AVIFAUNA OF THE ORJEN NATURE PARK

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Abstract

The bird fauna along the Orjen Mountain massif and the border area of the park along the Trebišnjica River was studied. The analysis covered habitats and migrations during the period from the summer of 2021 to the autumn of 2023, with the aim of long-term monitoring, forecasting, and protection of species.
The methods used for monitoring, marking, recording, and data processing included: the kilometer transect method, point census, movement along freely chosen routes, and the "playback" method. Previous studies of bird fauna in this park were also analyzed to synthesize results.
The main outcomes obtained after field research are as follows: a systematic list of bird species was compiled, supported by a photographic album, and maps were created showing the most important nesting habitats.
The proposal was presented to the nature park management and the stakeholders interested in this area, with the aim of protecting species and ensuring their sustainability within the habitat.
Keywords: *ornithofauna, nature park, bird habitat, bird movement, migration monitoring, survival forecasting, species protection.*

1. INTRODUCTION

The Orjen mountain massif is located in the far south of Bosnia and Herzegovina, at the tri-border area between Bosnia and Herzegovina, Montenegro, and Croatia. This region represents an important natural complex of exceptional geological, landscape, and biological value, known for its high habitat diversity and rich fauna, particularly birds. Despite this, the ornithofauna of Orjen has not yet been systematically studied, which highlights the need for a more detailed and long-term scientific approach aimed at better understanding its structure and ecological significance.

Orjen has been identified as one of three potential pilot Natura 2000 sites in Bosnia and Herzegovina, selected by domestic and international experts within the project *"Support for the Implementation of the Birds Directive and Habitats Directive in Bosnia and Herzegovina."* The Orjen area encompasses more than twenty different habitat types, making it one of the most diverse regions in the southeastern part of the country. Such habitat heterogeneity requires systematic field research to collect reliable and representative data on the presence, abundance, and spatial distribution of bird species.

The main goal of this research is to assess the importance of the Orjen Nature Park area as a bird habitat, in the context of its possible nomination as a future protected area of a higher category. At the same time, this area has been recognized as a potential IBA (Important Bird Area) site in Bosnia and Herzegovina (Kotrošan et al., 2012), which further confirms its ornithological and ecological value.

Available data on the ornithofauna of Orjen remain fragmentary. The earliest records come from the works of Grubač and Gašić (2004), who documented the presence of certain species in the vicinity of the village of Orahovac. A significant contribution to the knowledge of the local ornithofauna was made by Jovica Sjenčić (2013) in his study *"Data on Ornithological Research of Bijela Gora near Trebinje."* Additional studies have been presented and published by Aleksandar Vukanović, focusing on the ornithofauna of the Orjen–Bijela Gora area (2017–2018), as well as *"The Winter Census of Waterbirds of Trebinje Lake in 2017."*

In comparison with neighboring countries such as Montenegro and Croatia, where numerous monitoring programs have been conducted and detailed species lists published for areas with similar orographic characteristics (e.g. Lovćen, Sniježnica, Biokovo), research in Bosnia and Herzegovina is still in its early stages and mostly consists of individual field observations. This discrepancy further emphasizes the need for continuous study of ornithofauna in the mountain ecosystems of the country's southern region.

The subject of this study is the ornithofauna of the Orjen area, with a special focus on identifying bird species and their relationships with specific habitat types. The significance of the topic lies in the fact that systematic ornithological research contributes to a better understanding of ecological processes, the planning of natural resource management, and the advancement of nature conservation in Bosnia and Herzegovina.

This paper presents the results of field research, an overview of bird species and their abundance across different habitat types, as well as an analysis of their spatial distribution and ecological roles. The contribution of this study lies in

supplementing existing knowledge about the ornithofauna of southern Herzegovina, identifying key areas for bird conservation, and providing a scientific basis for future management and protection plans for the Orjen area as a valuable natural complex.

