

ANTHROPOGENIC IMPACT AND ITS EFFECTS ON AVIFAUNA DIVERSITY IN CIRIC VALLEY (IAȘI)

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KEYWORDS	ABSTRACT
Bird fauna Peri-urban habitat Wetlands Forest Human pressure Romania	Our study assessed the diversity of avifauna and the anthropogenic pressure in the Ciric Valley, located on the outskirts of Iași, which contains a mosaic of habitats, including deciduous forest, wetlands, and meadows. We used two ornithological methods: observation along the transect combined with fixed-point observation. The study area was divided into two large territories, depending on habitat characteristics: the Dorobanț and Aroneanu reservoirs, which shelter a diversity of 71 species, and the Ciric reservoir complex, where we observed 79 species of birds. The Shannon and Simpson indices, calculated to determine alpha diversity, show that the forest, along the three lakes it surrounds, has a greater variety of birds than the lakes in the rural area, reaching a value of 3.5. In both areas, most species are summer visitors and sedentary (Ciric) or passage species (Dorobanț-Aroneanu). Although the recorded anthropogenic pressure was high, a large percentage of the recorded species were breeding in the area, with 62.02% of the species inside the forest area and 56.34% in the perimeter of the Aroneanu reservoir. We noticed the presence of eight endangered or vulnerable species at each location, according to the Red Book of Vertebrates in Romania, and 32 bird species, respectively 30 bird species, included in Annexes 1 and 2 of the Birds Directive.

INTRODUCTION

Urbanization and related human activities have led to global biodiversity decline. Many countries deal with its repercussions, such as the degradation, loss, and fragmentation of habitats, which can lead to reduced gene flow between populations, pollution, anthropogenic pressure, biotic homogenization, an increase in the human population, and resource shortening. These factors cause avifauna to leave colonized areas and relocate to other places, resulting in a decrease in biological diversity (Watson et al., 2005; Morelli et al., 2018; Rosselli et al., 2020; Benitez et al., 2021; Krishna et al., 2023). The human impacts caused the taxonomic homogenization of avifauna, reducing species richness and diversity. Bird communities in urban areas are structurally simple, with few species. As urbanization intensifies, the abundance of individual birds tends to rise, whereas the specific diversity typically declines. Understanding the impact of urbanization on avifauna diversity and composition is critical for conservation efforts (Clergeau et al., 2006; Ion and Huțuleac, 2017).

Studies on this issue have become more frequent in the past few years. They underlined the importance of the avifauna as a bioindicator of habitat degradation and a tool for diagnosing the degree of human impact on the environment. Bird fauna is an index of overall diversity because bird species occupy several ecological niches, populate a variety of habitats, and have diverse diets. Birds bring many benefits to the environment, acting as natural pest control, spreading the fruits and seeds of plants, and they are key-species in the food chain (Otieno et al., 2021; Karjee et al., 2022). They can have several responses to urbanization, some can grow in number and others decrease. The ones that do not adapt to the new conditions either emigrate to other areas or avoid the altered territories, remaining in the same proximity. In other words, the perturbation of habitats generates stress that can lead to breeding failure. On the other hand, some bird species have learned to scavenge human resources, adapting to a new way of life (Altaf, 2021). Because they are directly or indirectly affected by urbanization, the studied areas face potential threats, with the papers highlighting the importance of assessing their avifauna status (Fisher, 2003; Rashid et al., 2020; Karjee et al., 2022; Krishna et al., 2023).

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Bird populations appear to be increasingly impacted, highlighting the significance of ornithological research. It is important to evaluate the effects of these changes and how they are perceived by wildlife. Studying the consequences of anthropogenic activities and how they affect bird diversity is relevant to find a plan to manage interactions and decrease the way in which they reflect on the fauna. Such studies can offer fresh insights into nature conservation, particularly concerning ongoing urban development (Ion and Huțuleac, 2017).

Studies have shown that bird communities benefit from the presence of mature and decomposing trees, multilayered vegetation, dense tree cover, high tree density, and remnants of native vegetation. Bird richness is related to resource availability, such as food, water, predator refuges, and nesting sites, and is greater if the habitat is more heterogeneous (Benitez et al., 2021). Proper management and protection of these areas are important for the survival of bird species in the long term (Mars et al., 2023).

The most fragile habitats are wetlands and forests because their resources are precious and are being exploited at a high level, especially those located near human settlements. Many researchers have emphasized the critical role of wetlands in biodiversity conservation, sediment control, water retention, oxygen sources, and as recreational spaces (Roy et al., 2016; Gosh et al., 2017; Mars et al., 2023; Khalil et al., 2023). Forests and their bird populations are at risk on a global scale due to various human activities, such as pollution, use of pesticides, simplifying the structure of forest habitats, spreading agricultural land, and carrying out recreational activities in their perimeter (such as walking, cycling, boating, running etc.). Despite their importance, these areas face increasing human pressure, leading to disturbances during the bird breeding seasons, which can affect their reproductive success and habitat selection (Altaf, 2021; Benitez et al., 2021; Nieoczym et al., 2022).

The study focused is on peri-urban areas, which are in the same category as the land we observed. The term "peri-urban area" refers to the transitional zone between urban and rural areas, embodying characteristics of both without fully aligning with either category. This essentially represents the partially urbanized segment of rural regions (Shahjadi et al., 2016). We chose this location because it is one of the hotspots regarding diversity in our city (Croitoru, 2009), and the area is currently in the process of urbanization, putting its diversity at risk. In our study, we noticed that the main pressure was the expansion of the city of Iași, which caused a shortening of the tampon area between the natural environment and human construction. In the villages close to the town, at process of urbanization is occurring in very short periods of time, and new residential buildings are being constructed. The Ciric area is also used as a relaxation space during the warm seasons. This was the purpose for which it was built in the 1930s and 1940s, and it has maintained its role until today. The woods are the main attractions for runners, bikers, and walkers, being a space for people where they can enjoy the clear air and nature. Such characteristics make it similar to other areas and territories that have been studied previously. Comparing the data, we can find a pattern and come up with solutions on how to develop and at the same time keep, or even rise, biological diversity around human settlements.

Seven previous studies examined the bird fauna in the study area, each making significant contributions to the knowledge of the bird fauna in the Ciric Valley. Although observations began in 1994 and date to the present day, there is a period of about 10 years during which no data has been recorded on the bird fauna in the area. An important part of our work was comparing our results with those presented in previous studies.

With this study, we seek to contribute to the understanding of avifauna's relationship with the urbanization process. Through the present study, we discuss the knowledge of the bird fauna diversity of the Ciric River Valley and its seasonal dynamics, by diversifying the methods of analyzing the collected data from the field. We determined the presence and distribution of bird species and counted individuals for each species on predetermined segments within, within the perimeter of which we appreciated the anthropogenic impact exerted on the bird populations and its effects on the diversity of bird fauna.

