

CONSERVATION STATUS AND DISTRIBUTION OF BIRDS OF COMMUNITY INTEREST IN THE MUNICIPALITY OF SIBIU, ROMANIA

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KEYWORDS: avifauna, Community interest birds, urban bird atlas, red list, Sibiu

ABSTRACT

This study documents the presence and distribution of species of Community interest in the Municipality of Sibiu, Romania. Data were collected during the breeding season, from 15 April to 15 June, between 2022 and 2025. Some of the data come from monitoring for the Sibiu Bird Atlas (an ongoing project), while others come from the Common Bird Monitoring (CBM) program. We analyzed 13,681 observations covering 106 bird species, totaling 33,583 individuals. We recorded 17 species of Community interest birds (included in the European Union Birds Directive), of which 12 had breeding codes, as well as on 10 birds from Romania's Red List of Bird Species present in the

territory of the Municipality of Sibiu. The results of this study, combined with those that will be obtained upon completion of the Sibiu Bird Atlas (providing a comprehensive qualitative and quantitative baseline), can help implement bird protection and conservation activities in the urban area, as well as support the development of socio-economic projects (urban regeneration, ecotourism, birdwatching, educational activities, green infrastructure). Continued monitoring and repeated studies of this type can reveal population trends and the impact of local administration measures (infrastructure projects, urban development works, etc.) on local biodiversity.

REZUMAT: Statutul de conservare și distribuția păsărilor de interes comunitar în Municipiul Sibiu, România

Acest studiu documentează prezența și distribuția speciilor de interes comunitar în Municipiul Sibiu, România. Datele au fost colectate în perioada de cuibărire 15 aprilie-15 iunie între anii 2022 și 2025. O parte din date provin din monitorizarea pentru Atlasul Păsărilor Sibiului (proiect în derulare), altele din monitorizarea păsărilor comune (CBM). Am analizat 13.681 de observații privind 106 specii de păsări însumând 33.583 de exemplare. Am obținut informații despre 17 specii de păsări de interes comunitar (cuprinse în Directiva Păsări a Uniunii Europene), dintre care 12 cu coduri de cuibărire, precum și despre 10 păsări de pe Lista Roșia a Speciilor de Păsări din România prezente pe teritoriul Municipiului Sibiu.

Rezultatele acestui studiu coroborate cu cele ce se vor obține în urma finalizării Atlasului Păsărilor Sibiului (incluzând și date de tip calitativ) pot ajuta la implementarea unor activități de protecție și conservare a păsărilor din zona urbană, precum și dezvoltarea unor proiecte cu rol socio-economic (proiecte de regenerare urbană, ecoturism, birdwatching, activități educaționale, infrastructură verde). Continuarea monitorizărilor și repetării studiilor de acest tip pot arăta tendințele populaționale, precum și impactul unor măsuri ale administrației locale (proiecte de infrastructură, lucrări de urbanizare etc) asupra biodiversității locale.

ZUSAMMENFASSUNG: Erhaltungszustand und Verbreitung von Vogelarten von gemeinschaftlichem Interesse im Munizipium Sibiu (Hermannstadt), Rumänien

Diese Studie dokumentiert das Vorkommen und die Verbreitung von Arten von gemeinschaftlichem Interesse im Stadtgebiet von Sibiu (Hermannstadt), Rumänien. Die Daten wurden während der Brutzeit, vom 15. April bis zum 15. Juni, in den Jahren 2022 bis 2025 erhoben. Ein Teil der Daten stammt aus dem Monitoring für den Vogelatlas von Sibiu (einem laufenden Projekt), während andere aus dem Programm für das Monitoring häufiger Brutvogelarten (Common Bird Monitoring – CBM) stammen. Wir analysierten 13.681 Beobachtungen, die 106 Vogelarten und insgesamt 33.583 Individuen umfassten. Wir erfassten 17 Vogelarten von gemeinschaftlichem Interesse (aufgeführt in der EU-Vogelschutzrichtlinie), von denen für 12 Brutcodes vorlagen, sowie 10 Vögel der Roten Liste der Vogelarten Rumäniens, die

im Stadtgebiet von Sibiu vorkommen. Die Ergebnisse dieser Studie können – in Verbindung mit den Daten, die nach Abschluss des Vogelatlas von Sibiu vorliegen werden (der eine umfassende qualitative und quantitative Grundlage bietet) – dazu beitragen, Vogelschutz- und Erhaltungsmaßnahmen im städtischen Raum umzusetzen sowie die Entwicklung sozioökonomischer Projekte zu unterstützen (Stadterneuerung, Ökotourismus, Vogelbeobachtung, Bildungsaktivitäten, grüne Infrastruktur). Fortgesetztes Monitoring und wiederholte Studien dieser Art können Populationstrends sowie die Auswirkungen von Maßnahmen der lokalen Verwaltung (Infrastrukturprojekte, Stadtentwicklungsarbeiten usw.) auf die lokale Biodiversität aufzeigen.

