

ASPECTS OF THE STRUCTURE AND BIODIVERSITY OF THE MACRONEVERTEBRATES IN THE ROMANIAN SECTOR OF THE DANUBE RIVER

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Abstract

Benthic macroinvertebrates play an important role in maintaining the functionality and integrity of aquatic ecosystems. The role in assessing the quality of water bodies, their integrity and biodiversity has grown in the last decade.

The aim of the present paper is to establish the qualitative and quantitative structure of macroinvertebrates in the Romanian Danube river sector (2 sampling points: Bala branch and Epurașu island). At the same time, it was made an analysis of the diversity of the benthic community through various biodiversity indices.

*The taxonomic structure is characterized by the presence of 7 taxonomic groups represented by 11 species. From the qualitative point of view, the group of gastropods (4 species) with the dominant species *Lithoglyphus naticoides* is the best represented. The biodiversity at the two sampling points is good and there are no significant differences between the two sampling points.*

Key words: macroinvertebrates, aquatic ecosystem, Shannon - Weiner index

INTRODUCTION

The Benthic macroinvertebrates play a multiple role in the functioning of aquatic ecosystems, and the presence of the key species, the magnitude of their wealth as well as other attributes of communities can affect the rates of ecosystem-specific processes [5].

The ecology of benthic invertebrates simultaneously involves qualitative aspects, the life cycle, and quantitative aspects of life history [2]. Factors that control these populations are also taken into account.

The biological cycle of a species is the set of stages that an individual traverses during his or her life. The variety of cycles corresponds to the diversity of the taxonomic groups. The duration varies, but it is grossly related to the final size of the species, from a few days to a few years.

The benthic macroinvertebrates associations are integrated into the structure of the vast majority of the continental aquatic ecosystems (streams, rivers, lakes, ponds),

generally representing numerically and / or biomass-dominant components, as well as major links to matter and energy transfer channels. The biodiversity of freshwater offers a wide variety of goods to human society, some of which are irreplaceable [6].

Diversity is a functional and structural parameter of ecosystems, a descriptor for their health status [9].

Biodiversity is often cited as the eminent gauge of biological integrity.

Ecosystem processes (nutrient productivity and recycling) result directly from the diversity of functional features of the biotic communities, which is in turn determined by the composition and the diversity of species [8].

The term "ecosystem health" is usually defined by the concept of "ecological integrity"[10]. In literature, we can find a number of indices with which we can calculate the biodiversity, some that take only into account the total number of species (S) or the total number of individuals present in samples (N).

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MATERIAL AND METHOD

The study of benthic biocenoses was performed both by qualitative analysis methods (based on simple lists of presence / absence of species) and by the quantitative analysis method (based on numerical data of abundance and species biomass).

The principle of the method consists in taking samples of zoobenthos with the help of dear ones; sorting the macroinvertebrates under the optics by systematic groups and identifying the animal organisms from each systematic group to the species level. Counting and weighing the identified zoobenthonic organisms; determining the zoobenthos density and biomass by extrapolating data to square meter.

The determination of main taxonomic groups was made after Godeanu, 2002 [7], Botnariuc, 1999 [1], Chiriac, 1965 [3] and Thierry Demol, 2000 [11].

The samples were taken in June 2017 from PC 01 and PC 02. Critical point PC01, Bala area and Carageorghie sand bank (km 347- km343) with 4 sampling stations (PC01-1, PC01-2, PC01-3 and PC01-4) and critical point PC 02, Epurasu area (km 342 + 700 - km 341 + 800) with 3 sampling stations (PC02-3, PC02-4 and PC02-5). (fig. 1 and table 1).

Table 1 Sampling points

| Critical point | Section | KmD |
|----------------|---------|-------------------|
| PC 01 | Bala | 347-343 |
| PC 02 | Epurașu | 342+700 – 341+800 |

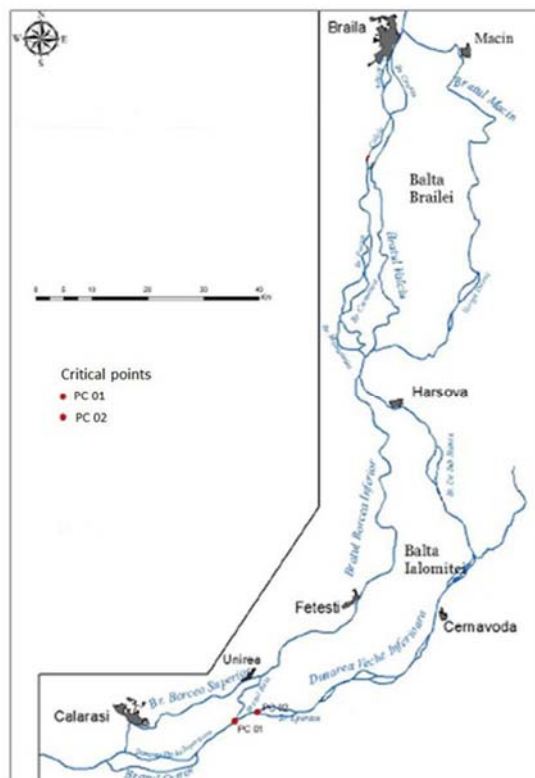


Fig. 1 Study area

RESULTS AND DISCUSSIONS

➤ *The qualitative composition of benthic macroinvertebrates*

After the qualitative processing the quality of the samples there were identified seven taxa (species represented 11), namely: *Oligochaeta*,

Gastropods, Bivalves, Ostracods, Amphipoda, Tricoptera, Diptera, in which (fig. 2):

- Oligochaets represented by a single species *Tubifex tubifex*;



Fig. 2 Samples of species identified on stations

- Gastropods represented by 4 species: *Viviparus acerosus*, *Lithoglyphus naticoides*, *Theodoxus danubialis*, *Esperia acicularis*. The species *Lithoglyphus naticoides* was present at all the stations studied;
- Bivalves represented by the species *Dreissena polymorpha* and *Unio pictorum*
- Ostracods were identified at the taxonomic group level;
- Amphipods represented by *Gammarus sp*;
- Dipters represented by *Chironomus plumosus* and *Culex pipiens*
- Tricopters represented by *Hydropsyche sp.* (fig. 3).

