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DISTRIBUTION AND FUNCTIONAL ROLE OF AMPHIBIANS IN ROZHNIATIV DISTRICT

Tsymbaliuk V.V.*PhD student**Vasyl Stefanyk Carpathian National University,
Ivano-Frankivsk, 7 Shevchenka Str., 76018***Mykytyn T.V.***Associate Professor, PhD in Biol. Sciences**ORCID: 0000-0002-3458-0520**Vasyl Stefanyk Carpathian National University,
Ivano-Frankivsk, 7 Shevchenka Str., 76018*

Abstract. *This study investigated the species composition, functional role, and anthropogenic threats to the batrachofauna (amphibians) in the Rozhniativ district of Ivano-Frankivsk region, a representative Carpathian foothill area. Field surveys were conducted throughout the active season (March–November 2025) in Spas, employing the route-point survey method at 12 diverse sites. The study confirmed eight amphibian species, all belonging to the order Anura, establishing a batrachofaunal complex typical of the Precarpathian region. Amphibians were found to perform a critical functional role in ecosystem stability, primarily through trophic regulation (biological control of invertebrates) and supporting local food webs. However, the stability of these populations is severely undermined by anthropogenic factors, including habitat loss and fragmentation (due to urbanization and infrastructure) and chemical pollution combined with hydrological changes from adjacent land use. The results necessitate the urgent implementation of targeted conservation and habitat restoration measures to ensure the long-term persistence of amphibian diversity and the vital ecosystem services they provide in the Rozhniativ district.*

Key words: *batrachofauna, Anura, ecosystem services, habitat degradation, trophic structure, Rozhniativ district, conservation management.*

Introduction.

Amphibians are an essential component of biodiversity, playing a crucial role in terrestrial and freshwater ecosystems as both predators (controlling invertebrate populations, e.g., Annelida, Coleoptera) and prey, thus maintaining ecological balance (Balandiukh, 2023; Gasso & Yermolenko, 2021).

In the 21st century, the survival of many amphibian species faces challenges due to a range of adverse natural and anthropogenic environmental factors (Palamarenko, 2020). Studies show amphibian population dynamics and reproduction are highly dependent on climatic conditions (low temperatures, low precipitation) (Slobodian, 2024). Major threats include anthropogenic factors such as urbanization, agricultural intensification, habitat degradation (loss/drainage of breeding sites), contamination,



and high road mortality (e.g., *Bufo bufo* and *Rana temporaria*) (Hartel & von Wehrden, 2013; Gasso & Yermolenko, 2021; Reshetylo et al., 2019).

Faunistic research in Western Ukraine, particularly in the Ukrainian Roztochchia, confirms a significant amphibian diversity (e.g., 12 species, including protected ones) (Andriishyn, 2020; Slobodian, 2024). These studies detail the reproductive dynamics of key species like *R. temporaria* and *B. bufo* (Andriishyn, 2023) and highlight the critical importance of human-made ponds for breeding, especially for *Bombina variegata* and *B. bufo* (Hartel & von Wehrden, 2013; Babik & Rafinski, 2001).

Despite existing regional research, specific data on the distribution and functional role of amphibians in Rozhniativ district (Ivano-Frankivsk oblast) – a Carpathian foothills region – are incomplete. The aim of this work is to study and analyze the species composition, distribution characteristics, and evaluate the functional role of amphibians in the territory of Rozhniativ district.

Materials and Methods. The study of the batrachofauna (amphibians) was conducted in Spas, Rozhniativ district, Ivano-Frankivsk oblast, Ukraine. The object of the study was amphibians. The territorial range covered a variety of biotopes: natural (forests, wetlands) and anthropogenically modified environments (ponds, field plots, rural settlements), which ensured the representativeness of the obtained data. Field research and census work were carried out throughout the growing season of 2025 – from March 15 to November 15. This extended period allowed for covering all phases of amphibian activity, from emergence after hibernation and breeding (spawning) to autumn migration and preparation for wintering.

To assess the species composition and abundance of amphibians, a route-point survey method was used. Prior to the start of field work, a reconnaissance survey of the territory was conducted to identify potential amphibian habitats, including the search for hydrobiotopes (ponds, streams, swamps) and areas of moisture/shelter (swampy plots, riparian thickets). The census was carried out at 12 fixed survey points (study plots) covering the key ecosystems of the region. The list of survey points, localized using Google Maps (fig. 1), included: “Chortizh Lake Tract” (1), “In berizka Tract” (2), “In berizka 2 Tract” (3), “In mlynivtsi Tract” (4), “In drobilky Tract” (5),



“Private Lake 1” (6), “Private Lake 2” (7), “Pid ukripyou” (8), “Swampy Waterbody 1” (9), “Swampy Waterbody 2” (10), “Pid sukholisom Tract” (11) and “Pid sukholisom 2 Tract” (12).