INTRODUCTION

Urban environments are increasingly recognized as complex ecosystems that play a critical role in biodiversity conservation. While urbanization typically leads to habitat fragmentation and loss, well-managed green infrastructures can support significant wildlife populations, particularly avifauna. In Romania, the Municipality of Sibiu (Hermannstadt) represents a pertinent case study for understanding the interplay between urban development and ecological connectivity.

Geographically situated in the Sibiu Depression, within the Olt River hydrographic basin, the city lies on a major migration corridor. The local territory is drained by the Cibin River and its network of tributaries, which create potential biodiversity hotspots. However, the current urban landscape poses challenges to ecological continuity. According to the General Urban Plan, the connection between natural elements and urban green spaces is currently fragmented, consisting largely of discontinuous tree lines and isolated "green pockets" that fail to fully connect the urban core with surrounding forests. Despite the

territory's favorable conditions for rare natural habitats and various planning proposals for new protected zones, the "Dumbrava Sibiului Natural Park" remains the only designated protected area within the municipality.

To address these planning and conservation gaps, accurate and up-to-date data on local bird populations is essential. This study documents the presence and distribution of bird species of Community interest within the Municipality of Sibiu, based on data collected during the breeding seasons from 2022 to 2025. Although avifaunal studies concerning the Municipality of Sibiu exist, they are not recent and do not address the breeding of bird species, nor their conservation status. By analyzing over 13,000 observations covering 106 species—including those listed in the EU Birds Directive and Romania's Red List—this research aims to provide the necessary baseline for implementing effective bird protection activities.

Furthermore, the results support the development of socio-economic projects such as urban regeneration and ecotourism,

highlighting the impact of local administration measures on biodiversity.

MATERIALS AND METHODS

2.1. Study area

Research was carried out in the Municipality of Sibiu (known in German as Hermannstadt) which serves as the seat of the county of the same name. Geographically, the city is situated in the Sibiu Depression—part of the Transylvanian Hilly Depression—at the coordinates 45°47' North latitude and 24°05' East longitude. Hydrographically, the territory belongs to the Olt River basin, being drained by the Cibin River. Within the city limits, the Cibin receives the waters of its tributaries: the Trinkbach Brook and Săpunului Valley (on the right), and Rusciori Valley and Fărmăndoala Valley (on the left).

According to General Urban Plan of the Municipality of Sibiu, currently, the connections between major elements (urban planted spaces and natural elements such as water bodies and forests) consist of small-scale spaces—functioning as green pockets, mostly unlandscaped—and discontinuous tree lines, which only partially connect the two systems. The anthropogenic green system within the Municipality comprises the following landscape typologies: medium-sized landscaped public spaces: urban gardens (3 ha – 10 ha); green spaces associated with collective housing: green pockets; small green squares: landscaped public spaces or planted areas (300 sqm – 3 ha); protective green spaces and street alignments (tree lines); vegetation within private properties: particularly gardens belonging to individual dwellings; forest areas: Dumbrava and Gușterița Forests.

Although the General Urban Plan shows that favorable conditions for rare natural habitats exist within Sibiu's territory (the hills around

Fărmăndoala Valley, Rusciorului Meadow, Strâmb Creek Meadow, and the Cibin Floodplain near the Turnișor neighborhood), and despite post-2000 urban planning proposals suggesting the creation of protected natural zones (Cibin Floodplain – Turnișor / Câmpșor and the Fărmăndoala natural area), in reality, there is only one designated protected area: "Dumbrava Sibiului Natural Park".

2.2 Study period

Fieldwork took place during the bird nesting season: annually, during 15 April–15 May and 16 May–15 June from 2022 to 2025 for the Atlas-type data, and during 15 April–15 May and 16 May–15 June in the years 2024 and 2025 for the CBM-type data.

