other researchers	ne/com
<i>Hippolais icterina</i> (Vieill., 1817)	ne/rare	own data, data from other researchers	ne/few
<i>Hippolais caligata</i> (Licht., 1823)	ne/rare	E.A. Popov (oral communication)	ne (in the floodplain of the Miass River)/rare
<i>Sylvia atricapilla</i> (L., 1758)	ne?/rare	E.A. Popov (oral communication)	ne/few
<i>Sylvia borin</i> (Bodd., 1783)	ne/few	own data, data from other researchers	ne/com
<i>Sylvia communis</i> Latham, 1787	ne/rare	E.A. Popov (oral communication); Shaygorodsky, 1996	ne/com
<i>Sylvia curruca</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Phylloscopus trochilus</i> (L., 1758)	ne, mig/un (ne), num (mig)	own data, data from other researchers	ne/com

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
<i>Phylloscopus collybita</i> (Vieill., 1817)	ne/num	own data, data from other researchers	ne/num
<i>Phylloscopus sibilatrix</i> (Bechst., 1793)	mig/rare	Shaygorodsky, 1996	–
<i>Phylloscopus trochiloides</i> (Sund., 1837)	ne/com	own data, data from other researchers	ne/com
<i>Phylloscopus inornatus</i> (Blyth, 1842)	vag/vr	Popov and Rassomakhina, 2016	–
<i>Regulus regulus</i> (L., 1758)	nom/few	E.A. Popov and I.N. Guseva (oral communication); Shaygorodsky, 1996	–
<i>Ficedula hypoleuca</i> (Pall., 1764)	ne/num	own data, data from other researchers	ne/num
<i>Ficedula (parva) parva</i> (Bechst., 1794)	mig/rare	own data, data from other researchers	ne/few
<i>Muscicapa striata</i> (Pall., 1764)	ne/com	own data, data from other researchers	ne/com
<i>Saxicola rubetra</i> (L., 1758)	ne/un	E.A. Popov (oral communication); Shaygorodsky, 1996	ne/un
<i>Saxicola torquata</i> (L., 1766)	ne/few	own data, data from other researchers	ne on the adjacent territory/com
<i>Oenanthe oenanthe</i> (L., 1758)	ne/?	Shaygorodsky, 1996	–
<i>Phoenicurus phoenicurus</i> (L., 1758)	ne/num	own data, data from other researchers	ne/num
<i>Phoenicurus ochruros</i> (Gmel., 1774)	?/rare	E.A. Popov (oral communication); Shaygorodsky, 1996	–
<i>Erithacus rubecula</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Luscinia luscinia</i> (L., 1758)	ne/rare	E.A. Popov (oral communication); Shaygorodsky, 1996	ne/few
<i>Luscinia svecica</i> (L., 1758)	ne (in the floodplain of the Miass River)/com	own data, data from other researchers	ne (in the floodplain of the Miass River)/com
<i>Tarsiger cyanurus</i> (Pall., 1773)	mig/rare	Popov and Rassomakhina, 2017	–
<i>Turdus pilaris</i> L., 1758	ne/com	own data, data from other researchers	ne/com
<i>Turdus merula</i> L. 1758	ne?/vr	Popov and Rassomakhina, 2017	–
<i>Turdus iliacus</i> L., 1766	ne/com	own data, data from other researchers	ne/com
<i>Turdus philomelos</i> Brehm, 1831	ne/com	own data, data from other researchers	ne/com
<i>Turdus viscivorus</i> L., 1758	mig/un	own data, data from other researchers	ne/few
<i>Zoothera varia</i> (Pall., 1811)	mig/vr	Popov, 2015	–
<i>Aegithalos caudatus</i> (L., 1758)	ne, nom/few (ne), com (nom)	own data, data from other researchers	ne, nom/few (ne), com (nom)