2. MATERIALS AND METHODS

The research was conducted across several sites characteristic of the Mediterranean biogeographical region, an area distinguished by its specific combination of climatic conditions and vegetation types. The following section presents the habitat categories included in the study, together with the codes assigned to each surveyed locality.

Although the division of habitats does not strictly follow established phytosociological classification frameworks, the selected categorization provides a clearer overview of the key features of each habitat type, particularly in relation to their relevance for the structure and diversity of the local avifauna. In this way, the habitats are arranged so as to emphasize their differences, ecological functions, and their role in supporting and preserving bird communities within the studied area.

Overview of the habitat types defined for the study:

- predominantly beech forests – Štirovnik, Begova Korita, slopes of Mala Jastrebica
- pine forests – Borova glava, Prijevor
- Bosnian pine (*Pinus heldreichii*) forests – Boljovska greda and Mala Jastrebica
- mixed forests and scrublands – Koritska Grede, Ubla
- rocky terrains – Milanov Osijek, Buganja greda, Vučji zub,
- cliffs – Koritska Grede, Velika and Mala Jastrebica
- mountain pastures and meadows – Carevo polje, Dobri Do, Konjsko polje, Begova Korita, Ubla, Pirina Poljana
- riverine and lacustrine ecosystems – Trebišnjica River and its reservoir Gorica Lake, Sušica River
- settlements – Jazina, Orovac, Konjsko

Time frame of research
Fieldwork was carried out over several seasons during a three-year period (2021–2023).
Winter surveys were conducted in January 2021, 2022, and 2023, focusing on the Trebišnjica River basin during the period when birds occupy their wintering grounds. Additional research was conducted in May and August 2021, May 2022, and May–June 2023.
In total, 15 field research days were carried out during the mentioned period.

Methods used
Standard ornithological methods were applied, including:

- kilometer transect method
- point census
- free field movement
- playback method (Gregory et al., 2004).

Among the methods used, transect surveys were the most commonly implemented. Observers conducted these surveys by walking along defined routes to collect data on species presence and distribution, covering the following routes: Lastva – Orovac – Donji Orahovac, Koritske Grede – Begova Korita, Ubla –Mala Jastrebica – Pririna Poljana - Dobri Do, Dobri Do-Buganje Grede- Vučji Zub, Tuli – Carevo polje – Konjsko, as well as in the areas surrounding Lake Goričko and along the course of the Trebišnjica River.

Free-range field surveys were carried out across the habitats of Ubla, Pirina Poljana, Dobri Do, Carevo Polje, and Zubačko Polje. This method enabled detailed monitoring of reproductive behavior, detection of breeding pairs, and the identification of currently active nests, while allowing observers to

adapt their movements to local habitat conditions and species activity.

The point census method was used during stationary observation or prolonged stays at the following localities: Koritske Grede, Begova Korita, Milanov Osijek, Goričko Lake, and the peaks of Vučji Zub.

The playback technique was used for species known to react to broadcasted vocalizations, whether songs or calls, played through speakers, as shown in Figure 1.