MATERIALS AND METHODS

The main aim of the Ciric River reservoirs was to prevent flooding in the villages located near the watercourse. Nowadays, these aquatic surfaces are used for new purposes, such as leisure. The first two reservoirs upstream of the river (Dorobanț and Aroneanu), located in the administrative territory of Aroneanu Village, have surface area of 70 ha, and 23 ha. On their banks are human settlements and, in some sectors, access roads for automobiles. The Ciric reservoir complex consists of three reservoirs (Ciric I, Ciric II and Ciric III, surnamed Venetia), covering areas of 14, 8, and 7 ha. In their surroundings, there is a deciduous forest planted between the years 1936 and 1963, sheltering a rich diversity of flora and fauna (Calistru et al., 2000; Mititelu et al., 1967).

The vegetation is specific to the forest-steppe zone and surrounds aquatic surfaces. The are consists of mesophilic and xerophilous meadows, salt-rich grasslands, hydrophilic and hygrophilous vegetation, and a deciduous forest with an average age of about 70 years. The fauna also presents a high level of diversity. Numerous authors studied the presence of invertebrates along the Ciric River (Vancea et al., 1961; Nicoară et al., 2000; Nicoară et al., 2005; Nicoară et al., 2009), and several others have researched the vertebrates (Nicoară, 2007; Gache, 2004; Butnaru, 2005; Butnaru, 2006; Croitoru, 2009; Tofănescu et al., 2019; Loghini, 2020; Nechifor et al., 2023). Most studies

on vertebrates target the bird fauna in the river valley, except for Nicoară's 2007 paper, which followed the presence of anuri amphibians in the area.

Our research was a one-year project that took place from April 2022 to March 2023. This study was conducted on the perimeter of the reservoirs on the course of the Ciric River, near the city of Iași. Field trips were regular and observations were made monthly, covering the three decades of each month. During these trips, we focused on recording bird species, counting the numbers of observed or listened-to individuals, and on human activities in the area that had a negative impact on the bird fauna, such as strong noise or changing habitat characteristics. We recorded the number of these activities for each transect, which was traveled in the morning, between 8AM and 12PM, when the birds were most active.

To conduct our field observations, we used two methods. The transect, which consists of following predetermined routes, allowed us to obtain data on the distribution of birds. Fixed-point observation was useful for monitoring bird species at specific points of interest along the route. These spots provided a clear view of the landscape, allowing us to identify and count species more effectively. They were strategically located to provide a broad perspective of the surrounding habitats. Nine points were established in spots with a large field of view on water surfaces: five for the first two reservoirs on the course of the river and four for the last three. While following resettled routes, we also identified bird species based on their specific calls. This method was mainly used in dense forest areas or in places with low visibility. We did not create separate list for these points; the species observed in those locations were included in the general list for each lake. The breeding species were determined during the field observations. We established bird species with breeding status as those that manifested strong territorial behavior, nest material gathering, nest building activities, and the presence of chicks and dependent juveniles in the study area. The species encountered in the field during the breeding period that did not show these facts were probably breeding species.

We used QGIS to facilitate the mapping of the study area. We divided our study area into six segments, corresponding to the five reservoirs (Dorobanț, Aroneanu, Ciric I, Ciric II and Veneția), as well as to the western slope of the forest. This allowed us to compare regions from an anthropic perspective and bird diversity. We included a map with all these elements in the Annexes section of this article (Figure 6).

To obtain a comprehensive view of the bird populations in the study area, we established three transects with different lengths that crossed the valley. Because the lakes were our main focus, we established that two of the routes should follow the banks of the wetlands, and one was designed for the forest. The first one is 3 km, and it starts from the dam of Veneția reservoir, following the eastern shore of the pond, crossing the Ciric I dam, and continuing on its western bank toward the Hotel Ciric, located halfway through Ciric II reservoir (Figure 1—the one closer to the top of the picture, colored in blue). The second transect, colored in yellow, (2.2 km) followed the route of Ciric Street, between the dams of Ciric I and Veneția reservoirs. For the Dorobanț and Aroneanu reservoirs, located outside of Iași City, we used existing roads along their eastern banks as a transect (Figure 2 – colored in red). Inside the village, we used the route closest to the water body. Its length is 5.1 km. Bird species were recorded at a distance of 20 m on each side of the transect.



Figure 1. Transect 1: Ciric reservoirs Complex (blue) and Transect 2: Ciric Forest (yellow)

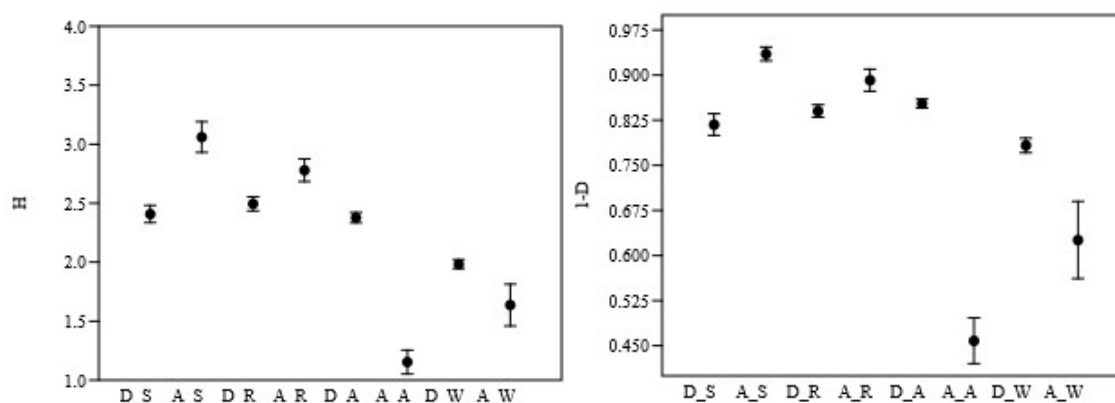


Figure 2. Transect 3: Dorobanț-Aroneanu reservoirs

The study area was divided into two distinct zones based on habitat characteristics and location. The first zone includes two segments, the Dorobanț and Aroneanu reservoirs, where the peripheral habitats are a mix of anthropogenic and meadow types. The two lakes cover a combined area of 93 ha. Observations recorded both on the water surface and within a 20-meter-wide (to the right) and 5.1 km-long perimeter (10.2 ha) and the land situated between the transect and the eastern shore of the Dorobanț lake resulted in total surface area of 130.5 ha. The second zone, the Ciric reservoir complex, comprises 29 ha and, is bordered by the deciduous Ciric Forest. In addition, a 20-meter-wide (on the right) area adjacent to the transect where observations were made, this wetland zone spans up to 38 ha. The forest transect covers 8.8 ha, based on the survey line's length (2.2 km) and width (40 meters). In total, this area has four segments: the three lakes and a forest transect.

We used two diversity indices to determine the alpha diversity of an area: the Shannon index, one of the widely used in ecology (Zamfirescu et al., 2008), and the Simpson index. We calculated each of them for the four periods of the bird's biological life cycle: spring migration (S), reproduction (R), autumn migration (A), and wintering season (W). We used the initials of the investigated reservoirs to represent the area: D, Dorobanț; A, Aroneanu; C2, Ciric II; C1, Ciric I; Ve, Veneția; F, Forest (Figures 3 and 4). The areas were delimited among the transects; they also served as the sampling units for the Shannon and Simpson diversity indices. The parameters were calculated automatically using PAST (Paleontological Statistics). We introduced the species with the number of individuals recorded in each area per season and calculated the Shannon and Simpson indices for the period of the bird's biological cycle. The program generated the graphs used to enhance the differences in diversity (see the next section).

