ASCERTAINING THE WATER QUALITY OF THE SASAR BASIN THROUGH THE NORMALIZED GLOBAL BIOLOGIC INDEX (NGBI)

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ABSTRACT. The NGBI method allows the evaluation of the general quality of a water course through the macrofauna analysis that is the synthetic expression of general biology. This method allows including the global biologic quality into a general typological range. A NGBI grade can be obtained for every station, whose value shows the water quality level within the analyzed water trunk. Thus, it could be considered that there is pollution when the value of the index is less than 5; for an index value of 6 the toxic character is probable, yet for a value of 10 we could say that the water quality is good, and for the value of 19 the quality is very good.

Keywords: Normalized Global Biologic Index, monitoring biologic methods

INTRODUCTION

Water quality worsening due to the anthropical activity associated to much higher consuming, have determined a series of involvements in the water resources protection and preservation.

A series of preoccupations regarding the water resources protection of this continent have already existed on the European level. Thus, EU has promoted the legislative tools for the durable protection and management of the water resources. Among them the most important is the Framework Directive 2000/60/EEC, which defines water as a patrimony that must be protected, treated and defended as such.

The general objective of DCA is that all the Member States should obtain for the surface waters "a good ecological and chemical condition" until 2015.

Consequently, the Member States must prevent the water courses deterioration and in case the impact cannot be avoided, they must ensure the less possible changes of the condition of surface and underground waters.

In this matter, there is a need in Romania also to ensure a rigorous water protection concomitantly with its rational usage.

The biologic methods of monitoring the quality of surface waters should be generalized in our country, towards the basis of the measures of use, control and ecological reconstruction.

Gheteu and his collaborators (2005), show that some of these methods are at the first trials of application on the water courses of our country.

MATERIALS AND METHODS

This work sums up the results of the sampling campaigns that had succeeded for a period of 4 years (2003-2006), during which 10 stations were identified and analyzed according to the NGBI (Normalized Global Biologic Index) methodology (AFNOR NF T 90-350, 1992). From these 10 stations, 5 monitoring stations include the Sasar River (Valea Mariutii, upriver of Baia Sprie, downriver of Baia Sprie, upriver of Baia Mare and downriver of Baia Mare), 2 stations are located on the Firiza river (upriver of Blidari and Firiza- upriver of the Sasar junction), and 3 stations were settled on the main tributaries of the searched river (Valea Limpedea, Valea Morii and Valea Gordanului) (Fig. 1).

The fundamental of the method consists in sampling benthic macroinvertebrates from the superficial flowing waters by using a square sampling device (Fig. 2) that isolates a portion of the substratum of the riverbed. Perturbing the substratum leads to the releasing of macroinvertebrates and then the flow introduces them into the net (SR EN 28625, 2001).

Benthic macrofauna will be sampled from each station, according to a sampling protocol, taking into account the different types of habitat that are defined by the couple of substratum – flow speed. The sampled taxons will be sorted and identified for determining the taxonomical variety of the sample and the index faunistic group (NF T 90-350, 1992).

8 samplings in 8 distinct habitats from a distance ten times more than the width of the water course were made according to the NGBI method. Thus, 95% of the present taxons within the respective station are yielded. This method recommends the sampling to be made during the water average flow.

The yielded samples were preserved in 4% formaldehyde on the spot.

The sorting of the organisms was carried out manually under stereomicroscope, in laboratory. The retained taxonomic unit is the family and sometimes the genus for the specific tests of each station (Tachet şi colaboratorii, 2000).