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
<i>Remiz pendulinus</i> (L., 1758)	ne (in the floodplain of the Miass River)/few	own data, data from other researchers	–
<i>Parus montanus</i> Bald., 1827	ne/num	own data, data from other researchers	ne/com
<i>Parus cristatus</i> L., 1758	win/rare	Shaygorodsky, 1996	–
<i>Parus ater</i> (L., 1758)	ne/com	own data, data from other researchers	ne/few
<i>Parus caeruleus</i> L., 1758	ne?/few	own data, data from other researchers	ne?/few
<i>Parus cyanus</i> Pall., 1770	ne/rare	own data, data from other researchers	ne/rare
<i>Parus major</i> L., 1758	ne/num	own data, data from other researchers	ne/num
<i>Sitta europaea</i> L., 1758	ne/com	own data, data from other researchers	ne/com
<i>Certhia familiaris</i> L., 1758	ne?/rare	own data, data from other researchers	ne?/rare
<i>Passer domesticus</i> (L., 1758)	ne on the adjacent territory/ com	own data, data from other researchers	ne on the adjacent territory/com
<i>Passer montanus</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Fringilla coelebs</i> L., 1758	ne/num	own data, data from other researchers	ne/num
<i>Fringilla montifringilla</i> L., 1758	mig/com	E.A. Popov and I.N. Guseva (oral communication); Shaygorodsky, 1996	mig/com
<i>Chloris chloris</i> (L., 1758)	ne/com	own data, data from other researchers	ne/com
<i>Spinus spinus</i> (L., 1758)	ne?, nom/un (ne?), num (nom)	own data, data from other researchers	ne?, nom/un (ne?), num (nom)
<i>Carduelis carduelis</i> (L., 1758)	ne/few	own data, data from other researchers	ne/com
<i>Acanthis cannabina</i> (L., 1758)	ne on the adjacent territory/ com	own data, data from other researchers	ne on the adjacent territory/com
<i>Acanthis flammea</i> (L., 1758)	nom/com	own data, data from other researchers	nom/com
<i>Carpodacus erythrinus</i> (Pall., 1770)	ne/com	own data, data from other researchers	ne/com
<i>Uragus sibiricus</i> (Pall., 1773)	ne, nom/rare (ne), com (nom)	own data, data from other researchers	ne?, nom (in the floodplain of the Miass River)/rare (ne?), com (nom)
<i>Pinicola enucleator</i> (L., 1758)	win/rare	Eremenko, 2003; E.A. Popov (oral communication); Shaygorodsky, 1996	–
<i>Loxia curvirostra</i> L., 1758	nom/few	own data, data from other researchers	nom/few

Species	Chelyabinsk (City) Forest		Kashtak Forests
	presence/ abundance	the source of information	presence/ abundance (own data)
<i>Loxia leucoptera</i> Gmel., 1789	nom/vr	E.A. Popov (oral communication)	–
<i>Pyrrhula pyrrhula</i> (L., 1758)	ne?, nom/un (ne?), com (nom)	own data, data from other researchers	ne, nom/un (ne), com (nom)
<i>Pyrrhula cinerea</i> Cab., 1872	win/rare	I.N. Guseva (oral communication)	–
<i>Coccothraustes coccothraustes</i> (L., 1758)	nom/few	own data, data from other researchers	nom/few
<i>Emberiza citrinella</i> L., 1758	ne, nom/num (ne), un (nom)	E.A. Popov (oral communication); Shaygorodsky, 1996	ne/few
<i>Schoeniclus schoeniclus</i> (L., 1758)	mig (in the floodplain of the Miass River)?	E.A. Popov (oral communication); Shaygorodsky, 1996	–
<i>Ocyris rusticus</i> (Pall., 1776)	mig/rare	own data	–
<i>Ocyris aureolus</i> (Pall., 1773)	mig/rare	Shaygorodsky, 1996	–
Number of species		151	101

than 25 years, which is associated with a reduction in the number of these species throughout their range (Krasnaya Kniga..., 2021).

During the period of our research, Garden Warbler, Song Thrush, Redwing and Willow Tit were common nesting sites in the City Forest, while in the period 1987–1996 blackbirds were observed only on migration, the Willow Tit – during the winter, and the Garden warbler flew from adjacent territories during nesting time (Shaigorodsky, 1996). A new species has appeared – the Oriental Turtle-dove, whose registrations in the forest have become frequent in recent years.

The dominants in the Kashtak Forest on average over 5 years (2018–2022) during the nesting period were the Chaffinch with a proportion of the total bird population of 19%, the Common Chiffchaff (15%) and the Tree Pipit (Fig. S8) (10%) (Fig. 3). The subdominant group included the Great Tit (6%), European Pied Flycatcher (5%) and Common Redstart (Fig. S7) (4%).

According to E.A. Shaigorodsky (pers. comm.), in 1987–1996 in the summer, this forest was dominated by the Chaffinch, the Common Chiffchaff (Figs. S12, S13) and the Yellowhammer (Fig. S9). During the period of our research, the latter nested in the edge parts of the forest with a predominance of birch, where it was not numerous (its share in the population on average was 1%). In the City Forest, in recent years, the Yellowhammer has been occasionally recorded only on migration (E.A. Popov, oral communication), while in 1987–1996 it was still a numerous breeding species (E.A. Shaigorodsky, oral communication). Its disappearance from the City Forest and a sharp reduction in numbers in the Kashtak Forest is undoubtedly associated with the increased recreational load on both forests and the increase in the number of citizens walking their dogs in their territories, as well as with the appearance of multi-storey buildings close to the southern edge of the Kashtak Forest, in birch plantations of which it was especially numerous. In a number of regions, researchers associate the decline in the abundance of the Yellowhammer with an increase in the degree of recreational transformation of forest ecosystems, for example, in the territory of the Bashkiria Natural Park and the Khvalynsky National Park (Mosolova, 2019; Nekhoroshkov, 1990). In other regions, growth is noted – up to the transition of the forest ecosystem to the 4th stage of recreational digression, for example, in the deciduous forests of the Middle Volga region (Bykov, 2018). The number of another ground-nesting species, the Tree Pipit, recorded in the City Forest in overgrown burnt areas and clearings, turned out to be much lower (2% of the population) than in the Kashtak, where it is part of the dominant group. The same reaction of the Tree Pipit to an increase in recreational load has been observed by other researchers (Mosolova, 2019; Zakharov, 1998). According to some authors (Kostyushin, 1996; Zakharov, 1998), this species can be used as an indicator

