THE PRIORITY OF BIOMONITORING IN NATURAL AQUATIC RESOURCES QUALITY MANAGEMENT

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Introduction

The goal of this study is offering a synthesis looking on this concept of saprobity, referring on the situation met in Izvoru Muntelui – Bicaz reservoir.

Traditionally, water quality overseeing is based on the physical – chemical analyses, intended to classify waters quality for them using in different human necessities.

Biological analyses were made initially to help the physical – chemical analyses in a higher accuracy and they have a history of over 100 years, appearing in the same time with the engaged of the saprobity concept, by Kolkwitz and Marsson (1908).

This concept arrange the aquatic organisms according to them sensitivity or tolerance to the organic impurity of the water.

The system was improved latter by Liebman (1962) and Sladecek (1973). On this scientifically fundament were developed a series of practical methods of application. The system was adopted in Romania too, through the researches undertaken by Mălăcea (1969) and is applied today with small adjustments, in water quality monitoring practice, legislated in the estate normative.

The bio-indicators are species, populations or species assemblages which, because of them variability, (biochemical, physiological, ethological or ecological), (allow) permit the characterization of an ecosystem condition and emphasize, as precocious as possible, the natural or anthropic changes of it (Blandin, 1986). Depending on the loading degree with organic matters and depending on physical – chemical characteristics, Kolkwitz and Marsson established next saprobes zones:

Multi saprobe zone (*Chironomus thumi, Tubifex tubifex, Anabena constricta);*

Medium saprobe zone:

- Alpha sub zone – medium saprobe, predominated by reduction processes, being present too the oxidation processes (*Asellus aquaticus, Limnodrilus hoffmeisteri, Cyclotela meneghiniana*);

- Beta sub zone – medium saprobe, where the oxidation processes become dominants reporting to the reduction processes (*Astacus fluviatilis, Stylaria lacustris*);

Oligo saprobe zone (*Simulium ornatum,Planaria* sp.).

Materials and methods

General data concerning the studied ecosystem

Izvoru Muntelui–Bicaz reservoir is an oligo-mesotrophic, dimictic man made lake, created in 1960, in the middle sector of Bistrita Valley.

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Morphometrical and hydro chemical characteristics

Maximum filling quota (altitude m)	513
Medium tributary flow (cm/s)	50.3
Maximum area (ha)	3105
Maximum length (Km)	31.1
Maximum depth (m)	88.2
Maximum volume of accumulated water (mil. cm)	1122
pH	6.5 – 7.5
Dissolved oxygen (mg O2/l) at the surface	5.5 – 11.2
Dissolved oxygen (mg O2/l) at the water/sediment interface	0.25 – 0.55
CBO5 (mg O2/l)	0.02 – 6.45
Total N (mg/l)	0.52 – 2.05
Total P (mg/l)	0.01 – 0.17

Figure 1. Sampling sites on Izvoru Muntelui – Bicaz reservoir

The analyzed (investigated) samples were collected monthly from December 2004 to December 2005, using a modified Petersen grab (170.3 cm^2) surface area, washed through 0.25 mm sieve and preserved in 70% ethanol. Three to nine randomly samples were collected monthly. The samples were processed using usual methods.

From the total amount of species, 22 were identified in the pseudolittoral zone, 10 in littoral and 8 in profound zone (Miron et al., 1968). The best represented is Oligochaeta with 11 species and Chironomidae larvae with 8 species. Only three species (*Limnodrilus hoffmeisteri, Tubifex tubifex* and *Procladius choreus*) are very well represented in all the three zones.

5 species found in our samples are recorded for the first time in Izvoru Muntelui – Bicaz reservoir: *Haplotaxis gordioides, Eseniella tetraedra* (Oligocheta), *Valvata naticina* (Gastropoda),

Asellus aquaticus (Isopoda) and *Scarodytes halensis* (Coleoptera).