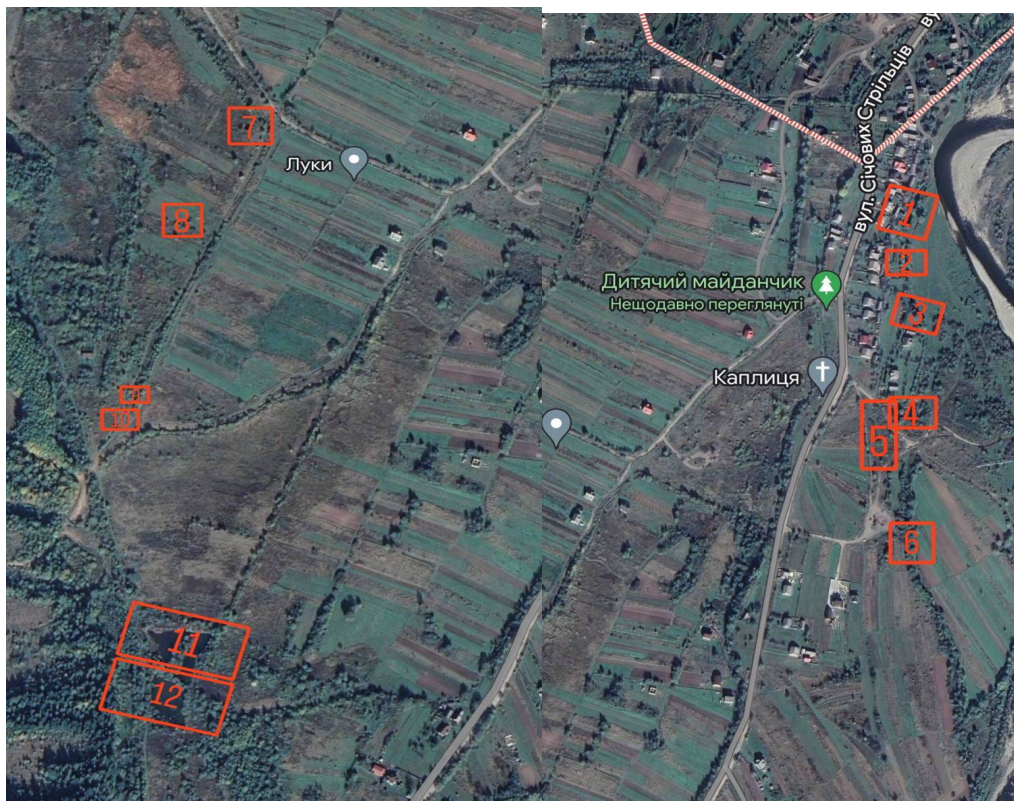


Figure 1 – Geographic Map of the Study Area and Census Points

Source: Google Maps

To estimate abundance, absolute and relative census methods were used, followed by data extrapolation, taking into account the biological characteristics and diurnal activity of the species. The primary method of data collection was visual observation, which included examining the banks of water bodies, as well as the riparian and underwater zones. Amphibian identification was carried out using specialized identification keys (notably Amphibians of Ukraine by E. M. Pysanets, 2007) and the iNaturalist mobile application for documenting observations.

Results of the Research.

Based on the field research conducted during the research period 8 species of amphibians were identified. These species belong to 1 order (Anura), encompassing 4



families and 5 genera. Representatives of the order Caudata (tailed amphibians) were not recorded in the studied territory.

The most numerically represented is the order Anura (frogs and toads), which includes the following families: Bombinatoridae, Hylidae, Bufonidae, and Ranidae.

The discovered species composition (Table 1) indicates a typical batrachofauna complex for the Precarpathian region, characterized by a dominance of widespread forest and forest-steppe species. The presence of species such as the Yellow-bellied toad (*Bombina variegata*) and the Common toad (*Bufo bufo*) is expected due to the diverse forest and foothill landscape of the Rozhniativ district. The abundance data derived from literary sources suggest that during the breeding season, certain species, particularly the Common toad and Grass frog, can reach high local densities in suitable spawning areas, which is consistent with active spring migration patterns.

The confirmed presence of the Natterjack toad (*Bufo calamita*) and the Agile frog (*Rana dalmatina*), whose distribution is generally limited to the western and southwestern regions of Ukraine, underscores the local ecological significance of the study area within the broader range of these species.

Table 1 – Amphibian Species Composition in Spas, Abundance, and Distribution in Ukraine

Order	Family	Genus	Species	Estimated Relative Abundance (According to Literature)	Distribution in Ukraine (According to Literature)
Anura	Bombinatoridae	Bombina	Yellow-bellied toad (<i>B. variegata</i>)	In foothills and low mountains (from 350–600 to 900 m) 10–50 (and more) individuals per 100 m of coastline.	East of the Ukrainian Carpathians. In Ukraine – in the Carpathians (up to 2000 m) and Precarpathia.