We used the Nikon Aculon 8-24x and A211 10x binoculars. The photographs were taken using a Nikon's Coolpix L840 38x camera or the researchers' mobile phones. These tools helped us adequately document the observed bird species, allowing us to accurately record bird diversity and the anthropogenic impact in the study area.



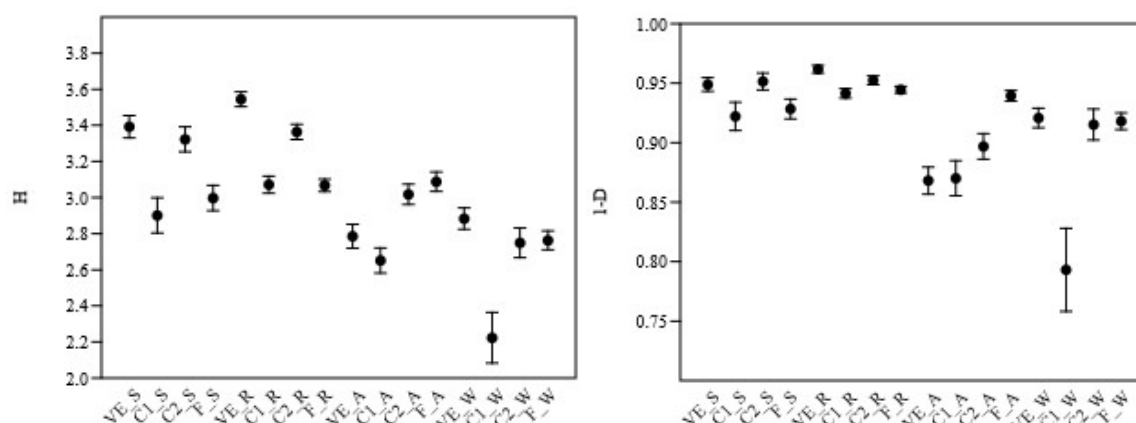


Figure 4. Shannon and Simpson diversity indices of the Ciric Reservoir Complex area

RESULTS AND DISCUSSION

Diversity analysis

We obtained a better image of the diversity of bird species in the study area by using more field trips. Our taxonomic list includes 96 bird species representing 42 families and 16 orders. We noticed that 53 bird species were common to both locations, considering their proximity to one another.

The reservoirs outside of Iași City have the bird fauna diversity consisting of 71 species, 31 of which belong to the order Passeriformes (43.66%), while the rest are aquatic or semi-aquatic birds, raptors, or anthropophilic species. There are only 18 species observed in this area: the common pochard (*Aythya ferina*), Eurasian bittern (*Botaurus stellaris*), Eurasian spoonbill (*Platalea leucorodia*), western marsh harrier (*Circus aeruginosus*), wood sandpiper (*Tringa glareola*), common sandpiper (*Actitis hypoleuca*), black-tailed godwit (*Limosa limosa*), whiskered tern (*Chlidonias hybrida*), northern lapwing (*Vanellus vanellus*), black-winged stilt (*Himantopus himantopus*), great crested grebe (*Podiceps cristatus*), red-backed shrike (*Lanius collurio*), hooded crow (*Corvus cornix*), bearded reedling (*Panurus biarmicus*), thrush nightingale (*Luscinia luscinia*), western yellow wagtail (*Motacilla flava*), wheatear (*Oenanthe oenanthe*), and corn bunting (*Emberiza calandra*).

For Ciric reservoirs, we observed 79 species, with passerines as the dominant species diversity (53.16%), typical species in the forest habitat. There are 53 common bird species. We also observed species as greater scaup (*Aythya marila*), common goldeneye (*Bucephala clangula*), long-legged buzzard (*Buteo rufinus*), common kingfisher (*Alcedo atthis*), great spotted woodpecker (*Dendrocopos major*), lesser spotted woodpecker (*Dryobates minor*), middle spotted woodpecker (*Leiopicus medius*), European green woodpecker (*Picus viridis*), marsh tit (*Poecile palustris*), long-tailed tit (*Aegithalos caudatus*), goldcrest (*Regulus regulus*), icterine warbler (*Hippolais icterina*), Eurasian blackcap (*Sylvia atricapilla*), garden warbler (*Sylvia borin*), lesser whitethroat (*Curruc curruca*), common nightingale (*Luscinia megarhynchos*), collared flycatcher (*Ficedula albicollis*), spotted flycatcher (*Muscicapa striata*), common redstart (*Phoenicurus phoenicurus*), black redstart (*Phoenicurus ochruros*), song thrush (*Turdus philomelos*), mistle thrush (*Turdus viscivorus*), Eurasian treecreeper (*Certhia familiaris*), hawfinch (*Coccothraustes coccothraustes*), Eurasian siskin (*Spinus spinus*), and yellowhammer (*Emberiza citrinella*).

The specific diversity represented by the number of species differs from one area of the Ciric River valley to another (Figure 5), in some cases very much, although they are located at small distances from each other.

The reservoirs Dorobanț and Aroneanu have approximately equal number of species and implicitly similar specific diversity, sheltering 57 and 53 bird species, respectively. We identified differences in the composition of bird fauna on the Ciric Reservoir Complex and within the Ciric Forest. The area of the Venetia reservoir shelters the highest diversity in terms of the number of species. We observed 75 of the recorded 79 bird species here, while around the Ciric II reservoir, a partially anthropized area, we identified 58 bird species. The Ciric I reservoir is located between them, and on its banks, there are constructions such as houses, restaurants, and swimming pools where people go often, which is not suitable for a large number of species or individuals to settle. We observed the lowest specific diversity of bird fauna along the transect located on the western slope of the forest, which is mostly forest passerine species.

In the case of the extra-urban reservoirs, the Shannon index has a value betranges fromween 3.06 (Aroneanu reservoir in spring migration) to 1.153 (autumn migration of the same area). The second index has a minimum value of 0.458 and a maximum value of 0.935. In both cases, there was greater diversity in the Aroneanu reservoir for the first two periods of the year, while in the following months, the places reversed, and the Dorobanț reservoir shelters a greater diversity of birds (Figure 3).