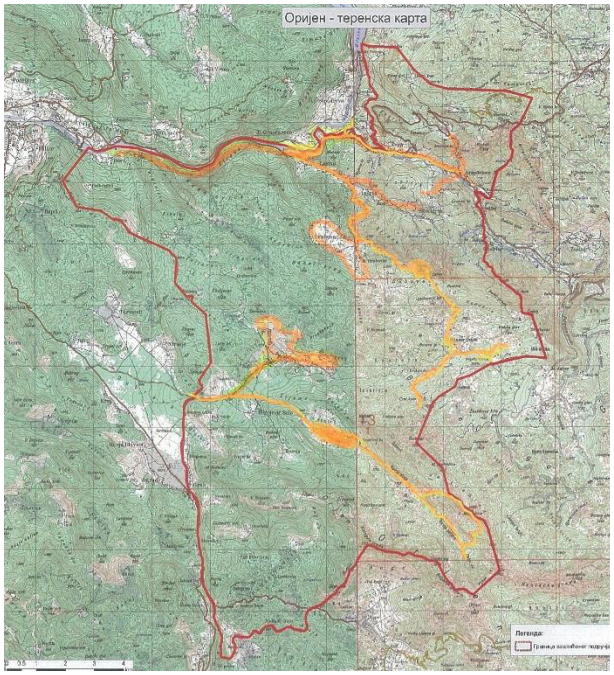

Figure 1. Studied ornithofauna of the Orjen area in relation to the boundaries (red line) of the Nature Park – the orange line represents transects (surveyed on foot), while the orange-shaded areas indicate zones investigated through field searches and free movement. (Source: ZZKIPN, processed by J. Sjeničić, A. Vukanović)

Most bird species were also photo-documented using a Nikon P900 camera. Identification was carried out using the illustrated field guides *"Birds of Europe with North Africa and the Middle East"* (Heinzel et al., 1996) and the *"Collins Bird Guide, 2nd Edition"* (Svensson et al., 2010). The scientific names of species, taxonomic order, and breeding status in Bosnia and Herzegovina follow del Hoyo et al. (2014, 2016). An assessment of the breeding status for the Bijela Gora area is also provided, although the research period was relatively short to confirm breeding for most species. The Serbian bird nomenclature used follows Vasić et al. (2004; 2005).

3. ANALYSIS OF RESULTS AND CONCLUSIONS

During field research on the Orjen Mountain area, a total of 68 bird species were recorded, belonging to 15 orders and 33 families. All species whose identification was uncertain or doubtful were excluded from the final list.

Endangered species, which should be the main focus in defining protection zones and conservation measures, are marked in red. These species meet the criteria of threat according to the EU Directives system, the Red List, as well as criteria related to habitat loss, rarity, and low population density at the level of Bosnia and Herzegovina.

The results of the research conducted in the area planned for protection, Orjen – Bijela Gora, indicate the existence of two distinctly different types of bird habitats. The first comprises the riverine and riparian system of the Trebišnjica basin the second encompasses the hilly–mountainous areas of the Orjen massif,

1 List of Bird Species Recorded in the Study Area in Trebišnjica basin:

1. **Anas platyrhynchos** – *Mallard* – Breeding species, present along the Trebišnjica River almost the year.
2. **Anas crecca** – *Eurasian Teal* – Breeding species, present along the Trebišnjica River almost throughout the year.
3. **Anas querquedula** – *Garganey* – Wintering species along the Trebišnjica River.

