

# BIOMONITORING OF WATER QUALITY ON SURFACE WATERS OF THE UKRAINIAN CARPATHIANS

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**Abstract:** Biomonitoring is an important component of general monitoring of surface waters. But lack of well-developed system of hydroecological monitoring is an obstacle in further development of this work in Ukraine. Pilot transboundary projects on the Tisza, the Dnistro, the Prut, the Siret and the Danube basins should be undertaken for familiarization and approbation by common efforts those methods for determination of water quality that are provided to-day in EU Water Framework Directive statements.

**Keywords:** water quality, biomonitoring, hydrobionts, transboundary cooperation, EU WFD

## 1. Biomonitoring and EU Water Framework Directive.

Biota is an essential component of water's ecosystems and by means of its vital functions influences effectively the water quality. At the same time it responds keenly on changes of water composition through transformation of structure and community functional activity. So, to follow effectively possible changes, the special system of watching for hydrobionts namely biomonitoring is needed. It is an indispensable component of general monitoring of surface waters.

Adoption of the EU Water Framework Directive (WFD) became an important achievement of European countries. This directive provides unification of ecological standards of water quality and consumption. All countries should conduct the great amount of work in field of unification of national legislation. Up to January 2003 only few of 20 surveyed countries completed implementation of WFD into national legislation, while the others were at preliminary stages of the process (De Stefano, 2003). Ukraine needs large preparatory work for WFD application too. In general, such work is keeping since 1997, when government approved the action plan for stepwise application of requirements for EU directives. Hydroecology in our country disposes of numerous theoretical information and practical experience. Good assessment of water quality is strictly connected with a question of elaboration of uniform classification of hydroecosystems state by using both biotic and abiotic components. In particular, in 1976 Ukrainian scientists had proposed the scheme of classification of the water biota that was based on the structural indexes of main groups of water life. However, lack of well-developed system of hydroecological monitoring is an obstacle in further development of above-mentioned works.

## 2. Ukrainian Carpathians as potential donor of "health" water life in case of ecological accidents.

Especially actual the problem becomes at stage of forming the transboundary hydroecological corridors as part of national ecological net (Romanenko et al., 2003). Evidently it is the Ukrainian part of the Carpathians that is of great importance for the region due to its water resources that are mainly transboundary. For instance in Transcarpathia we have state border with Poland, Slovakia, Hungary and Romania and the Tisza cross the areas of six countries. In fact the Dnistro, the Prut and the Siret also are transboundary. In case of natural and man-caused hazardous phenomena, the Carpathian tributaries of these rivers serve as a natural bank of biota for revitalization of ecosystems. This statement was confirmed for instance in 1984 (Kovalchuk, 1987; 1999). In autumn 1983, water life in the river Dnistro on the area between the town of Rozvadov and the Novodnistrovsk reservoir was contaminated by highly concentrated salt solution after breaking of the dam of settling reservoir "Stebnik" of potassium industrial enterprise. All ecosystems were killed. Restoration of water communities in the river begins owing to drift of biota just from the Carpathian tributaries. Some data on restoration of the communities of benthic microinvertebrates during the year after accident are given in Table 1.

Table 1. Seasonal changes of microinvertebrate quantities (thousands specimens on square metre) on the clean part of the Dnistro river near the Sambor town (1) and part that was exposed to pollution by the salt solution from "Stebnik" near the Rozvadov town (2), 1984

| Community         | Winter |     | Spring |     | Summer |    | Autumn |    |
|-------------------|--------|-----|--------|-----|--------|----|--------|----|
|                   | 1      | 2   | 1      | 2   | 1      | 2  | 1      | 2  |
| <i>Testacea</i>   | 25     | 0   | 28     | 12  | 14     | 6  | 70     | 12 |
| <i>Nematoda</i>   | 53     | 21  | 18     | 4   | 10     | 6  | 31     | 31 |
| <i>Rotatoria</i>  | 3      | 442 | 10     | 184 | 0      | 0  | 14     | 21 |
| <i>Tardigrada</i> | 18     | 0   | 10     | 0   | 0      | 0  | 8      | 0  |
| <i>Copepoda</i>   | 0      | 0   | 0      | 12  | 0      | 0  | 3      | 0  |
| <i>Ostracoda</i>  | 3      | 0   | 4      | 0   | 6      | 35 | 0      | 4  |
| <i>Cladocera</i>  | 3      | 0   | 0      | 0   | 0      | 0  | 0      | 6  |

Several disastrous events for water life had happened in Transcarpathia recently. These are silt drain on the Uzh river in 1999, cyanide contamination of the Tisza in 2000 and by heavy metals in 2001, frequent recent accidents with ingresses of oil from pipe lines in Transcarpathia (as on the Zavadka river from the Latoritsa River basin in 2000, and near the village Pidpolozzia at the same basin in 2003). Frequently, the data about such events do not leak to wide publicity except when they befall in densely populated regions.

Especially dangerous are also gradual, unfavourable for human being changes of hydrochemical indexes that happened as a result of contaminants drain into the waters by small permanent portions. Usually such processes are out of publicities field of vision and are hardly noted by chemical and physical methods. These are changes in biodiversity and structure of water communities that could demonstrate the level of real infringements in water biocenoses and decreasing of water quality.

### 3. Modern problems of biomonitoring application in the Ukrainian Carpathians.

Let us show the problem on an example of the Carpathian waters. Hydrobionts of these waters are rather poor investigated. Relatively good data exist about macroinvertebrates. During years microinvertebrates and protists were out of investigators interest. Poorly studied are testate amoeba (Rhizopoda Testacea), wheel animalcula (Rotatoria), oligochaeta worms (Oligochaeta), nematode worms (Nematoda), microturbellarian worms (Turbellaria), water bears (Tardigrada), copepods (Copepoda) and especially harpacticoids (Harpacticoida) etc. Sadly different water larvae of insects are still waiting of their investigator. These are: Ephemeroptera, Trioptera, Plecoptera, Diptera. In the former Soviet Union, investigations by evaluation of importance of hydrobionts in sapro-, halo- and trophoindication, toxic state of surface waters were actively developed. As result, different standards of water - drinking water standards, sanitary, fish breeding, hydroeconomy standards etc., partially based on biodiversity indices, were elaborated and adopted in the Ukraine (Romanenko, Zhukinskiy, 2003). But situation is complicated by differences in targets to be achieved. Except of that, possibilities of assessment of water quality upon the lists of hydrobionts are framed by the poor databases and necessity of including of the narrow specialists into species determination. But one could observe the progressive decreasing of amount of good specialists in different groups of hydrobionts. So, in future, for wide use only simple total structural indexes, based on relations and correlations between biomass and quantity of different groups of hydrobionts, are perspective. So it is available the obvious necessity in such indexes.

### 4. Necessity in common transboundary projects for Ukraine on the path of familiarization with EU WFD

Unfortunately the Ukraine is still not included into the candidate list of EU but belongs into neighbouring countries. So, it looks that several pilot transboundary projects on the Tisza, the Dnistro, the Prut, and the Siret should be undertaken for familiarization and common efforts for approbation of those methods for determination of water quality that are provided today by EU WFD statements.

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