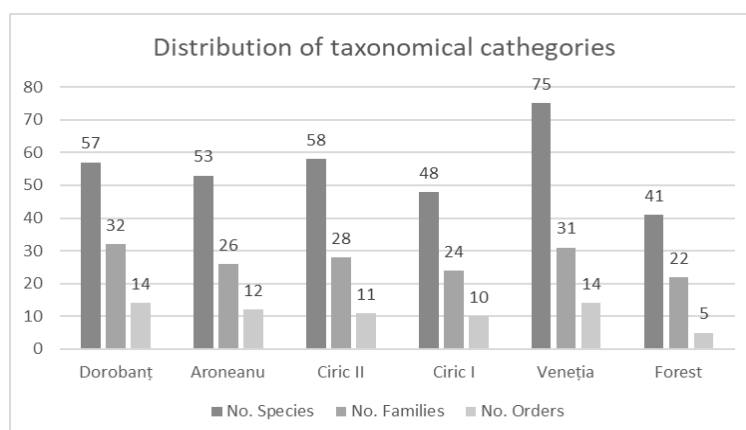


Figure 5. Distribution of taxa in six regions of the Ciric River valley

For the Ciric Forest, our data generated a value between 2.223 of the Shannon index (wintering period in the Ciric I reservoir's perimeter) and 3.544 (breeding season on the Veneția reservoir). In general, we recorded the minimum diversity during the winter months, followed by autumn and spring migration, and obtained the maximum value during the breeding season. The Simpson index had the same ranking for biological life cycle periods (Figure 5). The minimum and maximum values were 0.7931 (Ciric I reservoir, during the wintering season) and 0.9618 (Veneția reservoir, during the breeding season).

Overall, diversity indices were lower during the autumn migration than during spring. The breeding season was the interval with the highest diversity value, with the wintering period on the opposite side. This is because summer visitors, who represented the majority of the bird species identified by us, leave the study area in August or September, with the number fewer bird species observed between November and February.

Avian phenology

Phenologically, summer visitors are dominant in both locations; we met 31 of them in the area of the Ciric Reservoir Complex and Ciric Forest, as well as in the perimeter of the Dorobanț-Aroneanu reservoirs. In the first area, we identified 19 sedentary bird species, 15 passage species, 7 partially migratory species, 7 winter visitors, 2 rare, and 2 vagrant species in winter. In the second investigated territory, only 13 species were sedentary bird species, 7 were partially migratory species and 3 were winter visitors. The large number of passage species (15 and 18) indicates that the reservoirs do not meet the necessary conditions for settlement by birds, because of several factors. Many bird species do not find suitable habitats for reproduction because the area is subject to major habitat changes due to human pressure and activity. On the other hand, an unusual field observation was the recording of a large group of wood sandpipers in the upper part of the Dorobanț reservoir. This wader species, although usually present only as passage species in Romania, was present in the study area for several months, with up to 36 individuals, probably immature. This was possible because of the lack of rainfall in recent years, which led to a drastic reduction of the water surface, making it a suitable feeding place for a few bird species. Other wader species observed in smaller flocks within this perimeter are the northern lapwing, the black-winged stilt, the common sandpiper, and the black-tailed godwit.

The breeding species in Ciric Forest Park comprise 62.02% of the recorded bird fauna. Among the 49 breeding bird species in the study area, 41 are certainly regular nesting birds, while another eight are possibly breeding within this perimeter. For the reservoirs Dorobanț-Aroneanu, we identified 40 breeding bird species (56.34%), with 37 species being definitely breeding and three species being possibly breeding (grey heron – *Ardea cinerea*, garganey – *Spatula querquedula*, western yellow wagtail).

During the 12 months of ornithological field observations, we met groups of birds that stopped near the reservoirs or were flying above them, assessing that the Ciric River valley is a migration route for birds during spring and autumn, a fact highlighted by Tofănescu and Gache (2019). In the spring migration, we mention 20 grey herons in a resting stop on the Aroneanu reservoir, 4 small egrets (*Egretta garzetta*) in a flying passage in the area of the same reservoir, and 8 white storks (*Ciconia ciconia*) that passed over the Ciric Forest, both groups flying in a north-west direction. In the autumn migration, we recorded 620 starlings (*Sturnus vulgaris*) and 6 great egrets (*Ardea alba*) flying over the Aroneanu reservoir. We also surprised a mixed group of 122 great cormorants (*Phalacrocorax carbo*) and 29 Caspian gulls (*Larus cachinnans*) on the Dorobanț reservoir in November and several flocks of barn swallows (*Hirundo rustica*) flying south over the forest in September.

Human impact and protected species

The reservoirs located along the Ciric River are under countless types of human pressure. We included the activities carried out in the area in the list of collected data during our field trips to determine if there was a correlation between bird diversity and the degree of anthropogenic impact. Of all the six analyzed areas, the Dorobanț reservoir was the most exposed, with 41 recorded activities in 12 months, followed by the Ciric Forest (40), as a result of the constant auto traffic existing in the area. On the perimeter of the Aroneanu reservoir, 38 activities were identified, most of them related to the construction of a real estate complex on the western bank of this aquatic surface. For the three reservoirs of the Ciric complex, Ciric II, Ciric I, and Veneția (Ciric III), we recorded 29, 30, and 21 anthropic pressures, respectively. By analyzing these data and the specific diversity (Figure 4), we conclude that the specific diversity is indeed correlated with the degree of anthropization in the studied area. For the Dorobanț and Aroneanu reservoirs, we consider that although, the anthropogenic pressure is among the highest, the surface of the ponds, which is much larger than that of Ciric lakes, favors the presence of several bird species, which find protected areas where they can retreat in the case of human presence. The most common activities recorded were road and air traffic, fishing, construction, recreational activities such as picnics and walks, kayak-canoe training, forestry, vegetation burning, and public space sanitation. The fact that the Iași International Airport is located near the reservoirs is not only a source of disturbance for the bird fauna but also a source of safety risk for the passengers and crew of aircraft, which was highlighted previously (Tofănescu and Gache, 2019). During data collection, we encountered numerous planes flying at lower altitudes over the valley.

On the surface of the upper reservoirs, we observed 8 species of birds with conservation status mentioned in the Red Book of Vertebrates in Romania published in 2015: five of them are endangered (great egret – *Ardea alba*, purple heron – *Ardea purpurea*, small egrets – *Egretta garzetta*, Eurasian spoonbill – *Platalea leucorodia* and Black-winged Stilt – *Himantopus himantopus*), and three others are vulnerable (European turtle dove – *Streptopelia turtur*, Black-crowned Night-Heron – *Nycticorax nycticorax*, white stork – *Ciconia ciconia*). At the same time, among the 71 species, 33 (46.48%) appear in the lists of the Birds Directive (15 in Annex 1, as species that need special conservation measures and 17 in Annex 2, as hunting bird species through the national legislation but keeping their population out of disappearing risk). Many bird species recorded in the surroundings of the Ciric Reservoir Complex (37.97%) are protected. In our list, we identified five vulnerable species (black-crowned night-heron, European turtle dove, white stork, common goldeneye) and three endangered species (small egret, great egret, purple heron). Regarding the Birds Directive, we recorded 13 bird species listed in Annex 1 (species used as criteria for designation of Special Protected Areas in the Nature 2000 network), and another 17 species listed in Annex 2 (as hunting species respecting the national legislation without jeopardizing their long-term survival).