4. **Aythya ferina** – *Common Pochard* – Wintering species along the river.
5. **Aythya nyroca** – *Ferruginous Duck* – Wintering species along the river.
6. **Aythya fuligula** – *Tufted Duck* – Wintering species along the Trebišnjica River.
7. **Tachybaptus ruficollis** – *Little Grebe* – Present along the Trebišnjica River almost throughout the year.
8. **Podiceps nigricollis** – *Black-necked Grebe* – Wintering species along the Trebišnjica River.
9. **Podiceps cristatus** – *Great Crested Grebe* – Wintering species along the Trebišnjica River.
10. **Ardea cinerea** – *Grey Heron* – Present year-round; wintering in larger numbers along the Trebišnjica River.
11. **Mergus merganser** – Goosander – Confirmed breeder in the Trebišnjica River section within the study area.
12. **Columba livia** – *Rock Dove / Feral Pigeon* – Breeder near settlements and observed in flight across the area.
13. **Tachymarptis melba** – *Alpine Swift* – Probable breeder; a small colony recorded within the area.
14. **Cuculus canorus** – *Common Cuckoo* – Common breeder in forest habitats.
15. **Phalacrocorax carbo** – *Great Cormorant* – Present year-round and wintering along the Trebišnjica River.
16. **Larus michahellis** – *Yellow-legged Gull* – Migrant and breeder in nearby regions (e.g., Bilećko Lake, Adriatic islands, etc.).
17. **Chroicocephalus ridibundus** – *Black-headed Gull* – Migrant and breeder in nearby regions (e.g., Bilećko Lake).
18. **Fulica atra** – *Eurasian Coot* – Migrant and wintering species along the Trebišnjica River.
19. **Merops apiaster** – *European Bee-eater* – Recorded calling and in flight; possible breeder in suitable microhabitats (earth banks, excavations).
20. **Falco tinnunculus** – *Common Kestrel* – Breeder of open areas with suitable nesting sites.
21. **Oriolus oriolus** – *Eurasian Golden Oriole* – Breeder near settlements and along the Trebišnjica River.
22. **Garrulus glandarius** – *Eurasian Jay* – Common breeder.
23. **Corvus cornix** – *Hooded Crow* – Breeder in lower zones and near settlements.
24. **Pica pica** – *Eurasian Magpie* – Possible breeder.
25. **Poecile palustris** – *Marsh Tit* – Sporadically recorded; probable breeder.
26. **Delichon urbicum** – *Common House Martin* – Breeder on cliffs and rocky terrain; scarce.
27. **Cinclus cinclus** – *White-throated Dipper* – Common along the Trebišnjica River, present year-round.
28. **Turdus merula** – *Common Blackbird* – Most abundant thrush species in the study area, found in all habitats
29. **Phoenicurus ochruros** – *Black Redstart* – Naturally occurring but less numerous; inhabits rocky areas
30. **Erithacus rubecula** – *European Robin* – Breeding species, recorded in many habitats.
31. **Oenanthe oenanthe** – *Northern Wheatear* – One potential territory recorded at Milanov Osijek.
32. **Passer domesticus** – *House Sparrow* – Synanthropic species, recorded near settlements.
33. **Passer montanus** – Eurasian Tree Sparrow – Breeding species near settlements.
34. **Motacilla alba** – White Wagtail – Probable breeder, present near aquatic and humid habitats.
35. **Motacilla flava** – Yellow Wagtail – Probable breeder, recorded throughout the year.
36. **Fringilla coelebs** – Common Chaffinch – Very abundant species recorded in all transects and surveyed areas

List of Bird Species Recorded in the Study Area Orjen and Bijela Gora

1. **Cuculus canorus** – Common Cuckoo – Common breeder in forest habitats.
2. **Pernis apivorus** – European Honey Buzzard – Possible breeder
3. **Aquila chrysaetos** – Golden Eagle – Frequently observed hunting within the area; may occur outside the breeding period.
4. **Accipiter gentilis** – Northern Goshawk – Possible breeder.
5. **Accipiter nisus** – Eurasian Sparrowhawk – Possible breeder.
6. **Buteo buteo** – Common Buzzard – Widespread raptor, less numerous than in northern parts of the country.
7. **Upupa epops** – Eurasian Hoopoe – Confirmed breeder; common in lowland and hilly semi-open habitats.
8. **Merops apiaster** – European Bee-eater – Recorded calling and in flight; possible breeder in suitable microhabitats (earth banks, excavations).
9. **Alcedo atthis** – Common Kingfisher – Recorded along the Trebišnjica River throughout the year.
10. **Dryocopus medius** – Middle Spotted Woodpecker – Breeder in beech forests.
11. **Dendrocopos major** – Great Spotted Woodpecker – Breeder in forested areas.
12. **Falco tinnunculus** – Common Kestrel – Breeder of open areas with suitable nesting sites
13. **Lanius collurio** – Red-backed Shrike – Common passerine breeder in open shrubland habitats.
14. **Lanius minor** – Red-backed Shrike – Common passerine breeder in open shrubland habitats.
15. **Garrulus glandarius** – Eurasian Jay – Common breeder.
16. **Corvus corax** – Common Raven – Breeding species of the area.
17. **Corvus cornix** – Hooded Crow – Breeder in lower zones and near settlements.
18. **Lophophanes cristatus** – Crested Tit – Breeder in high-altitude forest habitats.
19. **Parus major** – Great Tit – Common species inhabiting various habitats.
20. **Lullula arborea** – Woodlark – Common and abundant breeder in semi-open mountain habitats.
21. **Hirundo rustica** – Barn Swallow – Breeding species near rivers and settlements.
22. **Phylloscopus collybita** – Common Chiffchaff – One of the most numerous breeders, especially on Jastrebica and in Bosnian pine forests.
23. **Aegithalos caudatus** – Long-tailed Tit – Occasionally recorded in small family groups within forest habitats.
24. **Sylvia atricapilla** – Eurasian Blackcap – Relatively numerous in suitable, mostly mosaic and shrubby habitats.
25. **Sitta europaea** – Eurasian Nuthatch – Numerous in suitable beech and mixed forests.
26. **Troglodytes troglodytes** – Eurasian Wren – Recorded only in cooler beech forests beneath Jastrebica.
27. **Monticola solitarius** – Blue Rock Thrush – Several territories recorded in lower altitudes.
28. **Turdus merula** – Common Blackbird – Most abundant thrush species in the study area, found in all habitats
29. **Turdus philomelos** – Song Thrush – Several territories recorded in suitable forest and shrub habitats.
30. **Ficedula albicollis** – Collared Flycatcher – Territory recorded on Bijela Gora, at the edge of beech forests.
31. **Phoenicurus ochruros** – Black Redstart – Naturally occurring but less numerous; inhabits rocky areas
32. **Erithacus rubecula** – European Robin – Breeding species, recorded in many habitats.
33. **Luscinia megarhynchos** – Common Nightingale – Several territories

