

Impact of environmental variables on benthic invertebrates community structure in Comana Marsh, Romania

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Benthic macroinvertebrates are widely used as bioindicators to assess ecosystem integrity, the identification and quantification of macroinvertebrates community structure can indicate either habitat degradation or other stressors (pollution), helping to target areas in need of restoration. In addition, these organisms have specific habitat requirements, and their presence or absence can provide valuable information about the habitat quality of the aquatic system (Tampo et al., 2021; Omoniyi, 2022). Comana Marsh of approx. 1200 ha is located on a second order tributary of the Danube River. A small-size dam and a system of concrete dykes were built on Neajlov River (approx. 7 m³/s, high flo in March and low-flow in August) to recreate an upstream marsh, in the foodplain. Comana Marsh underwent restoration in 2011 after the small side dam and a system of dykes were built on Neajlov River to recreate the upstream marsh by a network of small natural connecting anabranching channels with hydrologically variable regime.

Thus, our study aimed to conduct post-restoration monitoring on macroinvertebrates and to analyse their relation with environmental variable across Comana Marsh, Romania. Five sampling sites and a seasonal monitoring frequency (spring, summer and autumn) were selected to evaluate benthic invertebrates dynamic related to environmental variables after restoration process in Comana Marsh (Figure 1).

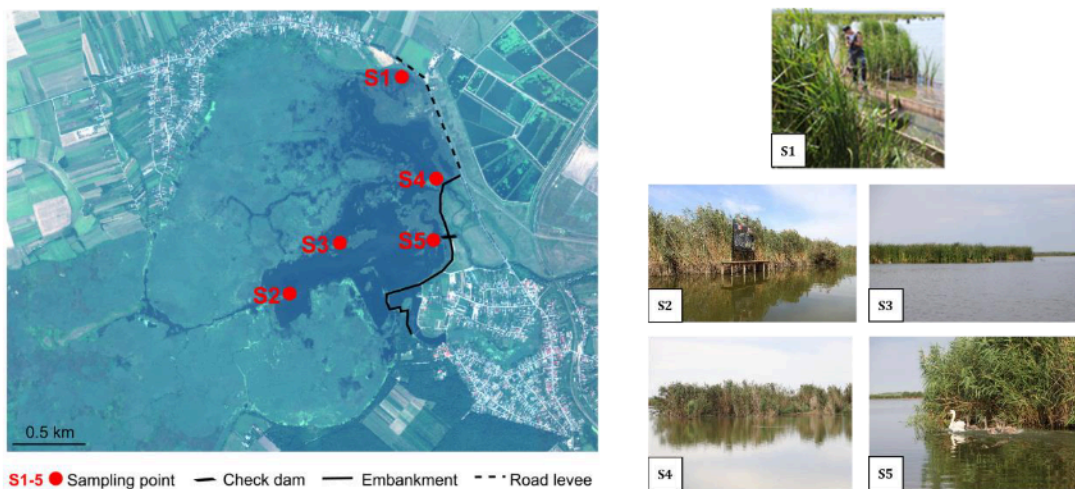


Figure 1 Study area: Comana Marsh.

Sampling was carried out in accordance with SR EN ISO 5667-1:2023, SR ISO 5667-6:2017 A11:2020, SR EN ISO 10870:2012. Kick-net and van Veen dredge sampling techniques were employed for macroinvertebrates characterization. Several environmental variables such as dissolved oxygen, temperature, pH, conductivity, total dissolved solids, turbidity, nutrients, chemical and biochemical oxygen demands, chlorides, sulphates alongside emerged vegetation (%), shoreline distance (m) were characterized. The relationship of environmental variables and macroinvertebrates abundance was analysed using Principal Component Analysis (PCA).

Benthic invertebrates community analysis emphasized a number of 12 taxonomic groups, of which 8 at supraspecific level (Nematodes, Oligochaeta, Ephemeroptera, Diptera: Chironomidae, ceratopogonidae, tabanidae, Culicidae and Ostracoda) and 20 at species level during April to September in Comana Marsh. Total abundance of benthic invertebrates (expressed as average) varied between 1884 ind/sqm (S4) and 5631 ind/sqm (S5) during April – September 2023. An increase of abundance values was observed from spring (2859 ind/sqm), summer (4016 ind/sqm) to autumn (4488 ind/sqm). The peak periods in July and September 2023 were due to high temperatures, which led to water level decrease, correlated with amplification of degradative processes in the system. High abundances of Oligochaeta, Gasteropods (*Planorbarius corneus* and *Valvata piscinalis*) were recorded in Comana Marsh during the studied period.

The PCA analysis revealed that macroinvertebrates abundance was negatively correlated to water depth, sulphates concentration and shoreline distance (data not shown).

Our findings showed a strong response of macroinvertebrates to water depth and sulphates concentration, mainly related to temperature increases. A positive correlation was observed between the abundance of aquatic invertebrates and both emerged and submerged vegetation, attributed to the availability of organic matter.

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References

- Tempo, L., Kaboré, L., Alhassan, E.H., Ouéda, A., Bawa, L.M., Djaneye-Boundjou, G. 2021. Benthic macroinvertebrates as ecological indicators: their sensitivity to the water quality and human disturbances in a tropical river. *Front. Water* 3: 662765.
- Omoniyi, G.E., Piscart, C., Pellan, L., Bergerot, B. 2022, Responses of macroinvertebrate communities to hydromorphological restoration of headwater streams in Brittany, *Water*, 14 (4):553.