2.3 Field observation methods

2.3.1. Urban bird atlas methodology

Atlas-type data are quantitative data. The methodology applied follows that of other urban bird atlases, in this case based on the "Atlas of the Birds of Cluj" (Kósa et al, 2021). The area of Sibiu was divided into 500 × 500 m squares, resulting in a total of 154 squares. The active timed area search method was used to determine the distribution and semi-quantitative assessment of breeding bird populations. For each 500 × 500 m square, two annual visits of up to one hour are required (between 05:00 and 09:00 in the morning). This is a very simple method, widely used in many bird atlas projects. It involves actively searching for birds within the selected 500 × 500 m square by moving at a normal walking pace while trying to cover as much of the area as possible and visiting all habitat types. The observer

records in the Ornitodata app—within the task specifically designed for the Sibiu Bird Atlas—information on the species and number of individuals seen and/or heard, breeding evidence using standard breeding codes, age, sex (for species with sexual dimorphism), as well as any other relevant observations in the comments section. Each square must be visited twice a year: the first visit between 15 April and 15 May, and the second between 16 May and 15 June. There must be a minimum interval of 14 days between the two visits.

2.3.2 CBM (Common Bird Monitoring) methodology

CBM is a general long-term monitoring program for common bird species. Similar initiatives are carried out in most European countries, and together they make up the Pan-European Common Bird Monitoring (PECBM). At the European level, the program is coordinated by the EBCC. In Romania, the program is coordinated by the Romanian Ornithological Society (SOR) and the Milvus Group – Association for Bird and Nature Protection. Within this methodology, species assessments are conducted through point counts. For practical reasons, the points are organized into groups of 25 within a 2 × 2 km square, and experts are required to survey at least 10 of them. Field visits in lowland and hilly regions follow this schedule: the first between 15 April and 15 May, and the second between 16 May and 15 June, with at least 14 days between the two visits. Bird counts should start as soon as possible after sunrise and finish by 10:00 a.m., as this is when birds are most active. All

RESULTS

Based on the atlas-type data, we identified 103 bird species, while 43 bird species were

observations under this methodology are recorded using the Ornitodata mobile application.

2.4 Use of the Ornitodata platform

Primary field data collection was conducted using Ornitodata, the standardized monitoring platform developed by the Romanian Ornithological Society (SOR). The application facilitates the recording of georeferenced observations directly onto satellite basemaps, allowing for detailed entry of abundance, demographic data (age and sex), and behavioral notes, specifically breeding evidence categories (ranging from "possible" to "confirmed").

2.5 Data processing and analysis

Following data export, the dataset underwent a rigorous cleaning and de-duplication process. Records were cross-referenced based on observer identity, timestamps and geolocation to ensure uniqueness. The validated data were subsequently compiled and tabulated using Google Sheets. Finally, QGIS (QGIS version 3.34.4-Prizren) was employed to generate spatial outputs, including seasonal species distribution maps and site-use visualizations.

Taxonomic classification and scientific nomenclature follow the *AviList: The Global Avian Checklist, v2025* (AviList Core Team, 2025). This global checklist harmonizes the classifications of the IOC World Bird List, BirdLife International, and the eBird/Clements Checklist, ensuring consistency with the latest phylogenetic revisions.

identified using the CBM (Common Bird Monitoring) methodology, totaling 106 bird

species observed in the Municipality of Sibiu during the breeding season.

Of the total 106 bird species, seventeen (Tab.1) are of Community interest (included in Annex 1 of the EU Birds Directive): two were identified by both methodologies (*Curruca nisoria*, *Lanius collurio*), fifteen via the urban atlas methodology (*Botaurus*

minutus, *Egretta garzetta*, *Ardea alba*, *Ciconia nigra*, *Ciconia ciconia*, *Clanga pomarina*, *Strix uralensis*, *Alcedo atthis*, *Picus canus*, *Dryocopus martius*, *Dendrocopos syriacus*, *Dendrocytes medius*, *Curruca nisoria*, *Ficedula albicollis*, *Lanius collurio*); four via CBM (*Pernis apivorus*, *Lullula arborea*, *Curruca nisoria*, *Lanius collurio*).