Compared to the avifauna in the city, the peri-urban area exhibits a significantly greater diversity of bird species, as documented by many researchers in Romania and in other parts of the world, including van Heezik et al. (2008), Croitoru (2009), Morelli et al. (2018), Ion and Hutuleac (2017), and Benitez et al. (2021). Ciric is a peri-urban zone that serves as a natural habitat and vital refuge for birds seeking a suitable space away from disturbances and habitat degradation. The area's enhanced diversity can be attributed to several key factors. First, the presence of rich vegetation provides ample foraging opportunities and nesting sites for various bird species. Additionally, the abundance of dead wood provides vital resources for cavity-nesting birds and contributes to the overall health of the ecosystem. Moreover, the presence of diverse micro-habitats ranging, from grasslands to wetlands further, enriches the avian habitat mosaic, supporting a wide array of bird species with varying habitat preferences. Furthermore, the environment has a lower anthropogenic than urban areas (Fulton, 2019; Altöf, 2021; Nieoczym et al., 2022). Reduced human disturbances allow bird populations to increase in number, thereby encouraging breeding success and population resilience. Overall, the peri-urban area's combination of natural habitat features and reduced human impact creates an excellent sanctuary for birds, highlighting its importance as a refuge and contributing to regional biodiversity conservation efforts, Ciric Forest is in the process of becoming a protected urban area.

Comparing the taxonomic list of our study area with other research's results we noticed that the avifauna in Ciric exhibits greater specific diversity, highlighting the richness of avian species. This aspect can be determined by various factors, such as the surface area of the investigated site, types of habitats, vegetation type, and degree of urbanization. The high number of species indicates the importance of our area as a habitat for diverse bird communities.

Most of the species observed in the study area belong to the order Passeriformes, which are commonly known as passerines (Benitez et al., 2021). This diverse group of birds includes familiar species such as sparrows, finches, warblers, and thrushes, which are renowned for their agility and melodic songs. This composition was observed at all the locations in our study area, especially in the segments located inside or at the edge of the forest.

The extensive surface of the study area, covering approximately 177.3 ha, significantly influences avifaunal dynamics, diversity, and abundance, as indicated in prior research. This vast expanse fosters heterogeneity within the avian community, leading to a greater diversity of species and overall diversity. The large study area allows for the establishment of diverse habitats, including various microclimates, vegetation types, and ecological niches, which collectively support a wide array of bird species. However, despite increased diversity, the abundance of individual bird species tends to be lower within expansive habitats. This lower abundance is a result of the dispersal

of individuals across the area. Nevertheless, notable exceptions occur during migration periods, where flocks of birds congregate, temporarily increasing the abundance of certain species within some areas of the study site (Hedblom et al., 2010; Roselli, 2020). These periodic influxes of migratory flocks highlight the dynamic nature of avian populations within the study area and underscore the importance of considering seasonal variations in avian abundance and distribution patterns.

The distribution of bird species within the study area is distinctly patterned: aquatic and semi-aquatic species predominantly inhabit the lakeshores, where they find abundant food and suitable nesting sites. Woodland birds, on the other hand, are primarily found within forested areas, taking advantage of dense vegetation for nesting and foraging. Meanwhile, the periphery of the village serves as a habitat for open-area species, characterized by grasslands and scattered shrubs, providing ample space for ground-feeding and open-nesting bird species. This spatial segregation of bird communities reflects the diverse ecological niches present within the study area, highlighting the importance of habitat heterogeneity in supporting avian biodiversity (Ion and Huțuleac, 2017).

The woods host a layered vegetation structure comprising of native and alien plant species, as noted in existing literature (Mititelu et al., 1967). The multilayered canopy and forest floor provide diverse niches that fulfill the needs of various bird species. The presence of rich vegetation not only offers sufficient food resources, such as fruits, seeds, and insects, but also provides essential shelter and nesting sites for various avian inhabitants. This vegetation arrangement creates a mosaic of habitats within the woodland, each suited to the ecological requirements of different bird species. The diversity of vegetation enhances the overall habitat complexity, fostering higher species diversity within the avian community. Moreover, the presence of native plant species promotes ecosystem resilience and stability because, these plants co-evolve with local bird species, forming ecological relationships. Consequently, the unique combination of layered vegetation and native plant species contributes to the area's distinctiveness, making it suitable for diverse bird communities and underscoring the importance of preserving such habitats for biodiversity conservation efforts (Morelli et al., 2018; Fulton, 2019).

The lakes have a significant potential to support greater diversity and abundance of bird species with improved reservoir management. The considerable number of species observed here serves as an indicator of good water quality (Roy et al., 2016), suggesting that with enhanced management practices, the lakes could become even more attractive habitats for avian populations. This habitat plays a decisive role in migratory species, serving as both a resting and feeding area for aquatic birds and as a guiding point during migration flights. In addition to the forest ecosystems, the wetland habitats within our study area exhibit high levels of species diversity, similar to other studies (Karjee, 2022). The diverse array of aquatic and terrestrial habitats within wetlands supports several bird species, highlighting the ecological importance of these unique ecosystems.

The degree of urbanization significantly influences both taxonomic and functional diversity (Roselli et al., 2020; Otieno et al., 2021). For instance, within the Ciric Forest area, Ciric I Lake exhibits the highest level of urbanization and consequently the lowest diversity, whereas Lake Venetia possesses, greater diversity and minimal human impact. Despite Dorobanț's proximity to human settlements, its larger water body and relatively stable environment have facilitated the observation of more bird species than the heavily altered Aroneanu reservoir. Alterations such as soil deposition on the village shores have reduced nesting and refuge areas for birds, intensified by the expansion of Șorogari village. These modifications negatively impact the diversity and distribution of avifauna, leading birds to avoid certain areas and concentrate in specific territories, in this case in the secluded part of the lake near the Dorobanț dam, characterized by ample reed coverage and minimal construction activity.

In anthropic areas, bird species closely associated with human settlements thrive, taking advantage of urban environments for nesting and feeding. Common examples include species like the Eurasian collared dove, the Syrian woodpecker, the house sparrow (*Passer domesticus*), the Eurasian tree sparrow (*Passer montanus*), the great tit, the common starling, and the barn swallow, which exhibit adaptations to urban living. These birds often exploit human structures and resources, such as buildings, parks, and food waste, to establish their territories and raise their young. Their ability to adapt to human-modified landscapes underscores the resilience and adaptability of certain avian species to anthropogenic pressures. One thing that deserves attention is that in urban areas, the abundance of birds is greater than the diversity, which means that even if there are few species, they will be represented by a large number of individuals. In Dorobanț village, the most abundant bird species observed during field trips were the house sparrow (110 to 120 individuals) and the Eurasian tree sparrow (70 to 80 individuals). These species thrive in human settlements because the availability of food and shelter resources (Rashid, 2020).

The significant exposure of our study area to urbanization and habitat degradation poses challenges to avian populations, as emphasized by Sadat et al. (2016). Urban expansion and habitat destruction threaten the viability of bird habitats and contribute to declining in species diversity and abundance.

Seven previous studies on the avifauna in our study area have studied its diversity, seasonal dynamics, and human impact. The authors have highlighted important aspects in their papers regarding the diversity and, dynamics of bird species and the anthropogenic impact exerted on the birds in this bordering area of the city.

The Scientific Annals of Alexandru Ioan Cuza University published the articles (G 2004), (B 2005, B 2006), and (L 2020). In 2009, the monograph on birds in Iași's green spaces, including the Ciric area, (C 2009) was published.