species of the degree of recreational disturbance of forest ecosystems. The Yellowhammer, according to our observations, is an even more sensitive species to the degree of recreation than the Tree Pipit. The Common Chiffchaff, as our research has shown, with an increase in recreational pressure (from Kashtak Forest to City Forest) does not reduce its share in the population, being included in the group of dominants and in the category of numerous species of both protected areas. In the broad-leaved forests of the Middle Volga region, an increase in the number of Common chiffchaffs was observed as the degree of their recreational transformation increased from the 1st stage of digression to the 4th (Bykov, 2018). In the forests of the Khvalynsky National Park there is a decrease (Mosolova, 2019).

Below we present essays on species recorded in the City and Kashtak forests, which, in our opinion, require special attention. These are rare (included both in the Red Data Books of the Russian Federation (Krasnaya Kniga..., 2021) and the Chelyabinsk Oblast (Krasnaya Kniga..., 2017), and those without

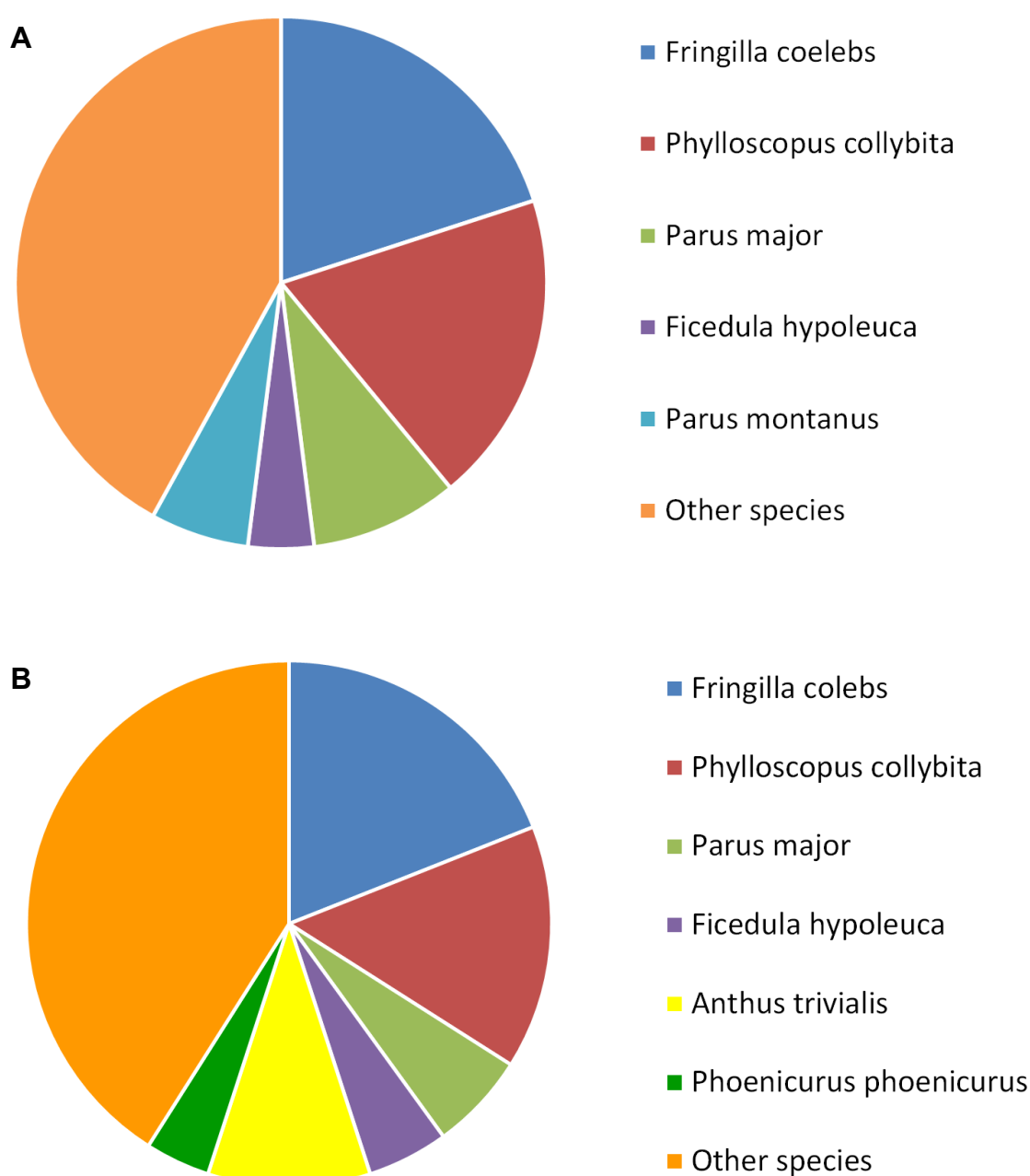


Fig. 3. The structure of dominance in the bird population of the Chelyabinsk (city) (A) and Kashtak (B) pine forests.

protected status, but requiring it), as well as those recorded on the periphery of the range and species whose presence in such places developed by man is a surprise.