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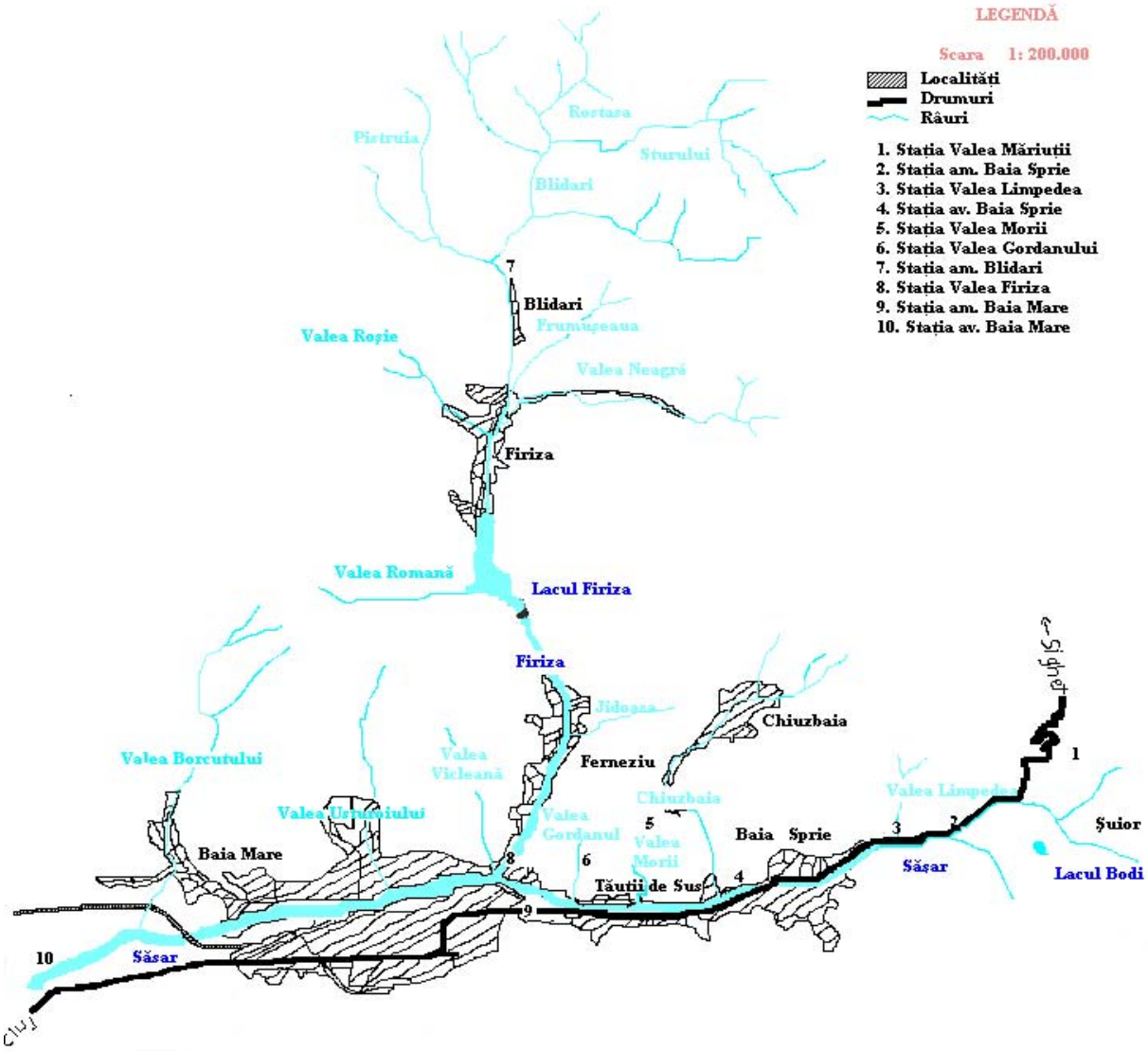

Chart 1. The location of the sampling stations within the hydrographic basin of the Sasar River.

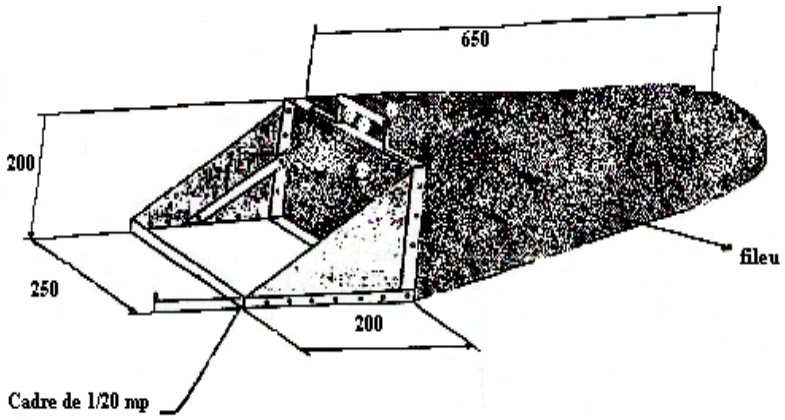

Fig. 2 The Surber type device of sampling benthic macrofauna (AFNOR, 1992)