(T&G 2019) published their research in a volume following an international congress. Finally, we conducted a previous study in the same area in 2020–2021, with the results published in 2023.

Compared with the studies mentioned above, we found that the Ciric avifauna includes between 80 and 96 species (Table 1). We regarded the data collected by Butnaru for the two articles as included in her 2009 monography under the title Croitoru. This year's observations show that diversity is among the highest recorded values; our list includes as many species as the one made by Tofănescu and Gache in 2019. The similarity of values may be due to the effort to make numerous trips during each month; the authors of the last-mentioned study went to the field two or three times during migration periods, and our study maintained this pattern for the entire year.

Table 1. Bird fauna's diversity in the Ciric River valley over time (previous and present studies)

No. of	G 2004	B 2005	B 2006	C 2009	T&G 2019	L 2020	N&G 2023	N&G 2025
Species	80	54	59	89	96	84	84	96
Families	35	27	28	41	29	38	35	42
Orders	15	9	10	16	15	17	12	16

Comparing the taxonomic lists of these papers, we concluded that the total number of species observed in the study area is 142, only 30 species have been present in the Ciric River valley since the beginning of the bird fauna' study: grey heron (*Ardea cinerea*), great egret (*Ardea alba*), little bittern (*Ixobrychus minutus*), black-crowned night heron (*Nycticorax nycticorax*), mallard (*Anas platyrhynchos*), mute swan (*Cygnus olor*), common buzzard (*Buteo buteo*), Eurasian goshawk (*Accipiter gentilis*), common moorhen (*Gallinula chloropus*), Caspian gulls (*Larus cachinnans*), black-headed gull (*Chroicocephalus ridibundus*), common tern (*Sterna hirundo*), Eurasian collared dove (*Streptopelia decaocto*), European turtle dove (*Streptopelia turtur*), European bee-eater (*Merops apiaster*), barn swallow (*Hirundo rustica*), sand martin (*Riparia riparia*), common house martin (*Delichon urbicum*), Eurasian reed warbler (*Acrocephalus scirpaceus*), great reed warbler (*Acrocephalus arundinaceus*), white wagtail (*Motacilla alba*), red-backed shrike (*Lanius collurio*), Eurasian magpie (*Pica pica*), rook (*Corvus frugilegus*), house sparrow (*Passer domesticus*), Eurasian tree sparrow (*Passer montanus*), common starling (*Sturnus vulgaris*), common chaffinch (*Fringilla coelebs*), European goldfinch (*Carduelis carduelis*), and Eurasian siskin (*Spinus spinus*).

This indicates that the habitat has undergone modifications over time and birds did not find proper conditions to stop here for a period of time. On the other hand, some of them could not adapt to the new conditions and left the site permanently or, on the contrary, established themselves here at some point and then came back each year. In order to know the exact cause of these fluctuations in the avifauna's composition, it would be necessary to take into account many factors, such as climate, the transformation of vegetation structure and landscape, human impact, and urbanization — data that we do not have.

The new species encountered this year were the purple heron, common goldeneye, greater scaup, common pochard, long-legged buzzard, bearded parrotbill, Eurasian spoonbill, common sandpiper, black-tailed godwit, and black-winged stilt, many of which have a conservation status.

This information demonstrates that birds, being the most mobile class of vertebrates, can easily change their habitat when the environmental conditions are not suitable for living. The taxonomic list of each paper that discussed the avifauna in Ciric differed, with some species not adapting to the urbanization process in the area and therefore could not be found in the field for several years, while others found proper breeding conditions. The Ciric Forest and lakes are one of the most diverse sites in the city, together with the Botanical Garden of Iași (Butnaru, 2005; Butnaru, 2006; Croitoru, 2009).

CONCLUSION

Between April 2022 and March 2023, we met 96 bird species along the Ciric River valley, which represents one of the highest values of specific diversity recorded to date. The recording of bird fauna was more efficient because the frequent field visits.

The collected data were by comparing the two sectors of the valley. Overall, the Ciric reservoirs and the forest surrounding them have a higher diversity in terms of the number of species than the Dorobanț and Aroneanu reservoirs located outside the city (79 and 71 species). On the other hand, we noted that the number of individuals of aquatic, semi-aquatic, and anthropophilic species is higher in the case of Dorobanț and Aroneanu reservoirs than in the peri-urban wetland, which is due to the large surface of the water. However, the Ciric Forest compensates for the large number of forest passerines that give the bird fauna its specificity. This underscores the patterned distribution of avifauna, which is determined by ecological and morphological characteristics.

The Shannon and Simpson indices used to calculate the alpha diversity had a higher value in the case of the Ciric reservoir complex and a lower value in the case of the Dorobanț and Aroneanu reservoirs, locations where these indices reach their minimum values (Figures 4 and 5). The area of the upper reservoirs is currently subject to accentuated habitat changes due to natural causes (lack of rain for the Dorobanț reservoir) or human causes (construction and consolidation on both sides of the shores of Aroneanu reservoir). Individuals of some species were

present in large numbers in the passage or, in the case of anthropophilic birds, settled in the village near the water source. The diversity was among the highest between the research carried out in this location over the years and between the studies carried out in similar areas containing the same habitat around the world. Ciric reservoirs and their surroundings contain a wide variety of bird species, an aspect that underlines the importance of this zone. This high diversity is a result of a series of factors that create optimal breeding, shelter and food conditions for the avifauna. From a phenological point of view, the bird fauna of the investigated area consists of summer visitors, sedentary species, partially migratory species, passage species, winter visitors, and rare species in winter. Categories are represented in different proportions depending on habitat characteristics, with the first being the most abundant. A noticeable difference from this viewpoint is the large difference between the numbers of sedentary species within the two analyzed territories. The only species present throughout the year in Dorobanț and Aroneanu are anthropophilic (for example the house sparrow, the Syrian woodpecker, and the Eurasian great tit). The forest on the outskirts of Iași shelters many more species during the winter season, many of them woodpeckers (order Piciformes, *Picus* species being observed only outside human settlements in areas covered with trees) and small birds representing the order Passeriformes.

The existence of numerous species with conservation status in the area, half of which are listed in official documents, the abundant specific diversity, together with the reporting of flocks with numerous individuals at certain times of the year, denote that the Ciric River valley represents an area with high ornithological potential. A limiting element is high anthropogenic pressure, which is a disturbing factor for birds as well as habitat changes and dynamics.

Peri-urban habitats represent a refuge for avian biodiversity and a transitional area between the city and natural environment, whereby animals are exposed to constant anthropogenic activities and environmental alteration. These elements determine decreasing number of birds in the territory. Environmental characteristics such as rich vegetation, large surface area, quantity of dead wood and abundance of habitats compensate for this, creating proper conditions for more species.

The data collected and presented in this paper contribute to our understanding of the effects of urbanization on the representatives of the Aves class. Although this information is valuable, extending the study duration would provide a more comprehensive understanding of avifauna diversity and dynamics. Observing bird populations over a long period allows for the identification of long-term trends and seasonal variations, thereby enhancing the accuracy of ecological assessments.