Table 1: Number of breeding pairs of bird species of Community interest in Municipality of Sibiu

Species	Possible breeding	Probable breeding	Confirmed breeding
<i>Botaurus minutus</i>	3	1	0
<i>Egretta garzetta</i>	0	0	0
<i>Ardea alba</i>	0	0	0
<i>Ciconia nigra</i>	0	0	0
<i>Ciconia ciconia</i>	1	0	6
<i>Pernis apivorus</i>	0	0	0
<i>Clanga pomarina</i>	0	0	0
<i>Strix uralensis</i>	1	0	0
<i>Alcedo atthis</i>	3	1	0
<i>Picus canus</i>	4	0	0
<i>Dryocopus martius</i>	1	0	0
<i>Dendrocopos syriacus</i>	6	4	0
<i>Dendrocytes medius</i>	7	0	0
<i>Lullula arborea</i>	1	0	0
<i>Curruca nisoria</i>	2	0	0
<i>Ficedula albicollis</i>	37	5	0
<i>Lanius collurio</i>	18	4	1

Species of Community interest were identified in 52 squares and at 6 CBM points.

To calculate the frequency (Tab.2) of species of Community interest, we considered the

130 investigated squares and the 10 predefined points from the CBM methodology, totaling 140 sampling units.

Table 2: Relative abundance and frequency of bird species of Community interest

Species	Relative abundance (%)	Frequency (%)
<i>Botaurus minutus</i>	0,018	2.14
<i>Egretta garzetta</i>	0,006	0.71
<i>Ardea alba</i>	0,009	1.42
<i>Ciconia nigra</i>	0,009	2.14
<i>Ciconia ciconia</i>	0,047	9.28
<i>Pernis apivorus</i>	0,003	0.71
<i>Clanga pomarina</i>	0,006	0.71
<i>Strix uralensis</i>	0,003	0.71
<i>Alcedo atthis</i>	0,020	2.85
<i>Picus canus</i>	0,012	2.85
<i>Dryocopus martius</i>	0,003	0.71
<i>Dendrocopos syriacus</i>	0,030	4.28
<i>Dendrocoptes medius</i>	0,020	2.14
<i>Lullula arborea</i>	0,003	0.71
<i>Curruca nisoria</i>	0,006	1.42
<i>Ficedula albicollis</i>	0,133	8.57
<i>Lanius collurio</i>	0,089	17.85

While the majority of species of Community interest in Sibiu have a frequency below 5%, three of them stand out: *Ficedula albicollis* (8.57%), *Ciconia ciconia* (9.28%), and *Lanius collurio* (17.85%). In the case of *Ficedula albicollis* frequency, we infer the importance of the presence of

woodlands (specifically Sub Arini Park), as well as gardens (Keller et al., 2020) in Sibiu; meanwhile, for *Ciconia ciconia*, the Cibin River floodplain is important (Keller et al., 2020), as it is for *Lanius collurio*, coupled with the presence of patches of uncultivated land and shrubs (Keller et al., 2020). As

expected, commensal species exhibited the highest frequencies: *Turdus merula* (95.71%), *Passer domesticus* (93.57%),

Streptopelia decaocto (80.00%), *Carduelis carduelis* (77.85%), *Columba livia domestica* (72.14%).