recorded in lowland forest and shrubby habitats

34. **Oenanthe oenanthe** – Northern Wheatear – One potential territory recorded at Milanov Osijek.
35. **Passer domesticus** – House Sparrow – Synanthropic species, recorded near settlements.
36. **Passer montanus** – Eurasian Tree Sparrow – Breeding species near settlements.
37. **Motacilla cinerea** – Grey Wagtail – Probable breeder, recorded throughout the year.
38. **Fringilla coelebs** – Common Chaffinch – Very abundant species recorded in all transects and surveyed areas
39. **Chloris chloris** – European Greenfinch – Common breeder of various habitats.
40. **Carduelis carduelis** – European Goldfinch – Recorded in Ubla; confirmed breeder.
41. **Serinus serinus** – European Serin – Present in mosaic habitats and near settlements.
42. **Emberiza citrinella** – Yellowhammer – Common bunting,
43. **Emberiza cia** – Rock Bunting – Probable breeder in mountainous and rocky shrub habitats within the study area.

Photo Album of Selected Bird Specimens from the Field

Figures 2–9. Photographic documentation of several bird species recorded during field research.

Figure 2. Lanius collurio (Red-backed Shrike) -Carevo pilje (Photo: Aleksandar Vukanović)

Figure 3. Erithacus rubecula (European Robin) - Jazina (Photo: Aleksandar Vukanović)

Figure 4. *Oriolus oriolus (Eurasian Golden Oriole) – Aranđelovo (Photo: Aleksandar Vukanović)*

Figure 5. *Emberiza cia (Rock Bunting) – Begova Korita (Photo: Aleksandar Vukanović)*

Figure 6. *Oenanthe oenanthe (Northern Wheatear) – Milanov Osijek (Photo: Aleksandar Vukanović)*