Hylidae	Hyla	European tree frog (<i>H. arborea</i>)	In Zakarpattia, up to 20 individuals per 100 meters of breeding coastline in suitable habitats during spring.	Widespread across almost all of Ukraine, most numerous in Polissia, Forest-Steppe regions, and forested areas of Crimea. In the steppe zone – in river floodplains and ravines.
Bufonidae	Bufo	Common toad (<i>B. bufo</i>)	Up to 70 individuals per 100 meters of coastline during spawning (Zakarpattia). Outside the breeding season – about 1–2 individuals per 1 km of route.	Found in regions with forest landscapes (coniferous, broadleaf, mixed forests, parks, gardens). In the Carpathians – in beech and spruce-fir forests, up to the subalpine zone.
		Natterjack toad (<i>B. calamita</i>)	During the breeding period – 21–112 individuals per 1000 m ² . Post-breeding – 1–12 individuals per 1000 m ² .	In Ukraine – in Volyn and partially in Lviv, Ivano-Frankivsk, and Rivne regions.
Ranidae	Rana	Grass frog (<i>R. temporaria</i>)	At spawning sites (Zakarpattia) – up to 100 individuals per 100 m of coastline. Post-breeding (June–September) – 3–20 individuals per 100-meter route.	Widespread in most northern, western, and eastern regions. Almost completely absent in steppe areas.
		Moor frog (<i>R. arvalis</i>)	Varies from 7–11 individuals per 1000 meters to 5–20 individuals per 100-meter route.	Widespread over most of the territory, mainly in the forest and partially in the forest-steppe zones. In the Carpathians, observed only in lowlands and foothills, generally not above 1000 m a.s.l.
		Agile frog (<i>R. dalmatina</i>)	During the breeding season – 3–8 individuals per 100 m. Post-breeding – 0.3–2 individuals per 100 m.	In Zakarpattia, Precarpathia, Chernivtsi region, and western Vinnytsia region.



		Pelophylax	Pool frog (<i>P. lessonae</i>)	Along irrigation channels – 25–98 individuals per 100 m. In Precarpathia – 1–100 individuals per 5.6–100 m ² .	Widespread over most of Ukraine, limited to the forest-steppe boundary in the south. In Ukraine, generally does not ascend above 600 m a.s.l.
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Functional Significance. Batrachofauna is a critically important structural and functional element of the ecosystems in Rozhniativ district, providing a range of indispensable ecosystem services. Their functional role is classified as regulating, supporting, and cultural. The key contribution to regulating services lies in trophic regulation: amphibians, being predators, execute effective biological control over invertebrate populations, including potential pests and disease vectors. While an indirect influence through predation on pollinating insects is noted, the overall balance promotes the maintenance of ecological equilibrium. Supporting services include the position of amphibians as important bioindicators and their key role in nutrient cycling. They are an integral part of complex food webs, serving as a food source for secondary predators (birds, mammals, reptiles), which directly contributes to the preservation of overall biodiversity.

Anthropogenic Pressure and Future Threats. The stability of batrachofauna populations in the district is under significant threat due to increased anthropogenic pressure, leading to negative ecological consequences.

The primary threat is habitat loss and fragmentation, caused by:

1) Habitat degradation (deforestation, expansion of agricultural areas, infrastructural construction), leading to direct loss of suitable habitats for terrestrial phases and disruption of migration routes.

2) Hydrological changes (drainage or, conversely, siltation of wetlands), which critically destroy breeding sites (hydrobiotopes).

3) Urbanization and industrialization, which cause chemical pollution (e.g., heavy metals) – particularly dangerous due to the high permeability of amphibian skin.



4) Landscape fragmentation by roads, which isolates populations and is a source of high mortality during seasonal migrations.

5) Intensive agriculture, which reduces biotope diversity and utilizes toxic pesticides/herbicides.

Research Perspectives. Given the established functional importance and high level of threats, future research should focus on quantitative population monitoring and the development of targeted strategies for the conservation and restoration of habitats in Rozhniativ District. This is essential for mitigating anthropogenic impact and ensuring the long-term sustainability of batrachofauna populations and the ecosystem services they provide.

Summary and Conclusions. This study confirmed the presence of eight amphibian species in Spas, Rozhniativ district, Ivano-Frankivsk oblast, Ukraine, all belonging to the order Anura (tailless amphibians), characteristic of the Precarpathian foothill batrachofaunal complex. The local amphibian populations perform a critical functional role in maintaining ecosystem stability, primarily through trophic regulation (effective biological control of invertebrates) and supporting the complexity of local food webs. However, the sustainability of these populations is severely undermined by anthropogenic factors. The most significant threats identified are habitat loss and fragmentation (due to urbanization, deforestation, and road construction), coupled with hydrological changes and chemical pollution from adjacent agricultural practices. The results underscore the urgent necessity of implementing targeted conservation and habitat restoration measures to mitigate negative anthropogenic impacts and ensure the long-term persistence of amphibian diversity and the vital ecosystem services they provide in the Rozhniativ district.

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