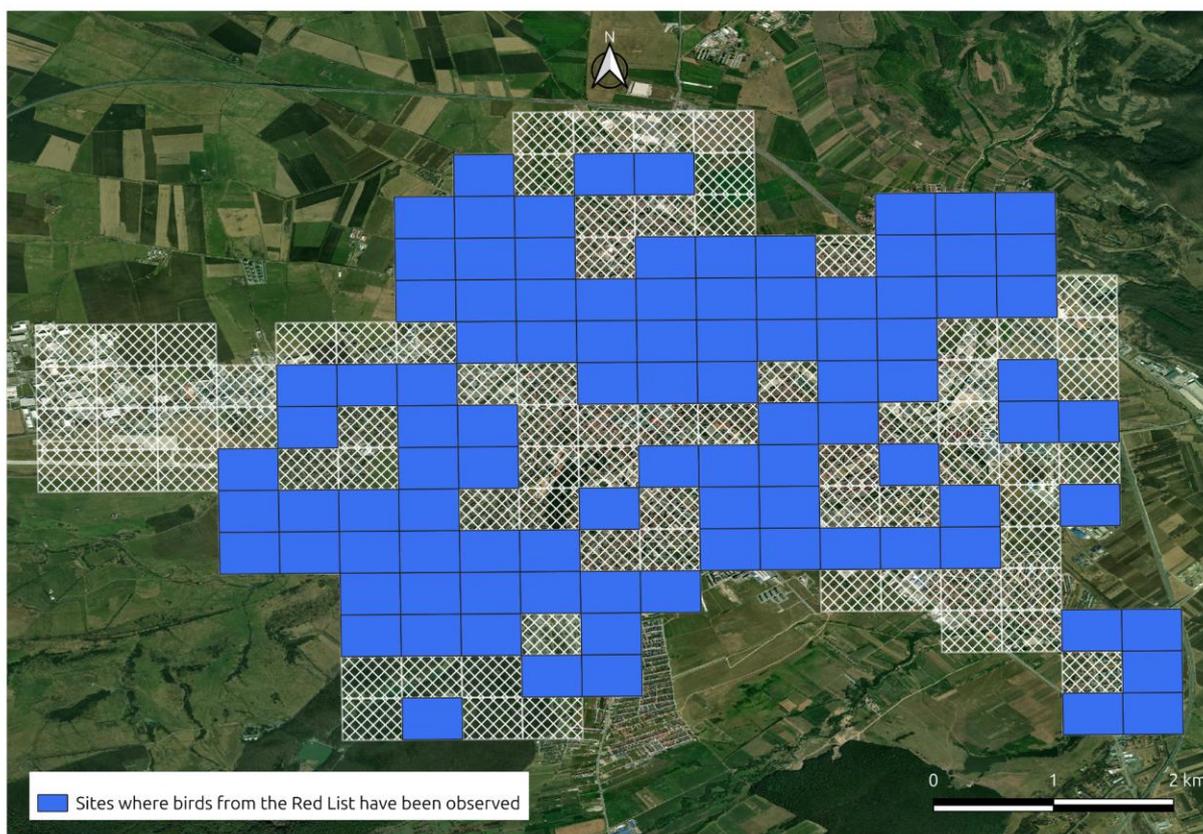


Figure 1: Distribution map of species on the Romanian Red List of Birds

Regarding the species covered by the Romanian Red List, our methodologies identified ten bird species (Fig.1, Tab.3): one species classified as "Vulnerable" (VU): *Linaria cannabina* (out of the 22 species considered "Vulnerable" nationally) and nine species classified as "Near Threatened" (NT): *Astur gentilis*, *Alauda arvensis*, *Anthus trivialis*, *Clanga pomarina*, *Fulica atra*, *Hirundo rustica*, *Botaurus minutus*, *Saxicola*

rubetra, *Saxicola torquatus* (out of the 27 species classified as "Near Threatened" nationally). Among these, only *Clanga pomarina* was not identified with a breeding code (possible, probable, or confirmed). Although "Near Threatened" species do not currently meet the criteria for classification in endangered categories, there is a significant risk that they may become endangered in the future.

Table 3: Status and breeding of bird species on the Red List

Species	Statut	Breeding
<i>Linaria cannabina</i>	VU	yes
<i>Astur gentilis</i>	NT	yes
<i>Alauda arvensis</i>	NT	yes
<i>Anthus trivialis</i>	NT	yes
<i>Clanga pomarina</i>	NT	no
<i>Fulica atra</i>	NT	yes
<i>Hirundo rustica</i>	NT	yes
<i>Botaurus minutus</i>	NT	yes
<i>Saxicola rubetra</i>	NT	yes
<i>Saxicola rubicola</i>	NT	yes

Regarding the birds included on the Red List, their presence was confirmed in 99 out of the

130 squares studied, covering 51 of the 52 squares where species of Community interest were also identified.

DISCUSSIONS

The identification of 106 bird species, representing a significant portion of the regional avifauna, underscores the ecological value of the Municipality of Sibiu. This high diversity is likely supported by the heterogeneity of the urban landscape, which ranges from densely built areas to river floodplains and forest edges.

Notably, the presence of 17 species of Community interest and 10 Red List species indicates that Sibiu currently functions not just as a barrier, but as a refuge and potential ecological corridor within the Olt River basin. A key finding of this study is the

unexpectedly high frequency (17.85%) of *Lanius collurio*. Its prevalence in Sibiu suggests the existence of significant "green pockets" of uncultivated land and shrubbery, particularly in the transition zones between the city and its surroundings. These habitats, often viewed as "wastelands" awaiting development, are critical for species dependent on open areas with shrubs, such as *Curruca nisoria* and the vulnerable *Linaria cannabina* (Keller et al., 2020) (Fig.2).

The urbanization of these marginal areas poses a direct threat to these populations.