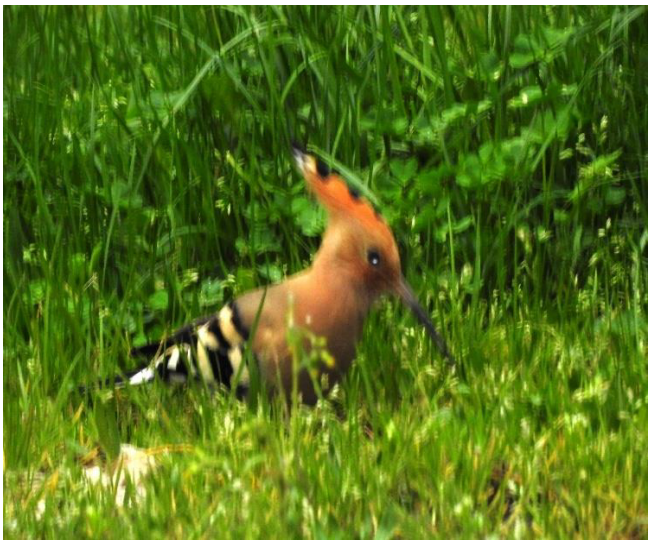

Figure 7. Upupa epops (Eurasian Hoopoe) – Ubla (Photo: Aleksandar Vukanović)

Figure 8. *Troglodytes troglodytes (Eurasian Wren) – Lastva (Photo: Aleksandar Vukanović)*

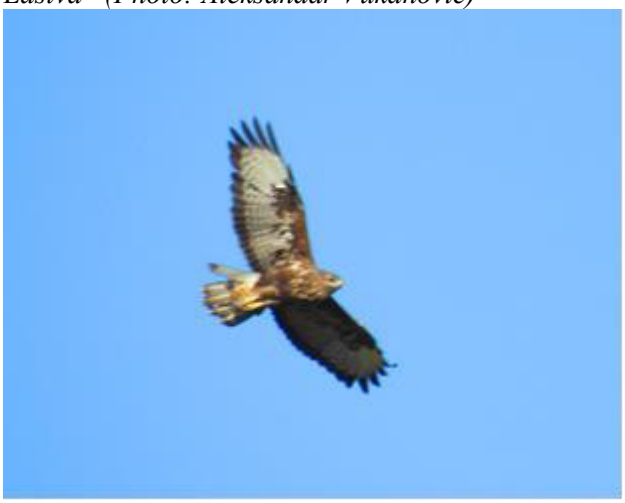

Figure 9. *Buteo buteo (Common Buzzard) – Pirina Poljana (Photo: Aleksandar Vukanović)*

Riverine and Riparian Habitats

The area along the Trebišnjica River holds exceptional ornithological value, particularly during the winter months. Over the three-year period of monitoring and recording birds in aquatic habitats, it was established that a large number of birds regularly inhabit the surroundings of Trebinjsko Lake, ranging from several hundred to several thousand individuals. During cold winters, when most inland water bodies in Bosnia and Herzegovina freeze over, the open waters of the Trebišnjica become a crucial refuge for numerous species.

The most frequently recorded species were *Tachybaptus ruficollis*, *Podiceps cristatus*, *Phalacrocorax carbo*, *Ardea cinerea*, *Anas crecca*, *Anas querquedula*, *Anas platyrhynchos*, *Larus michahellis*, *Chroicocephalus ridibundus*, *Fulica atra*, and *Gallinula chloropus*. A direct relationship was observed between the severity of winter conditions and bird abundance — the lower the winter temperatures, the higher the number of individuals present.

Out of the total of 68 species recorded across the entire study area, species associated with aquatic habitats showed the highest representation, which aligns with their ecological requirements and the local hydrological conditions.

Mountainous Part of the Orjen Massif

In the higher areas of Mount Orjen, songbirds (Passeriformes) are predominant, with particular emphasis on representatives of the families Paridae, Sylviidae, Muscicapidae, and Fringillidae. During field surveys, the most frequently recorded species were Fringilla coelebs (chaffinch), Turdus merula (common blackbird), Sylvia atricapilla (blackcap), Phylloscopus collybita (common chiffchaff), and Lanius collurio (red-backed shrike).

Of these species, only Lanius collurio is listed in Annex II of the European Union Birds Directive, indicating that it requires special protection and habitat conservation. The other species, although commonly present, belong to the group of widely distributed and ecologically stable birds that adapt well to various Mediterranean-type habitats.