Birds of the City and Kashtak forests that require special attention

European Honey Buzzard *Pernis apivorus*. Listed in the Red Data Book of the Chelyabinsk Oblast in category NT (Near Threatened). At the end of July 2017 and in the second ten days of July 2018, a single European honey-buzzard and, accordingly, two circling birds were observed over the City Forest (Gashek et al., 2018, 2019). Rare sightings of the species were recorded there in the 1980s and 1990s. (Shaygorodsky, 1996). A single circling bird was recorded at the end of June 2020 over the central part of the Kashtak Forest (Gashek and Krasutsky, 2021). It is possible that the European Honey Buzzard periodically visits both forests from adjacent territories in search of food.

Northern Goshawk *Accipiter gentilis*. Included in Appendix 3 of the Red Data Book of the Chelyabinsk Oblast as a species that requires special attention to its condition in the natural environment. We found a nest that had recently been abandoned and at least two chicks were still hanging around nearby, in July 2015 on an old pine tree in the center of the forest. A second nest (possibly of the same pair) with a large feathered chick was found on June 26, 2021 on the eastern outskirts of the City Forest. It was located on a plot of mature pine forest 200 m from the shore of the Shershnevskoye Reservoir, also on an old pine tree, at an altitude of 15 m, just 6 m from a path with busy pedestrians and cyclists. On the same nest on May 10, 2022, we observed an incubating female. On the site of this couple, in addition to the residential one, there were three more nests built on old pine trees. There, as well as in several other areas of the forest, the remains of Rock Pigeons were discovered – this species, which lives in abundance in the adjacent territories, is one of the main food items of the predator. The fact of nesting of the Northern goshawk in the City Forest demonstrates the pronounced anthropotolerant behavior of this hawk, which in the Chelyabinsk Oblast prefers to breed in the most remote areas of relatively weakly disturbed forests, while in some regions of Europe and a number of cities of European Russia in recent decades it has begun to show a tendency towards synurbism (Fridman and Suslov, 2021; Fridman et al., 2007; Morozov, 2021a, b). We assume nesting of the Northern goshawk in the Kashtak Forest: a young bird was encountered on August 17, 2018 (Gashek et al., 2019).

Short-toed Snake Eagle *Circaetus gallicus*. Included in the Red Data Book of the Russian Federation in category VU (Vulnerable). On the territory of the Chelyabinsk Oblast, a single Short-toed Snake-eagle was recorded in 2014 in the Oktyabrsky district, four birds in 2022 in the Miass urban district (Zakharov and Brusyanin, 2014; Zakharov and Migun, 2022). A young concussed migratory bird was picked up in early October 2016 in the Kashtak Forest (Gashek et al., 2018).

Willow Grouse *Lagopus lagopus*. Included in the Red Data Book of the Chelyabinsk Oblast in category NT (Near Threatened). The subspecies *L. l. major* (Lorenz, 1904) is included in the Red Data Book of the Russian Federation in category VU (Vulnerable). The only time the species was recorded on the territory of the City Forest was in the winter of 1989: the bird was caught in a house basement on its outskirts (Eremenko and Polyakov, 2003).

Western Capercaillie *Tetrao urogallus*. A cautious forest bird, rare in populated and visited areas of the Ural-Siberian region (Ryabitsev, 2002). Western Capercaillie is traditionally classified as anthropophobic (species most sensitive to anthropogenic influences) (Fridman et al., 2016; Potapov, 1987, 1990). At the same time, there are studies proving that Western Capercaillie nests are confined, in particular, to the sides of forest roads (Kirpichev, 2020). According to O.N. Zilin, an employee of the “Protected Natural Areas of the Chelyabinsk Oblast”, a male Western Capercaillie and solitary females were repeatedly recorded by him in 2018 in old-growth areas of pine plantations in the Kashtak Forest. In the central part of the forest, in an area of mature pine forest with an undergrowth of Mountain ash, Siberian crab apple and Maple ash, on May 16, 2020, we found a nest with a female incubating a clutch of 7 eggs (Fig. 11S) (dimensions: 61.0×41.8; 59.2×42.6; 60.7×41.4; 57.2×42.1; 55.0×41.4; 58.4×41.9; 57.5×41.6 mm).

Eurasian Pygmy Owl *Glaucidium passerinum*. Included in the Red Data Book of the Chelyabinsk Oblast in category NT (Near Threatened). E.A. Popov reported about an owl that flew into a trolleybus in pursuit of a Great Tit on the eastern outskirts of the City Forest in one of the winters of the 2010s.