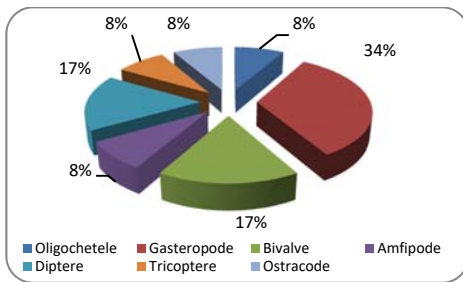


Fig. 3 Taxonomic structure of macroinvertebrates

➤ The quantitative composition of benthic macroinvertebrates

- Abundance (%)

The oligochaetes were found in only 2 stations (PC 01-3, PC 02-3) at 28.43%. The best represented taxonomic group is the gastropods. Of these, the species *Lithoglyphus naticoides* is dominant, being present in 6 of

the 7 sampling stations. The minimum abundance is 46% PC 01-4 and the max 100% PC 01-1. The abundance of the other taxonomic groups on stations is as follows: bivalves between 0-100%, ostracods between 0-50%, tricopters between 0 - 33%, dipters between 0 and 28.43% (Fig. 4).

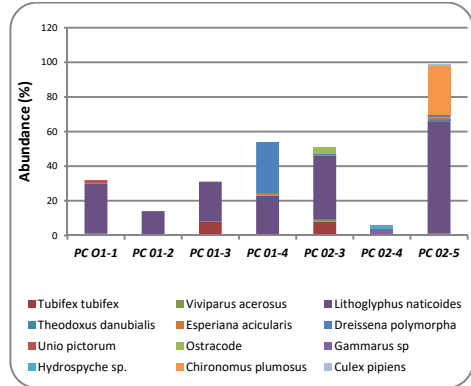


Fig. 4 Evolution abundance macroinvertebrates on stations

- Density (ex/m²)

As can also be seen in figure 5, the gastropods had the highest density; the highest value being recorded at station PC 02-5 (2773.43 ind/m²). Bivalves had a density of 1171.88 inv./m² (PC 01-4). Dipters had the highest density at this station of 1132.81 ind/m².

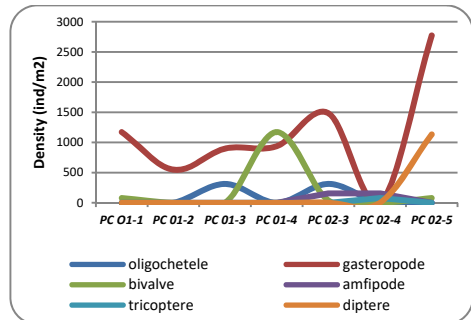


Fig. 5 Evolution of density on stations

- Biomass (g/m²)

The biomass of oligochaetes varies from 1.02 to 1.52 g/m² between the stations. Bivalves had biomass only at PC 01 - 1 station with the value of 5116.80 g/m². Gastropod biomass varied from 0 to 189.45 g/m².

At the PC 02-04 station, the Hydrosyche amarides and tricopter had a biomass of 2.23 g / m² and 3.95 g/m² respectively. At station PC 02 - 5 dipters had biomass of 9.96 g / m².

- Biodiversity

The value of the diversity indices of the benthic macroinvertebrates at the sampling points are shown in Table 2.

Biodiversity indices show us relatively good values which do not differ significantly between the two sampling points.

Table 2 Biodiversity indices

| Indice | PC 01 | PC 01 |
|------------------|-------|-------|
| H _s | 0,395 | 0,531 |
| E _H | 0,507 | 0,492 |
| (1-D) | 0,486 | 0,539 |
| E _{1-D} | 0,53 | 0,58 |
| Berger-Parker | 0,679 | 0,654 |
| Margalef | 1,026 | 2,178 |

H_s Shannon-Weiner index, E_H - Shannon equitability (1-D) Simpson index, E_{1-D}- Simpson equitability

CONCLUSIONS

In the studied sectors, there were identified 7 taxonomic groups of 11 species were identified. The best represented, both in terms of number of species and numerical abundance, is the group of gastropods.

High molar density can be a potential risk factor for fish due to the fact that gastropods can be intermediate hosts for a series of fish parasites that in their development cycle pass through the body of the gastropods

✓ The presence in relatively large abundances and densities of the dipters and of the oligoheads indicates the existence of a larger quantity of organic substance.

✓ The presence of diphtheres indicates that chemical water loading does not exceed the limit because dipters are chemical pollution bodies. Being very sensitive to any type of water quality deterioration, the dipters are indicators of water with no chemical pollution.

✓ The importance of amphipods is mainly in their way of nutritional detritivor (thus contributing to the shredding of organic matter), as well as the fact that they are an important part of the fish feed. They appeared more often in samples harvested near the shore, these organisms preferring a lower water speed.

✓ We can conclude that during the study period, the state of the macrobenthic populations in the Danube can be considered good, the point with the highest diversity of benthic organisms is PC 02.

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