The structure of bird communities at higher altitudes shows a clear dominance of songbirds, reflecting the richness of forest and semi-forest habitats that provide a variety of resources for nesting, feeding, and protection from predators. These areas represent an important ecological space for the conservation of Orjen's avifauna, as they allow for the maintenance of stable populations of both protected and common species.

Significance of the Studied Area

The results obtained indicate the significant conservation value of the Orjen area, which, based on the richness and diversity of its avifauna, could be considered for formal protection. Given that previous ornithological data for this area are very limited, comparative analyses are constrained. However, the results can be interpreted in the context of similar ecosystems in southern Herzegovina and the neighboring Montenegrin part of Orjen.

Although the recorded diversity does not fully reflect the actual state of populations, the findings confirm that the Orjen massif lies on an important Adriatic migratory route. The combination of specific geomorphological, climatic, and floristic conditions has created a variety of ecosystems — from fir-beech forests, through mountain meadows and rocky areas,

to the riverine ecosystems of the Trebišnjica — all of which collectively contribute to the high biological diversity of the region.

Rare and Conservation-Significant Species

Special attention of the researchers was focused on the presence of rare and threatened species of particular conservation importance: Circaetus gallicus (Short-toed Snake Eagle), Aquila chrysaetos (Golden Eagle), and Pernis apivorus (European Honey Buzzard). Confirmation of the presence of Aquila fasciata (Bonelli's Eagle) would be of exceptional significance, as this species is considered potentially extinct in Bosnia and Herzegovina, highlighting the international importance of this area for avian conservation.

In addition to these key species, other notable birds were recorded during the field surveys, including Alectoris graeca (Rock Partridge), Bubo bubo (Eurasian Eagle-Owl), Tachymarptis melba (Alpine Swift), Upupa epops (Eurasian Hoopoe), Mergus merganser (Common Merganser), Monticola solitarius (Blue Rock Thrush), and Hippolais olivetorum (Olive-tree Warbler). The presence of these species further emphasizes the richness and diversity of habitats on Bijela Gora, ranging from forested complexes and rocky areas to water bodies and edge habitats.

According to the Regulation on the Red Lists of the Republic of Srpska (Official Gazette RS, 124/12), 52 of the 53 species recorded on Bijela Gora are classified as protected. This confirms the high ecological value of the area and highlights its important role in the conservation of both local and migratory bird populations. Moreover, the varied habitat structure and presence of species with different ecological requirements make Bijela Gora a key site for future conservation strategies and monitoring of threatened species.

Research Limitations and Recommendations

The study was conducted during a favorable period (May–June), but certain limitations affected the scope of the results. Adverse weather conditions (rain, wind), a short time frame, and seasonal restrictions (spring–summer focus) meant that some habitats, particularly rocky areas, screes, and higher mountain zones, remained insufficiently surveyed.

In these locations, species typical of mountain and Mediterranean ecosystems can be expected, such as *Buteo rufinus*, *Falco naumanni*, *Falco biarmicus*, *Eremophila alpestris*, *Anthus spinoletta*, *Prunella collaris*, *Monticola saxatilis*, *Sylvia cantillans*, *Sitta neumayeri*, and *Emberiza hortulana*.

It is recommended that the management of the Hunting Association incorporate activities for the protection of all fauna species into their plans. The mountaineering association *Vučiji zub*, as well as the organization *Center for Sustainable Development and Ecology (CORIE)*, should also include the protection of particularly rare species in their annual and long-term activities. Local ministries of ecology and tourism are tasked with developing and monitoring instruments for the protection of rare species and overall biodiversity.

For a comprehensive assessment of the avifauna of Orjen, systematic research throughout all seasons is necessary, with particular emphasis on migratory and winter periods. Forest habitats and the presence of diurnal and nocturnal raptors are of special importance, as they, together with large mammals such as wolves, lynxes, and bears, represent so-called "umbrella species" that are crucial for the conservation of overall biodiversity.

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