Ural Owl *Strix uralensis*. Nesting, sedentary and nomadic species of the Southern Urals. It is found from the northern borders of the region to the steppe regions (Zakharov, 2006). In the City Forest in 2017–2021 we repeatedly encountered adult birds (Fig. 4S), often in areas heavily visited by people. The owls did not react to pedestrians and cyclists, and while photographing them, we were allowed

close to the trees on which they were sitting. At the beginning of May 2017, a nest with a brooding female was found in an old Northern Goshawk nest (Gashek et al., 2018), and on June 26, 2021, two flightless chicks were found (Fig. S5) in an area heavily visited by people. Previously, the Ural Owl was found using the City Forest as wintering grounds (Shaigorodsky, 1996). In the Kashtak Forest, we suspect nesting based on repeated recordings of birds (Fig. S4) during the breeding season in 2018 (Gashek et al., 2019), as well as in 2022 (our unpublished data). The scaring distance of Tawny Owls in the Kashtak Forest was significantly greater than that in City Forest. In recent decades, this species has inhabited city parks in many regions (Morozov, 2012).

White-backed Woodpecker *Dendrocopos leucotos*. In many regions of the European part of Russia, the species has significantly decreased in numbers in recent decades (Bakka, 2015; Bardin and Fetisov, 2019; Belyaev, 2018; Cherenkov, 2020; Golubev and Rusinov, 2014; Ivanchev and Nikolaev, 2017; Koshelev et al., 2021; Okolelov et al., 2016; Spiridonov et al., 2013; Tolstenkov and Ochagov, 2008; Vyshegorodskikh, 2017). According to our data (Gashek et al., 2022), the White-backed Woodpecker has also become rare in the Chelyabinsk Oblast.

In the City Forest we occasionally encountered single birds during the nesting period in areas adjacent to the Miass River. In the Kashtak Forest, meetings were somewhat more frequent; a nest with chicks about to emerge was discovered on May 22, 2021, in the hollow of a dry birch tree in a section of birch forest in the northern part of the forest.

Three-toed woodpecker *Picoides tridactylus*. Included in Appendix 3 of the Red Data Book of the Chelyabinsk Oblast. Single birds were recorded in the City Forest on winter migrations in 1987–1994, 1998, 2014 and 2015 (Polyakov, 2002; Shaigorodsky, 1996; E.A. Popov and I.N. Guseva, oral communication).

Olive-backed Pipit *Anthus hodgsoni*. In the Southern Urals, it is a rare, sporadically nesting species, found at the northern border of the region (Zakharov, 2006). The species was first recorded in the Chelyabinsk Oblast in 1996: a singing male was recorded in early July in the vicinity of the town of Verkh. Ufaley; in the second ten days of July 1998, several adult and young birds were observed there, as well as the feeding of a short-tailed fledgling by an adult bird (Ryabitsev, 1998). In the Kunashaksky District, a single pipit was encountered on April 26, 2002 in the Mamynkul swamp, a bird with food was found in July 2003 in the forest near the Sinara Rievr (Kuzmich, 2002; Kuzmich et al., 2005). During the nesting period of 2017, in the vicinity of the town of Kyshtym, two singing males were observed; in the Nyazepetrovsky Reserve, the singing and restlessness of a few individuals were recorded everywhere (Gashek et al., 2018).

A singing male was observed on May 26 and 29, 2018 in an area of forb-grass birch forest in the southern part of the Kashtak Forest. This is the most southern place of probable nesting of the species in the Chelyabinsk Oblast (Gashek et al., 2019).

Great Grey Shrike *Lanius excubitor*. Included in the Red Data Book of the Chelyabinsk Oblast in category NT (Near Threatened). Rare encounters of single individuals in winter were recorded in the City Forest in the period 1987–1994 and 2015 (Popov, 2015; Shaigorodsky, 1996).

Spotted Nutcracker *Nucifraga caryocatactes*. A nomadic and wintering species in the Southern Urals (Zakharov, 2006). The entry of a single bird into the territory of the City Forest was registered on April 22, 2013 (Popov, 2014).

Blackcap *Sylvia atricapilla*. A species with a European distribution, relatively common in the mountainous (western) regions of the Chelyabinsk Oblast and rare in the forest-steppe Trans-Urals (Zakharov, 2006). In the Kashtak Forest, in areas of old-growth pine forests with a dense undergrowth of maple ash, Siberian crab apple, rose hip, raspberry, and bird cherry, singing territorial males and nesting disturbance of males and females were observed annually, which indicates the probable nesting of the species, although it has not been formally confirmed (Gashek and al., 2019). In the City Forest, on May 29, 2022, also in an area of an old-growth pine forest with a well-developed undergrowth, we noted the singing of a territorial male.

Yellow-browed Warbler *Phylloscopus inornatus*. The western part of the species' range is located significantly north of the Chelyabinsk Oblast (Ryabitsev, 2002). A single migratory individual was observed in the City Forest on October 2, 2016 (the only registration in the region) (Popov and Rassomakhina, 2016).

Red-breasted Flycatcher *Ficedula (parva) parva*. Not numerous and rare, in some places a common species in the Urals, the Urals and Western Siberia (Ryabitsev, 2002). Relatively common during the nesting period in broad-leaved, dark-coniferous-deciduous and riverine habitats of the

western macroslope of the Southern Urals. It is extremely rare in the Trans-Ural forest-steppe; singing males are recorded in aspen-birch forests only in the north-west of the forest-steppe (Zakharov, 2006).