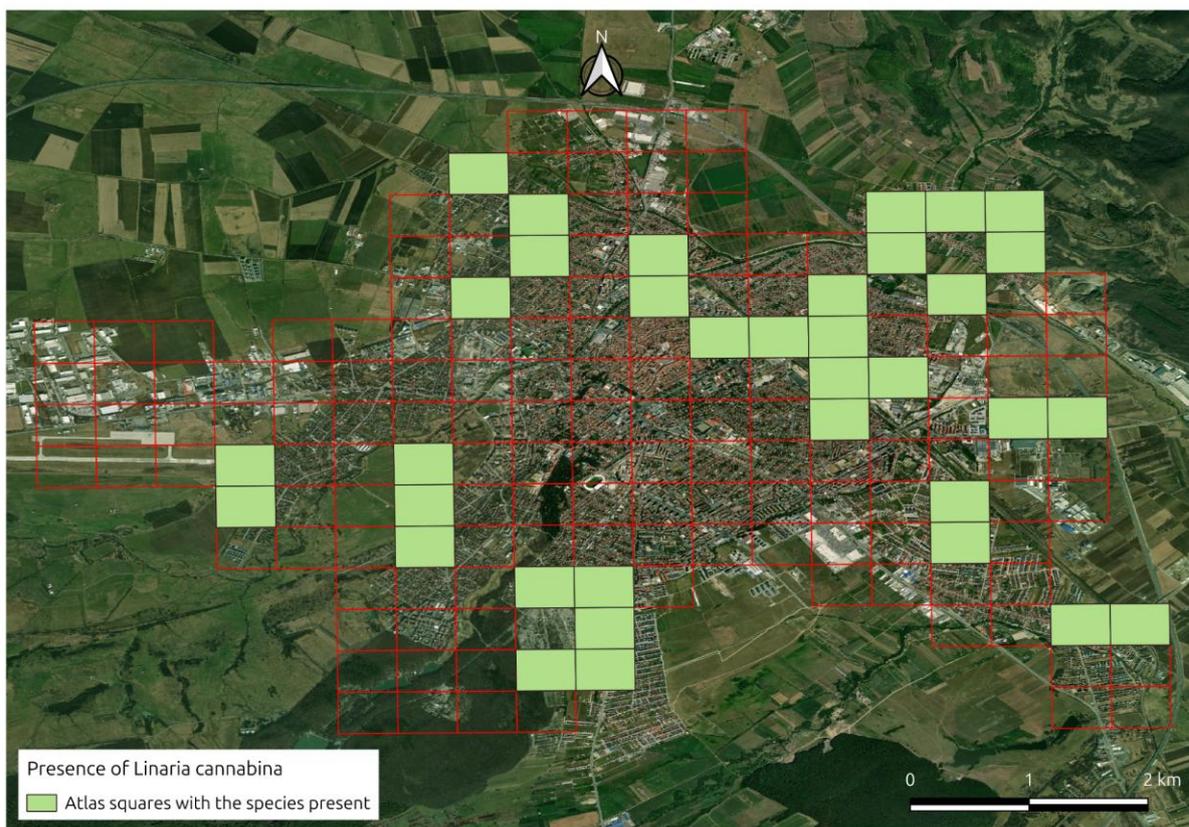


Figure 2: Distribution map of *Linaria cannabina*

The presence of *Ficedula albicollis* (frequency 8.57%) (Fig.3) and woodland species like *Dryocopus martius* and *Dendrocoptes medius* highlights the importance of mature tree stands. The data suggests that large, established green spaces such as Sub Arini Park mimic forest conditions sufficiently to support specialist species. This validates the need to preserve old-growth trees within the urban fabric, as they provide nesting cavities that new sterile landscaping cannot replace.

Our results (Fig.4) reveal a discrepancy between species distribution and protected areas. While *Ciconia ciconia* and *Botaurus*

minutus rely on the Cibin River floodplain, this area lacks formal protection comparable to the "Dumbrava Sibiului Natural Park." Furthermore, the presence of "Near Threatened" species like *Clanga pomarina* —the only species found on both the Red List and the EU Directive list in our study — suggests that the area serves as a feeding ground or corridor for raptors, even without confirmed breeding. The current fragmentation of green spaces described in urban planning documents threatens to isolate these populations, emphasizing the need for legal protection of the Cibin meadow and better connectivity between the city's green pockets.

