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# Diversity of bird communities and pressure from the recreational transformation

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## Abstract

Recreational activity leads to a complex
transformation of the forest ecosystem. These disturbances taken together
affect the habitat conditions of birds.
The transformation of bird communities under the pressure
of negative impacts occurs in various ways. Due to the large number of species
and wide ecological valence, many birds adapt to habitats in modified biotopes
(Walther 2002;
Blinkova et al. 2020). Some colonize new nesting sites
(Shupova et al. 2022); others move nests to safer tiers of the forest stand
(Blinkova & Shupova 2018) or to greater depths when nesting in a burrow
(Chen et al. 2011). Birds easily navigate a new environment (Nicolaus et al.
2019); develop new elements of behavior depending on living conditions, which
improve the result of foraging (Jarjour et al. 2020), and the ability to engage
in altruistic behavior increases offspring survival (Gómez-Serrano &
López-López 2017).
The analysis was to understand how the species
composition and diversity of birds changed along the sub-environment gradient:
park, semi-natural (tourist bases) and natural (floodplain oak forest) habitats
on the outskirts of the town. Observations were performed in June 2013 on the
site of the left bank of Siverskyi Donets River from Svyatogirsk town (49°01'55.3"N
37°34'09.8"E) to Bogorodychne village (49°01'32.5"N
37°31'02.1"E).
To determine the anthropogenic impact gradient in the
biotope, we took into account the share of the transformed territory, the share
of the territory directly exposed to the uncontrolled impact of vacationers,
the attendance of the site by people and domestic animals in the form of a sum
of points. This was done according to the method described by us in the work of
Shupova et al. (2023). The gradient of increasing anthropogenic impact forms
the following series of biotopes compared by us: biotope 1
→ biotope 2 → biotope 3,
and expressed in the number of points: 116→237→259.
Elucidation of the species composition, abundance and
biotopic distribution of birds was performed by the method of counting birds on
routes (Bibbi et al. 2000).
We compare species diversity using data from samples
of different sizes obtained with transects (sampling units) of unequal length,
due to which observed species abundances can be biased. To eliminate errors in
the interpretation of the analysis of diversity indices, there was a need for
modeling to minimize the influence of disproportional sampling fractions.
Our estimate of α-diversity is based on Shannon
entropy, calculated by the method that links it to the species accumulation
curve proposed by A. Chao et al. (2013), and β-diversity indices, we calculated
abundance-based (Chao et al. 2006).

The recreational transformation of riverbank tree biotopes negatively affects the species composition of communities and the magnitude of bird diversity along the sub-environment gradient: park, semi-natural (tourist bases) and natural (floodplain oak forest) habitats on the outskirts of the town.
The α-diversity index data showed a clear picture of recreational transformation impact on birds. The Shannon entropy index shows an insignificant decrease in the species diversity of bird communities during the transition from biotopes 1 and 2, and more decrease in the bird community during the transition between biotopes 2 and 3. The Berger-Parker index, which reveals the degree of dominant species pressure, is the largest in the biotope 2. The Pielou evenness index revealed that the bird community inhabiting biotope 2 is also the most unbalanced. This result emerged after modeling the weighted indices, it is consistent with the result shown by ranged curves of species abundance, which we consider next, and we recommend our method for working with the Berger-Parker and Pielou index. According to the Sørensen and Jaccard indices, the greatest similarity of the species composition between the bird communities inhabiting the biotopes 2 and 3, the smallest – in the pair of bird communities of the biotopes 1 and 3.

## Attachments

PDF

alpha-beta-diversity...

672KB

## Image Attribution

View of the study area from the right bank of the river (on the left are a floating oak forest, tourist bases, in the center is a park, in the background is Sviatohirsk Town. Ukraine)

## Guidelines

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## Materials

The species of birds and the search for their nests in tree canopies visually were determined using binoculars Barska X-Trail 10x50 Reverse Porro. The audio definition of birds' voices (mp3) was used for the acoustic identification of species.

## Safety warnings

This work was supported by the National Academy of Sciences of Ukraine [theme: ‘Assessment of the impact of military actions on the transformation of terrestrial natural ecosystems using model groups of bioindicator species and monitoring of alien species in flora and fauna as a component of ensuring the biological security of Ukraine’, 0123U101039].

## Ethics statement

In the study, visual and acoustic identification of birds was carried out, without contact with their body.

## Before start

The our research is addition that examines the response of arboreal bird communities during the nesting period in the northern European Steppe Zone, based on empirical data.

# Diversity of bird communities and pressure from the recreational transformation of riverbank tree biotopes of Siverskyi Donets River

1 Recreational activity leads to a complex transformation of the forest ecosystem. These disturbances taken together affect the habitat conditions of birds.
The transformation of bird communities under the pressure of negative impacts occurs in various ways. Due to the large number of species and wide ecological valence, many birds adapt to habitats in modified biotopes (Walther 2002;
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