# Comparative analysis of Biotic Indices for water quality evaluation, based on bottom invertebrate communities (Macrozoobenthos) from Bulgarian rivers

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**(Summary of the Ph.D. thesis)**
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**Motivation**. The objective of the WFD is to achieve at least a "good" ecological state (or potential) for all surface waters by 2015. Therefore, determining the current environmental state of different categories of river water is extremely important. This knowledge is essential to develop effective management plans for the different river water and to compare the achieved results with the rest countries from East-Continental GIG.

**Goal**. The thesis deals with different indices used for water quality evaluation in Bulgaria for a long period; their usefulness for Bulgarian conditions and developing a multi-habitat method appropriate for Bulgarian typology of the rivers, comparative to the other countries of EU.

**All material and methods are reviewed in the following papers:**

SOUFI R., UZUNOV Y. (2008). Data on Ecological Status of the Kamchia River as Assessed by Invertebrate Communities Parameters. Acta Zool. Bulg., Suppl. 2, 2008: 233-242, Sofia.

SOUFI R., VARADINOVA E., UZUNOV Y. (2002). Trends in the changes on the Saprobilogical state of the Struma river the last 20 years. - International Symposium and Young Scientists' School - Bioprocess Systems'02, Sofia, October 28-29, II. 35-39.

SOUFI R., UZUNOV Y.,VARADINOVA E. (2006). Relation of the standard Saprobilogical Indices used for water quality assessment of the river Struma with some other Biotic Indices used in Bulgaria and other EU countries. BioPs 2006, October 24-25, I.26-I. 32, Sofia.

CHESHMEDJIEV S., R. SOUFI, Y. VIDINOVA, V. TYUFEKCHIEVA, I. YANEVA, Y. UZUNOV, E. VARADINOVA (2011). Multi-habitat sampling method for benthic macroinvertebrate communities in different river types in Bulgaria. – Water Res. and Manag., 1 (3): 55-58.

UZUNOV Y., VARADINOVA E., SOUFI R., (2005). Shifts in species diversity of the bottom invertebrate in two South-West Bulgarian rivers. Varna workshop 2005: Large scale disturbances (regime shifts) and recovery in ecosystems: challenges for management towards sustainability. pp. 188-197.

SOUFI R., E. VARADINOVA, Y. UZUNOV (2004). Relation of the Bulgarian biotic index to the standardized indices for water quality assessment of the River Mesta (SW Bulgaria) - Comp. rend. Acad. bulg. Sci., 57, 8: 83-86.

SOUFI R., UZUNOV Y.,VARADINOVA E. (2006). Relation of the Bulgarian Biotic Index to the Standardized Indices for Water Quality Assessment in Bulgaria: Study on the Struma River (South-West Bulgaria). Acta Zool. Bulg., 58, (2) 2006: 265-273, Sofia.

**Results.** The level of taxonomic identification of *separate* indicator groups included in the procedures for index calculation, has a major impact on the degree of correlation of various methods for  water

quality assessment. For this purpose it is compulsory the assessment to be made by high qualified specialists – hydrobiologists.

Different assessment methods - (saprobic, cenotic and biotic) for most river types show a relatively good correlation. On the other hand the low level of correlation between the saprobe indices used until recently in Bulgaria and some structural parameters of the communities proves the capacity of biotic indices to detect common nonspecific reaction of bottom communities towards external impacts (caused not only by the organic and toxic loads). This makes BI more appropriate for the overall degradation assessment of the river ecosystems to those which are referent or background.

Studies have shown the need for a comprehensive assessment in determining water quality and increase the need for deployment of both multimetric indices and predictive models.

**Conclusions:** Different methods and techniques for sampling of Macrozoobenthos from rivers (for a specific period of time or multi-habitat) do not significantly affect the assessment of the main types of indices (saprobe or biotic), whenever the river habitats are well covered.

Changes in species composition of benthic macroinvertebrates are connected not only with the occurrence or removal of individual species, but with restructuring of bottom communities, expressed through their distribution and extent of domination. For individual sites/river sections, these changes can be interpreted as a change of regime (regime shift).

In a stable saprobiological situation physical factors acquire limitation (water regime, hydro-morphological changes), part of which are global and regional for example: extreme drought, extreme flooding, runoff regulation.

The use of flexible, integrated and multimetric methods for environmental assessment enables a sufficiently accurate assessment of specific cases (specific typology, special substrates, etc.)

The ABI used in Bulgaria, can easily be adapted for use in different climatic and physical geography conditions in other countries. The method has been successfully applied in six countries from Eastern Europe and the Caucasus region, where the climate and typology is extremely different from the climate in Bulgaria (Project EPIRB).

The methods suggested for sampling and analysis of communities of Macrozoobenthos in the rivers permit the introduction of effective systems for ecological quality data verification when applying them in the system of biomonitoring in Bulgaria.

**Contributions**. A multi-habitat method for sampling bottom communities of invertebrates in different types of rivers in Bulgaria has been developed and adapted for Bulgarian conditions; The approaches discussed in the publications enable the competent authorities, as well as the managers and experts from other fields related to management of water resources, to make appropriate decisions concerning the management of river basins; A national method, which has been designed for small and medium-sized rivers monitoring (ABI), has been adapted in order to be used in biomonitoring program for the Bulgarian section of the river Danube (mRBA for Lower Danube and tributaries). The obtained results have been verified and successfully accepted for statistical processing and compared with the results of the rest of the countries from the GIG.