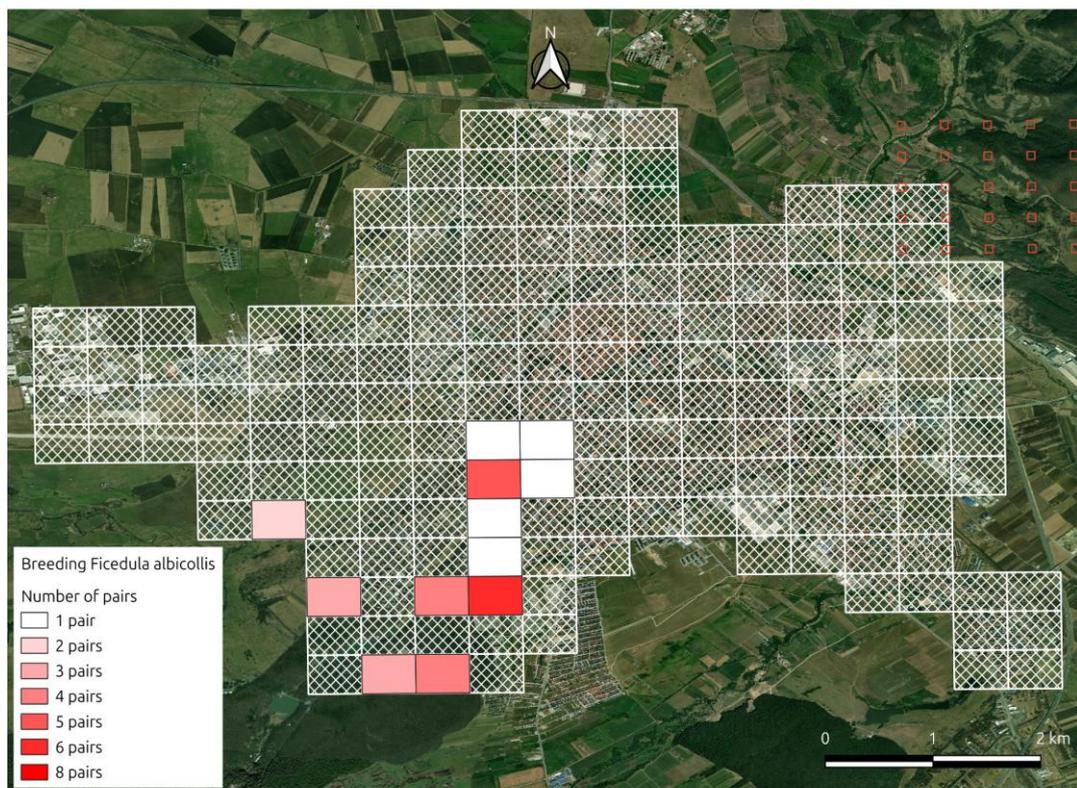


Figure 3: Distribution map and breeding status for *Ficedula albicollis*

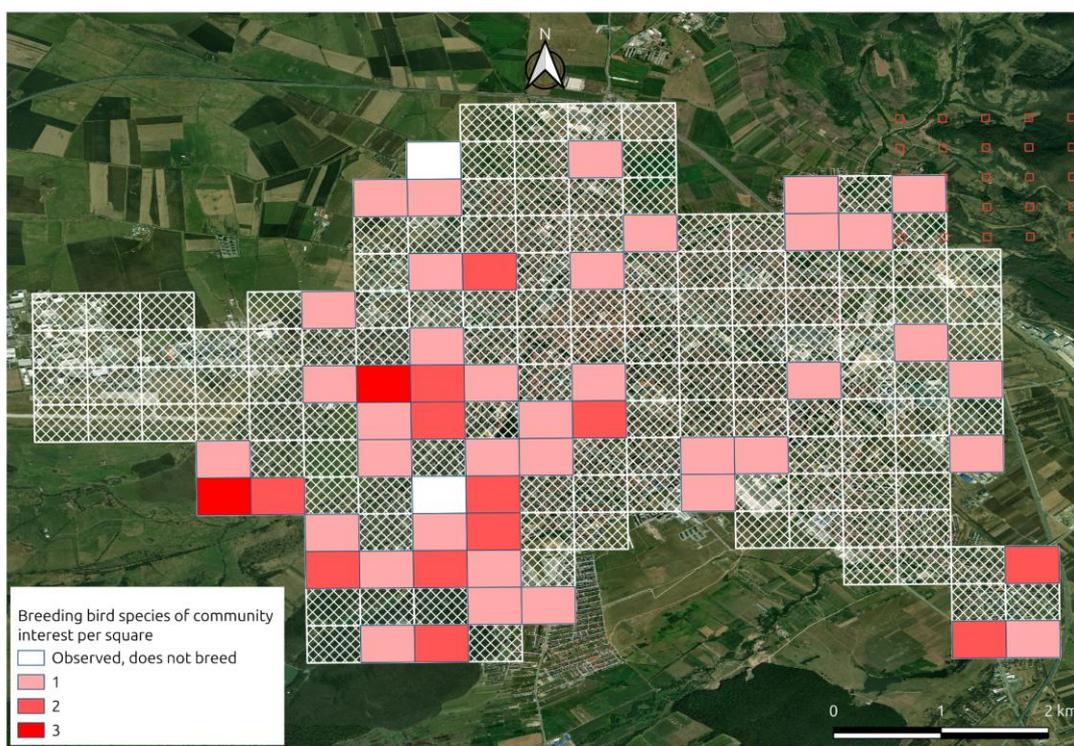


Figure 4: Distribution map based on the number of pairs of bird species of Community interest

4.1. Comparative Analysis and Historical Context

The diversity of species of Community interest in Sibiu appears significant when compared to other regional urban studies. For instance, the Atlas of Birds of Cluj (Kósa et al, 2021) identified six breeding species of Community interest (*Botaurus minutus*, *Picus canus*, *Dendrocopos syriacus*, *Dendrocoptes medius*, *Lanius collurio*, *Ficedula albicollis*). In comparison, this study suggests a higher diversity, likely due to the varied landscape of Sibiu which includes the Cibin floodplain.

Historically, the avifauna of Sibiu's green spaces, particularly Sub Arini Park, has been documented, though often without specific breeding evidence. Stănescu (1971) recorded six species of Community interest during the prevernal aspect (*Ciconia ciconia*,

Dendrocoptes medius, *Lanius collurio*, *Lanius minor*, *Milvus milvus*, *Picus canus*) and four in the vernal aspect (*Ciconia ciconia*, *Caprimulgus europaeus*, *Dendrocoptes medius*, *Lanius collurio*) between 1969 and 1970. Similarly, Benedek (1999) noted the presence of six species (*Alcedo atthis*, *Ciconia ciconia*, *Ficedula albicollis*, *Dendrocoptes medius*, *Picus canus*, *Nycticorax nycticorax*) in the prevernal period, but without data regarding possible breeding.

The continuous presence of species like *Ficedula albicollis* and *Dendrocoptes medius* over decades confirms the long-term ecological importance of these mature park habitats, while our current data adds crucial confirmation of their breeding status which was lacking in previous phenological studies.

