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## HABITAT SPECIFICITY AND STRUCTURE OF AMPHIBIAN COMMUNITIES IN THE DNISTER RLP AS AN ECOSYSTEM STATE INDICATOR

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**Abstract.** This study analyzes the batrachofauna of the Dnister Regional Landscape Park (RLP) as a tool for bioindication. The state of the park's ecosystems was assessed based on data regarding the biotopic distribution and morpho-physiological indicators of amphibians. It was revealed that the population structure of the agile frog (*Rana dalmatina*) reflects microclimatic changes, while the level of fluctuating asymmetry in the *Pelophylax* complex indicates hidden pollution of the aquatic environment. The threat of biotic pollution due to the expansion of the amur sleeper (*Perccottus glenii*) is substantiated.

**Key words:** *amphibia, Dnister Canyon, bioindication, fluctuating asymmetry, Rana dalmatina, Pelophylax ridibundus, anthropogenic impact.*

### Introduction.

The Dnister Regional Landscape Park (RLP), located within the Ivano-Frankivsk region, is a key element of the ecological network of Ukraine. Due to the permeability of their skin and their complex life cycle, amphibians (Amphibia) are considered one of the most sensitive indicators of environmental conditions (Zhelev et al., 2021). The aim of this work is to determine the most informative indicators of amphibian populations for assessing the anthropogenic load on the canyon's ecosystems.

### Materials and Methods.

The research is based on the analysis of scientific publications, data from the «Chronicles of Nature» and monitoring results from the territories of the Horodenka and Tlumach districts. To assess developmental stability, the method of fluctuating asymmetry (FA) analysis of bilateral traits was used. The analysis of habitat specificity was conducted taking into account the geomorphological features of the canyon (Smirnov and Buchko, 2018).

### Research Results.

Biotopic Differentiation and the «Canyon Effect». The specific geomorphology

of the Dnister Canyon, where relative heights reach 120-180 m, creates a unique microclimate. This allows thermophilic species to penetrate far to the north. In particular, the expansion of the agile frog (*Rana dalmatina*) along the Dnister Valley indicates the river's role as a thermal corridor. Populations of this species within the RLP are confined to hornbeam-oak forests on slopes with southern exposure (Smirnov, 2013).

Fluctuating Asymmetry as a Stress Marker. Analysis of marsh frog (*Pelophylax ridibundus*) populations demonstrates that even in outwardly stable biotopes, an increased level of fluctuating asymmetry is observed. This correlates with data on the hydrochemical state of the Dnister, which is influenced by discharges of industrial waters and agrochemicals from adjacent fields (Suriadna et al., 2010; Zhelev et al., 2015).

Hybrid Zones. A contact zone between the fire-bellied toad (*Bombina bombina*) and the yellow-bellied toad (*Bombina variegata*) is recorded within the park's territory. Floodwaters facilitate the drift of the montane species (*B. variegata*) into lowland areas, where hybridization occurs. The stability of these zones depends on the preservation of floodplain forests (Vences et al., 2013).

### **Discussion.**

The park territory, covering an area of 19,656 ha (Nature Reserve Fund of Ukraine, 2023), is characterized by high habitat mosaicism. The steep slopes of the canyon, covered with petrophytic steppes and shrubs, create natural barriers to agrochemical runoff from upland (placor) areas. This explains the phenomenon where sensitive species, such as the fire salamander (*Salamandra salamandra*) or the carpathian newt (*Lissotriton montandoni*), are preserved in small streams on the slopes, while eurybiontic species (the *Pelophylax* complex) dominate in the Dnister channel itself and adjacent floodplain water bodies. Thus, the park's ravine-gully network functions as refugia for biodiversity amidst the region's intensive agricultural development.

Comparative Analysis of Indicators Analysis of literature data allows for the identification of a hierarchy of bioindicators for this region:

Morphological Indicators (FA). The most sensitive tool. Studies show that *Pelophylax ridibundus* can accumulate heavy metals and pesticides without an immediate decrease in abundance, but this is reflected in developmental instability (asymmetry). This allows for the detection of «hidden» ecosystem stress before collapse occurs (Zhelev et al., 2021).

Faunistic Indicators (*Rana dalmatina*). The presence of this species is an indicator of climate change and the preservation of broad-leaved forests. The disappearance of *R. dalmatina* in RLP localities would indicate not water pollution, but rather the degradation of forest litter and changes in microclimate (deforestation of slopes) (Smirnov and Buchko, 2018).

Biotic Indicators (Invasions). The appearance of the amur sleeper (*Perccottus glenii*) in the Dnister tributary system is a marker of biotic pollution. This predator alters community structure by preying on newt and frog larvae, leaving only common toad (*Bufo bufo*) tadpoles, which are resistant to toxins. The monodominance of *Bufo bufo* in a water body can serve as a signal of amur sleeper invasion (Reshetnikov, 2013).

Conservation Issues. Despite its protected status, the RLP territory is impacted by the transboundary transport of pollutants. Changes in the hydrological regime (absence of spring floods) negatively affect the reproduction of *Bombina variegata*, which depends on temporary water bodies. This confirms the necessity of shifting from protecting individual species to preserving hydrological cycles (Afanasyev and Manturova, 2021).

### **Summary and conclusions.**

The Dnister RLP functions as an important biogeographical node, ensuring the coexistence of montane, forest, and steppe amphibian species. The most informative method for early diagnosis of pollution in the park's aquatic ecosystems is the analysis of fluctuating asymmetry in abundant species (*Pelophylax ridibundus*). The population structure of *Rana dalmatina* is an indicator of the preservation of forest biotopes and climatic trends, while the invasion of *Perccottus glenii* poses a direct threat to the biodiversity of floodplain water bodies. It is recommended to include FA monitoring

and the mapping of spawning grounds of rare species in the park's «Chronicles of Nature» program as priority measures.

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