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ANNEXES

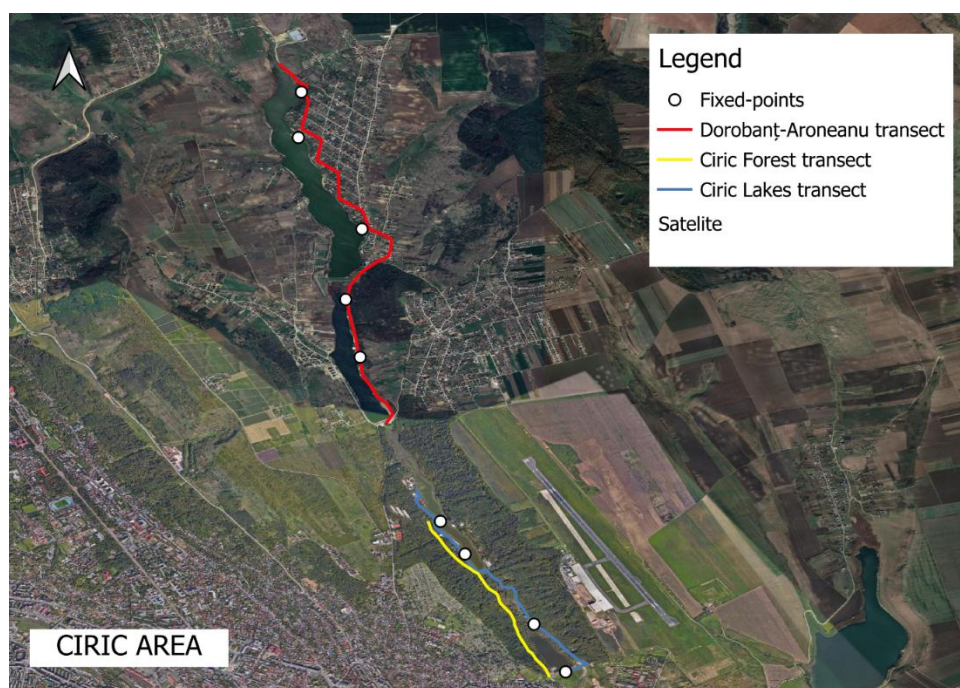


Figure 6. The reservoirs along the Ciric River

Table 2. Dorobanț-Aroneanu reservoirs: phenology and breeding status of recorded bird fauna

No.	Species	Phenological presence in the study area												Phenology and breeding species
		N	D	J	F	M	A	M	J	J	A	S	O	
1	<i>Anas platyrhynchos</i>	X	X	X	X	X	X	X	X	X	X	X	X	PM, B
2	<i>Spathula querquedula</i>					X	X	X		X				SV, PB
3	<i>Cygnus olor</i>		X	X	X					X		X		P
4	<i>Aythya ferina</i>						X							P
5	<i>Egretta garzetta</i>						X	X		X				P
6	<i>Ardea alba</i>	X	X		X	X		X			X	X	X	PM
7	<i>Ardea cinerea</i>	X	X		X	X	X	X	X	X	X	X	X	PM, PB
8	<i>Ardea purpurea</i>							X	X	X				SV
9	<i>Nycticorax nycticorax</i>						X	X	X	X	X			SV, B
10	<i>Ixobrychus minutus</i>								X		X			SV, B
11	<i>Botaurus stellaris</i>						X	X	X					SV
12	<i>Phalacrocorax carbo</i>	X	X			X	X	X	X	X	X	X	X	SV
13	<i>Ciconia ciconia</i>						X	X	X	X				SV, B
14	<i>Accipiter gentilis</i>		X		X	X					X			P
15	<i>Accipiter nissus</i>	X												P
16	<i>Circus aeruginosus</i>									X				P
17	<i>Buteo buteo</i>	X		X	X	X					X	X		PM
18	<i>Falco tinnunculus</i>				X									P
19	<i>Phasianus colchicus</i>	X			X									WV
20	<i>Platalea leucorodia</i>									X				P
21	<i>Galinula chloropus</i>						X	X	X	X	X			SV, B
22	<i>Tringa glareola</i>						X		X	X	X	X	X	P, SV
23	<i>Actitis hypoleucos</i>										X			P
24	<i>Limosa limosa</i>									X				P
25	<i>Larus cachinnans</i>	X	X	X	X	X	X	X			X	X	X	PM
26	<i>Chroicocephalus ridibundus</i>	X								X	X	X	X	WV
27	<i>Sterna hirundo</i>						X	X	X	X	X			SV
28	<i>Chlidonias hybrida</i>							X	X	X				SV
29	<i>Vanellus vanellus</i>								X	X				P
30	<i>Himantopus himantopus</i>								X					P
31	<i>Podiceps cristatus</i>						X							P
32	<i>Streptopelia decaocto</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
33	<i>Streptopelia turtur</i>						X	X	X	X	X			SV, B
34	<i>Columba palumbus</i>					X	X	X	X	X	X			SV, B
35	<i>Columba livia domestica</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B

No.	Species	Phenological presence in the study area												Phenology and breeding species
		N	D	J	F	M	A	M	J	J	A	S	O	
36	<i>Cuculus canorus</i>						X	X	X	X				SV, B
37	<i>Apus apus</i>									X				P
38	<i>Merops apiaster</i>										X	X		P
39	<i>Dendrocopos syriacus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
40	<i>Picus canus</i>		X											P
41	<i>Oriolus oriolus</i>							X	X	X	X			SV, B
42	<i>Lanus collurio</i>						X	X	X	X	X	X		SV, B
43	<i>Garulus glandarius</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
44	<i>Pica pica</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
45	<i>Corvus frugilegus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S
46	<i>Corvus cornix</i>	X	X	X	X	X	X	X	X	X	X	X	X	S
47	<i>Panurus biarmicus</i>					X	X	X	X	X	X	X		SV, B
48	<i>Parus major</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
49	<i>Cyanistes caeruleus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
50	<i>Remiz pendulinus</i>												X	P
51	<i>Hirundo rustica</i>						X	X	X	X	X	X		SV, B
52	<i>Delichon urbicum</i>						X	X	X	X	X			SV, B
53	<i>Riparia riparia</i>						X	X	X	X	X	X		SV, B
54	<i>Acrocephalus arundinaceus</i>						X	X	X	X	X	X		SV, B
55	<i>Acrocephalus scirpaceus</i>						X	X	X	X	X			SV, B
56	<i>Luscinia luscinia</i>						X	X	X	X	X			SV, B
57	<i>Phylloscopus collybita</i>						X	X	X	X	X	X		SV, B
58	<i>Oenanthe oenanthe</i>						X	X	X	X	X			SV, B
59	<i>Erithacus rubecula</i>					X	X	X	X	X	X	X		SV, B
60	<i>Turdus merula</i>	X	X	X	X	X	X	X	X	X	X	X	X	PM, B
61	<i>Sturnus vulgaris</i>					X	X	X	X	X	X	X	X	SV, B
62	<i>Troglodytes troglodytes</i>	X	X	X	X	X								WV
63	<i>Sitta europaea</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
64	<i>Passer domesticus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
65	<i>Passer montanus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
66	<i>Motacilla alba</i>						X	X	X	X	X	X		SV, B
67	<i>Motacilla flava</i>						X	X	X	X	X			SV, PB
68	<i>Carduelis carduelis</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
69	<i>Chloris chloris</i>					X	X	X	X	X	X	X		SV, B
70	<i>Fringilla coelebs</i>	X	X	X	X	X	X	X	X	X	X	X	X	PM, B
71	<i>Emberiza calandra</i>					X	X	X	X	X	X	X		SV, B

Legend: Phenology status: P – bird species in passage, WV – winter visitors, SV – summer visitors, S – sedentary species, PM – partial migratory species; Breeding status: B – breeding species, PB – probably breeding species.