CONCLUSIONS

During the breeding season monitoring conducted between 2022 and 2025, using both Atlas and CBM methodologies, we identified 17 bird species of Community interest. Based on the breeding codes, we can state that: two species were confirmed breeders: *Ciconia ciconia*, *Lanius collurio*; four species were probable breeders: *Botaurus minutus*, *Alcedo atthis*, *Dendrocopos syriacus*, *Ficedula albicollis*; six species were possible breeders: *Strix uralensis*, *Picus canus*, *Dryocopus martius*, *Dendrocoptes medius*, *Lullula arborea*, *Curruca nisoria*. Furthermore, we identified 10 species included in the Romanian Red List of Birds: *Linaria cannabina* (classified as Vulnerable) and *Astur gentilis*, *Alauda arvensis*, *Anthus trivialis*, *Clanga pomarina*, *Fulica atra*, *Hirundo rustica*, *Botaurus minutus*, *Saxicola rubetra*, *Saxicola torquatus* (classified as Near Threatened).

Clanga pomarina, despite lacking evidence of breeding within the Municipality of Sibiu, is the only identified species found in both categories: it is both a species of Community interest and included on the Red List. Among the breeding species of Community interest, two are dependent on aquatic habitats (*Botaurus minutus*, *Alcedo atthis*), two on open areas with shrubs (*Curruca nisoria*, *Lanius collurio*) — a habitat where *Linaria cannabina* (a species on the Romanian Red List of Birds) was also found — and six on forest habitats (*Picus canus*, *Dryocopus martius*, *Dendrocopos syriacus*, *Dendrocoptes medius*, *Lullula arborea*, *Ficedula albicollis*). This demonstrates that these habitats must be protected, and urban development should take into account these areas of interest for local avifaunal biodiversity.

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