In the City Forest, single birds were observed on autumn and spring migration on September 15, 2016 and May 2, 2017 (Gashek et al., 2018; Popov and Rassomakhina, 2016). In the Kashtak Forest, the singing of territorial males was repeatedly heard in May 2020 in an area of an old-growth pine forest. We assume nesting of several pairs.

Orange-flanked Bush-robin *Tarsiger cyanurus*. In the south of the forest zone and in the forest-steppe of the Urals and Western Siberia it is a rare migratory species (Ryabitsev, 2002). Single migratory individuals were encountered at a feeder in the City Forest in September and early October 2017 (Popov and Rassomakhina, 2017), as well as in the first ten days of October 2020 (E.A. Popov, oral communication).

Eurasian Blackbird *Turdus merula*. Not numerous for nesting in dark coniferous-deciduous forests and a more common species in the broad-leaved forests of the Southern Urals, occurring to the east up to the Ilmen Nature Reserve (Zakharov, 2006). In many regions of Europe and Central Asia, the blackbird has successfully colonized urbanized areas and nests in urban tree plantations of Kaliningrad, St. Petersburg, Minsk, Dushanbe, Bishkek (Abdusalyamov and Garibmamadov, 2007; Berezantseva and Goncharova, 2019; Blagoslonov, 1975; Grishanov and Shukshina, 2015; Kadyrova et al., 2021; Lykov et al., 2009; Morozov, 2021a; Sakhvon, 2021a, b), in recent decades it has increasingly penetrated for nesting in the cities of the Perm Kama region, developing large forest parks (Matveeva, 2009). In the Chelyabinsk Oblast, this thrush still remains an urban-phobic species.

A pair of adult birds with two fledglings was encountered on the Kommunar pond on August 19, 2017 (Popov and Rassomakhina, 2017), which may indirectly indicate the possible episodic nesting of the species in the riverine areas of the City Forest.

White's Thrush *Zoothera varia*. Listed in the Red Data Book of the Chelyabinsk Oblast in category LC (Least Concern). Inhabits broad-leaved-dark-coniferous habitats and floodplain forests of mountainous regions (Zakharov, 2006).

The remains of a migratory bird were discovered at the end of September 2015 in the City Forest (Popov, 2015).

Crested Tit *Parus cristatus*. In the Southern Urals – nesting, sedentary and nomadic species (Zakharov, 2006). In the Chelyabinsk Oblast, found nesting in the Ilmen Reserve (Snigirevsky, 1929; Teploukhov, 1921) and the Etkul district of the Chelyabinsk Oblast (Redko, 1998). Later, in the Ilmen Nature Reserve, the Crested Tit was noted during nesting time in pine and pine-birch forests (Zakharov, 2006). In some years, during the period of winter migrations, it was found relatively common in the pine and pine-birch forests of the eastern foothills of the Southern Urals (ibid.).

Rare winter sightings of Crested Tits in the City Forest were recorded in the period 1987–1994 (Shaygorodsky, 1996).

Eurasian Bullfinch *Pyrrhula pyrrhula*. Nesting, resident, and nomadic species of the Southern Urals. In most of the region, it is observed during wintering and migrations. Relatively common nesting in pine and pine-birch forests of the eastern foothills of the Southern Urals. It is found during the nesting period in mountainous areas along spruce-birch and fir-spruce plantations. Inhabits overgrown dark coniferous clearings and is relatively rare in broad-leaved habitats in the western regions of the region (Zakharov, 2006).

In the City and Kashtak forests, the Eurasian Bullfinch is common during seasonal migrations and is not numerous during nesting time. In the City Forest, on May 5, 2017, a pair of birds was observed mating, while the female was holding nesting material in her beak (Gashek et al., 2018). Based on these observations, we assume that the species breeds in small numbers. In the Kashtak Forest in 2018, a few tens of meters from the residential development of the village Kashtak a nest was found on a young pine tree at a height of 2.5 m, in which on May 18 the female incubated a clutch of five eggs (Kaminsky, 2018; Malchevsky and Pukinsky, 1983; Tarasov et al., 2018). These facts of anthropotolerant behavior of the bullfinch are further evidence of its tendency to synurbization, observed in a number of other regions of Russia (Inginen et al., 2010; Kaminsky, 2018; Malchevsky and Pukinsky, 1983; Zhimulev et al., 2012).

Eurasian Bullfinch *Pyrrhula cinerea*. A rare wintering and nomadic species in the Southern Urals. Almost every year, small numbers are recorded in the Ilmen Nature Reserve in winter (Zakharov, 2006).

Single individuals were observed in the City Forest on January 2, 2017, in a flock of common bullfinches and in April of the same year – at a feeder (Popov and Rassomakhina, 2017).

Rustic Bunting *Ocyris rusticus*. Included in the Red Data Book of the Russian Federation in category VU (Vulnerable). On the territory of the Chelyabinsk Oblast, the state of the species is also assessed as unfavorable (Gashek and Krasutsky, 2021).