Results and discussions

Table 1. Species richness (Legend: + permanent species; ¤ sporadic species; - absent species)

No.	Taxa	Zone			New species for the Bicaz reservoir
		1	2	3	
1	Nematomorpha indet.	-	+	-	
2	Naididae indet., juveniles	-	+	-	*
3	*Potamothrix hammoniensis*	+	-	+	
4	*Limnodrilus cloparediamus*	+	-	-	
5	*Limnodrilus hoffmeisteri*	+	+	+	
6	*Peloscolex speriosus*	+	-	+	
7	*Tubifex tubifex*	+	+	+	
8	*Ilyodrilus tempeltoni*	+	-	-	
9	*Stylodrilus* sp.	+	-	-	
10	*Haplotaxis gordioides*	-	+	-	*
11	*Eseniella taetraeda*	+	-	-	*
12	*Valvata naticina*	+	+	-	*
13	*Pisidium casertanum*	+	-	+	
14	*Cyclops viccinus*	+	-	+	
15	*Asellus aquaticus*	+	-	+	*
16	*G.* sp. indet.	+	-	-	
17	*Scarodytes halensis*	-	¤	-	*
18	*Diptera* varia .indet.	-	¤	-	
19	*Procladius choreus*	+	+	+	
20	*Micropsecta precox*	-	+	-	
21	*Cladotanytarsus mancus*	-	+	-	
22	*Cladotanytarsus lobatifrons*	-	+	-	
23	*Harnischia fuscimanus*	-	+	-	
24	*Polypedilum nubeculosum*	+	+	-	
25	*Cryptochironomus defectus*	-	+	-	
26	*Chironomus* gr. *plumosus*	+	+	-	

Table 2. Numerical and biomass density

Zone		1	2	3
Oligochaeta	No. ind./m2 g/m2	1020 2.3	1266 4.6	11273 8.4
Chironomidae	No. ind./m2 g/m2	725/2.3	6447/13.5	7200/8.3

Table 3. Relative numerical abundance (%)

Taxa\ Zone	1	2	3
Oligochaeta	3.2	91.8	98.4
Chironomidae	73.7	6.1	1.2
Other taxa	23.1	2.1	0.41

Table 4. Relative abundance of dominant species

Taxa\ Zone	1	2	3
Limnodrilus hoffmeisteri	2.1	78.4	1.7
Tubifex tubifex	1.1	13.4	96.7
Procladius choreus	26.3	4.2	1.2
Chironomus plumosus	38.0	0.6	0
Polypedilum nubeculosum	8.3	1.3	0
Other taxa	23.1	2.1	0.4

These data, interpreted strictly saprobiological indicate a situation of maximum perturbation of ecological equilibrium, framing the lake, with the profound zone in the category of multi saprobe waters. But the physical – chemical analyses in the water column and in the actually sediments, with the biological analysis referring to the phytoplankton, zooplankton and ichtiofauna stress out a situation with reduced contribution of nutriments, permitting to frame the lake in the oligotrophic category, with a slight tendency of mesotrophy, especially in the littoral zone, where the extern contribution of nutriments is higher.

This situation shows that Izvoru Muntelui – Bicaz reservoir, despite the indicator organisms of excessive polluting predomination, is not influenced by a major anthropic impact coming from biodegradable organic substances discharging. On the contrary, the reduced diversity of benthofauna is caused by the reduced contribution of nutriments.

In the Izvoru Muntelui – Bicaz reservoir exist an affected area by the athropic impact, because of the application of the intensive aquaculture in floating cages, which introduces in the lake important quantities of organic substances, resulted from the unconsumed fodders, faeces and excreta.

In spite of very limited area of practicing aquaculture, the effect is substantially felt in the structure of benthic community, concretized with the apparition of new species and the increasing of individual's numerical density in the studied populations.

Conclusions

Strictly saprobiological, it has been found a situation of maximum perturbation of ecological equilibrium, framing the lake in the profound area in the multi saprobe category, three species being characteristic to the Bicaz reservoir: *L. hoffmeisteri, T. tubifex* and *Procladius choreus*.

From the new 6 species, recorded in 2005 (5 in pseudolittoral area and 1 in sublittoral and profound area), *Asellus aquaticus* was found in over 25 % from total collected samples and can be considered like a stabile species in the ecosystem.

The significant increasing of macroinvertebrates density in the profound area in 2005, associated with the occurrence of a species characteristic to the biodegradable organic substances, shows a small eutrophisation of the lake in areas being permanently under water.

Biological analyses can not be interpreted on the same way in all the situations; for them putting in practice is necessary an major effort of research till the elaboration of a national system of monitoring, in accordance with the E.U. requirements, defined in Frame Directive Water (2000).

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