Table 3. Cîrcîi reservoir Complex and Forest: phenology and breeding status of recorded bird fauna

No.	Species	Phenological presence in the study area												Phenology and breeding species
		N	D	I	F	M	A	M	I	I	A	S	A	
1	<i>Anas platyrhynchos</i>	X	X	X	X	X	X	X	X	X	X	X	X	PM, B
2	<i>Aythya marila</i>		X											Ac
3	<i>Bucephala clangula</i>				X									Ac
4	<i>Spatula querquedula</i>				X									P
5	<i>Cygnus olor</i>	X	X	X	X	X		X	X	X	X	X	X	PM, P
6	<i>Ciconia ciconia</i>					X								P
7	<i>Egretta garzetta</i>											X		P
8	<i>Ardea cinerea</i>		X			X	X			X	X	X		SV, RW
9	<i>Ardea alba</i>		X									X		P, RW
10	<i>Ardea purpurea</i>								X	X	X			SV
11	<i>Nycticorax nycticorax</i>					X		X	X	X	X			SV, PB
12	<i>Ixobrychus minutus</i>								X	X				SV, PB
13	<i>Phalacrocorax carbo</i>									X	X	X		P
14	<i>Accipiter gentilis</i>		X		X				X		X			S, PB
15	<i>Accipiter nisus</i>					X						X		P
16	<i>Buteo buteo</i>		X	X	X	X			X	X				PM, PB
17	<i>Buteo rufinus</i>											X		P
18	<i>Falco tinnunculus</i>			X		X	X							P
19	<i>Phasianus colchicus</i>					X								P
20	<i>Gallinula chloropus</i>					X	X	X	X	X	X	X		SV, B
21	<i>Larus cachinnans</i>					X				X	X	X	X	P
22	<i>Chroicocephalus ridibundus</i>	X		X					X	X	X	X	X	PM

No.	Species	Phenological presence in the study area												Phenology and breeding species
		N	D	I	F	M	A	M	I	I	A	S	A	
23	<i>Sterna hirundo</i>						X	X	X	X	X			SV
24	<i>Columba palumbus</i>					X	X	X	X	X	X	X	X	SV, B
25	<i>Columba livia domestica</i>	X	X	X	X	X	X	X	X	X	X	X	X	S
26	<i>Streptopelia decaocto</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
27	<i>Streptopelia turtur</i>						X	X	X	X	X			SV, B
28	<i>Cuculus canorus</i>						X	X	X	X	X			SV, B
29	<i>Merops apiaster</i>										X	X		SV
30	<i>Alcedo atthis</i>		X			X	X	X	X	X	X	X	X	PM, PB
31	<i>Apus apus</i>							X	X	X	X			SV
32	<i>Dendrocopos syriacus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
33	<i>Dendrocopos major</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
34	<i>Leiopicus medius</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
35	<i>Dryobates minor</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
36	<i>Picus viridis</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
37	<i>Picus canus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
38	<i>Oriolus oriolus</i>							X	X	X	X	X		SV, B
39	<i>Garrulus glandarius</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
40	<i>Pica pica</i>									X				P
41	<i>Corvus frugilegus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S
42	<i>Parus major</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
43	<i>Cyanistes caeruleus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
44	<i>Poecile palustris</i>	X	X	X	X	X						X	X	WV, PB
45	<i>Aegithalos caudatus</i>	X	X	X	X	X				X				WV, P, PB
46	<i>Remiz pendulinus</i>										X	X		P
47	<i>Regulus regulus</i>	X	X	X									X	WV
48	<i>Hirundo rustica</i>						X	X	X	X	X	X	X	SV, B
49	<i>Delichon urbicum</i>							X	X	X	X	X		SV, B
50	<i>Riparia riparia</i>							X	X	X	X	X		SV
51	<i>Acrocephalus arundinaceus</i>						X	X	X	X	X	X		SV, B
52	<i>Acrocephalus scirpaceus</i>						X	X	X	X	X	X		SV, B
53	<i>Hippolais icterina</i>											X		P
54	<i>Phylloscopus collybita</i>					X	X	X	X	X	X	X		SV, B
55	<i>Sylvia atricapilla</i>						X	X	X	X	X			SV, B
56	<i>Sylvia borin</i>						X	X	X	X	X			SV, B
57	<i>Curruca curruca</i>						X	X	X	X	X			SV, B
58	<i>Luscinia megarhynchos</i>							X	X	X	X			SV, B
59	<i>Ficedula albicollis</i>							X	X	X	X			SV, PB
60	<i>Muscicapa striata</i>							X	X	X	X	X		SV, B
61	<i>Phoenicurus phoenicurus</i>						X	X	X	X	X	X		SV, B
62	<i>Phoenicurus ochruros</i>						X	X	X	X	X	X		SV, B
63	<i>Erithacus rubella</i>				X	X	X	X	X	X	X	X	X	SV, RW, B
64	<i>Turdus merula</i>	X	X	X	X	X	X	X	X	X	X	X	X	PM, B
65	<i>Turdus philomelos</i>					X	X	X	X	X	X	X		SV, B
66	<i>Turdus viscivorus</i>			X	X									WV, P
67	<i>Sturnus vulgaris</i>				X	X	X	X	X	X	X	X	X	SV, B
68	<i>Sitta europaea</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
69	<i>Certhia familiaris</i>	X	X	X	X	X							X	WV
70	<i>Troglodytes troglodytes</i>	X	X	X	X									WV
71	<i>Passer domesticus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
72	<i>Passer montanus</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
73	<i>Motacilla alba</i>					X	X	X	X	X	X	X		SV, B
74	<i>Carduelis carduelis</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
75	<i>Fringilla coelebs</i>	X	X	X	X	X	X	X	X	X	X	X	X	PM, B
76	<i>Spinus spinus</i>	X	X	X	X								X	WV
77	<i>Coccothraustes coccothraustes</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B
78	<i>Chloris chloris</i>					X	X	X	X	X	X	X		SV, B
79	<i>Emberiza citrinella</i>	X	X	X	X	X	X	X	X	X	X	X	X	S, B

Legend: Phenology status: P – bird species in passage, WV – winter visitors, RW – rare winter visitors, SV – summer visitors, S – sedentary species, PM – partial migratory species; Ac – vagrant/ accidental species. Breeding status: B – breeding species, PB – probably breeding species.