We recorded single migratory males in the City Forest on May 2, 2017 (Gashek et al., 2018) and May 2, 2022.

The high degree of recreational digression of the entire City Forest and individual sections of the Kashtak Forest, the littering of their territories and other anthropogenic factors are already significantly affecting the state of the entire biota of these protected areas. Serious concerns are also caused by the constant attempts of local authorities, with the assistance of the regional Ministry of Ecology, to allow the construction of capital construction projects within the boundaries of monuments under the pretext of “loss of environmental value” of the corresponding areas, with subsequent compensation by adjacent areas of lesser environmental value. Consequently, the Sokolinaya Gora residential complex, consisting of several multi-storey buildings and developed infrastructure, including a 2-level parking lot, an ice-skating rink and other facilities emerged in the center of Kashtak Forest in the 2000s on an area of 8 hectares. Ten years later, on the initiative of the local Ministry of Ecology, this built-up area, located in the center of a mature relict pine forest, was removed from the boundaries of the protected area, and as compensation, a birch forest adjacent to the forest in the northeast was added. In the City Forest, over the past 10–15 years, a number of capital construction projects have emerged, and in 2012 its protected zone was reduced from 233.48 to 14.79 hectares³. Several times over these years, changes in the boundaries of the natural monument occurred in connection with the removal of built-up areas and placing cadastral registration of real estate, as well as with the seizure of land plots for development. Recently, the idea of transferring both protected areas from the category of natural monuments to the category of natural parks has been intensively promoted, which is presented as a way to improve the status and more effective conservation of these objects. The main argument in favor of creating natural parks is the zoning of territories of future protected areas, which involves the allocation of protected, recreational, and economic zones. However, in practice, such zoning will lead to the transformation of forests (primarily the City Forest, which is extremely attractive for business) into cultural and recreation parks with attractions, paved walking areas, catering facilities, small architectural forms, etc. Obviously, the consequence of this will be further fragmentation of habitats, degradation of plant communities, simplification and impoverishment of the structure of entomo-, ornitho- and other cenoses. Protected areas in the center (and on the outskirts) of the metropolis will exist only on paper. In our opinion, the Chelyabinsk (City) and Kashtak forests need to maintain the status of natural monuments of regional significance or upgrade it to natural monuments of federal significance, which will protect unique ecosystems from encroachment by local officials and businesses.

Creating and multiplying so-called ecological trails designed to reorient and streamline the flow of recreationists in the territories of forests, to reduce the overall load on the key components of their ecosystems (especially in the City Forest), in fact only increase the impact of visitors and, as a result, increase disturbance, contribute to even greater degradation of forest communities by replacing natural forest areas with artificial structures.

Forestry activities are carried out by local forestry on the territories of both monuments without taking into account the environmental requirements of the vertebrate and invertebrate animal species inhabiting them. The removal of dead wood and dead wood occurs in most cases during the growing season of herbaceous plants and the reproduction of most species of animals, including birds, disrupting the most important processes of their life cycle – the choice of nesting sites, nest building, incubation of clutches and feeding of nesting chicks and fledglings. The destruction of dead wood deprives hollow nesters of the opportunity to build nests in hollows, most of which are located in dry and drying trees. It is on such trees that Blackbirds, Spotted Flycatcher, and diurnal raptors prefer to nest. This problem was also voiced in the works of other authors (for example, Morozov, 2012).

Hanging artificial nesting devices such as birdhouses in the City Forest by various organizations and environmental foundations does not bring any tangible benefit to hollow-nesting birds, since the vast majority of these devices are made and hung incorrectly. Even the few “correct” ones rarely attract birds. The reason for this is that Great Tits, Coal Tits and Blue Tits prefer hollows hollowed out by woodpeckers to man-made houses, while Common Redstarts and European Pied Flycatcher prefer natural voids in tree trunks.

³ Decree of the Government of the Chelyabinsk Oblast dated February 15, 2007 No. 27-P “On the natural monuments of the Chelyabinsk Oblast Chelyabinsk (city) and Kashtaksky forests (with amendments and additions)”.

The best that a person can do to preserve the forests of Chelyabinsk with the birds and other representatives of the biota that inhabit them, as well as any other natural objects, is to minimize interference in natural processes and maximize the preservation of the integrity of the forest cover.

Conclusions

Thus, the fauna and bird population of two forests, two natural monuments of the Chelyabinsk (City) and Kashtak forests, formed at the same time and located at a distance of 10 km from each other, have both common features and some differences. It is known that recreational transformation of habitats significantly affects the nesting avifauna; at the same time, different bird species react differently to changes in their nesting conditions (Bykov, 2018). In addition, there is no doubt that the species diversity of birds directly depends on the area of the park, which, as is known, is typical for island habitats (Matveeva, 2009). In the City Forest located in the center of the metropolis, which experiences a significantly higher anthropogenic load than the Kashtak Forest and is half the size, 74 reliably and presumably nesting bird species were recorded over a 40-year period of research, while in the Kashtak Forest over a 5-year period – 81 species. Nesting in the Kashtak Forest of such urbophobic species as the Common Buzzard, Black Grouse and Western Capercaillie indicates the preservation of elements of the “wild” natural community by this ecosystem. The population of the City Forest is dominated by the Chaffinch and Common Chiffchaff; the subdominants include the Great Tit, the European Pied Flycatcher and the Common Redstart. The Chaffinch, the Common Chiffchaff and the Tree Pipit dominate in the Kashtak Forest; subdominants are the Great Tit, the European Pied Flycatcher and the Common Redstart. In the City Forest, under the influence of recreation, there is a reduction in the number and abundance of ground-nesting species: the Yellowhammer has disappeared; the Tree Pipit is not numerous and makes up only 2% of the population. At the same time, some species nesting in the City Forest have ethological adaptations indicating their synurbization: anthropotolerant behavior of the Northern Goshawk, the Ural Owl, the Eurasian Bullfinch, and the Chaffinch. In the latter species, the scaring distance is reduced to 2–3 m, whereas in the Kashtak Forest it is several tens of meters.

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APPENDIX. Photos of some bird species of the Chelyabinsk (City) and Kashtak forests.



Fig. S1. *Corvus corax*, fledgling. Chelyabinsk (City) Forest. All photos were taken by V.A. Gashek.



Fig. S2. *Dendrocopos major*, male. Chelyabinsk (City) Forest.



Fig. S4. *Strix uralensis*. Chelyabinsk (City) Forest.



Fig. S3. *Accipiter nisus*, female. Chelyabinsk (City) Forest.



Fig. S5. *Strix uralensis*, fledgling. Chelyabinsk (City) Forest.

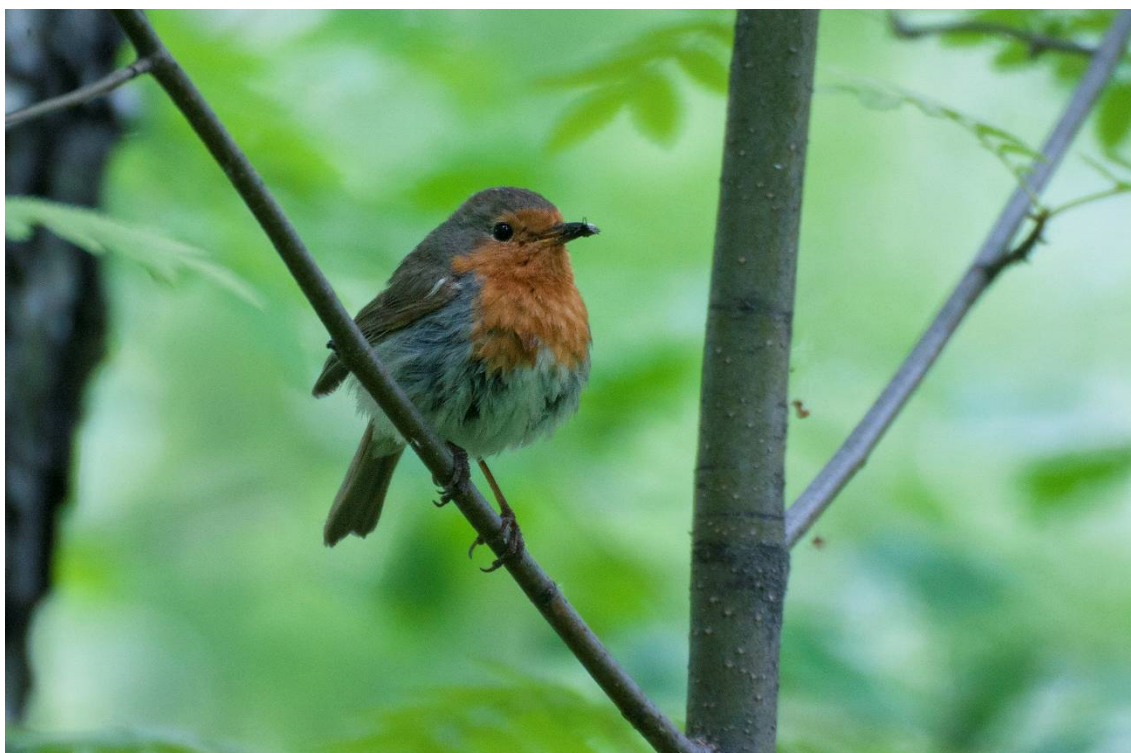


Fig. S6. *Erithacus rubecula* with food near the nest. Kashtak Forest.



Fig. S7. *Phoenicurus phoenicurus*, male. Kashtak Forest.



Fig. S8. *Anthus trivialis*. Kashtak Forest.



Fig. S9. *Emberiza citrinella*, male. Kashtak Forest.



Fig. S10. *Muscicapa striata*. Kashtak Forest.



Fig. S11. The nest of *Tetrao urogallus*. Kashtak Forest.



Fig. S12. Female *Phylloscopus collybita* incubating a clutch. Kashtak Forest.



Fig. S13. *Phylloscopus collybita*, fledgling. Kashtak Forest.



Fig. S14. *Streptopelia orientalis*, lekking of the male. Kashtak Forest.