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Table 1

The NGBI value relative to the nature and the taxonomic variety of macrofauna (AFNOR, 1992). (Σt – the total number of yield taxons; G – index faunistic group; [1]-taxons represented by minimum 10 individuals; the other must be represented by minimum 3 individuals)

Classes of variants		14	13	12	11	10	9	8	7	6	5	4	3	2	1
Indicator Taxons	Σt G_i	> 50	49 45	44 41	40 37	36 33	32 29	28 25	24 21	20 17	16 13	12 10	9 7	6 4	1 3
Chloroperlidae Perlidae Perlodidae Taeniopterygidae	9	20	20	20	19	18	17	16	15	14	13	12	11	10	9
Capniidae Brachycentridae Odontoceridae Philopotamidae	8	20	20	19	18	17	16	15	14	13	12	11	10	9	8
Leuctridae Glossosomatidae Bereidae Goeridae Leptophlebiidae	7	20	19	18	17	16	15	14	13	12	11	10	9	8	7
Nemouridae Lepidostomatidae Sericostomatidae Ephemeridae	6	19	18	17	16	15	14	13	12	11	10	9	8	7	6
Hydroptilidae Heptageniidae Polymitarcidae Potamanthidae	5	18	17	16	15	14	13	12	11	10	9	8	7	6	5
Leptoceridae Polycentropodidae Psychomyidae Rhyacophilidae	4	17	16	15	14	13	12	11	10	9	8	7	6	5	4
Limnephilidae[1] Hydropsychidae Ephemerellidae[1] Aphelocheiridae	3	16	15	14	13	12	11	10	9	8	7	6	5	4	3
Bäetidae[1] Caenidae[1] Elmidae[1] Gammaridae[1] Mollusca	2	15	14	13	12	11	10	9	8	7	6	5	4	3	2
Chironomidae[1] Asellidae Hirudinea Oligochaeta[1]	1	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Table 2

THE INTERPRETATION OF THE RESULTS

Quality Class	Excelent	Good	Relatively Good	Low	Very low
NGBI	20-17	16-13	12-9	8-5	4-0

The Normalized Global Biologic Index is determined as it follows: if Gi =8 and Σt =33 then IBGN=17, that assumes an excellent water quality, with a low impurity level.

RESULTS AND DISCUSSION

The analyzed index was comparatively applied for each station apart, in order to evaluate the impurity level (Table 3).

NGBI grades were nor recorded within the interval of 17-20, for the Sasar River basin, respectively a very good quality of water, owing to the fact that the studied area is mostly located in a highly industrialized region, mainly centered on the nonferrous ore extracting and processing.

High index values were remarked in the spring area of the Sasar River (Valea Mariutii station, NGBI -14) and Firiza river (upriver of Blidari NGBI – 14). Within this section the human pressure is minimum, thus the ecosystems variability is not affected.

The stations of Valea Limpedea (NGBI -12); Valea Morii (NGBI -12)and Valea Gordanului (NGBI -9) are characterized by a relatively good water quality, with a moderate impurity level. The upriver of Baia Sprie

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station presents a moderate up to critical impurity level, according to the NGBI – 8 grade.

The quality of water undergoes important modifications downriver of the urbane centers of Baia Sprie and Baia Mare. Thus, highly degraded water, with high impurity, characterizes the downriver of Baia Sprie station (NGBI -4), and a very high impurity level and a major anthropic stress for the zoobenthic communities was found within the stations of Valea Firiza (NGBI – 1), upriver and downriver of Baia Mare (NGBI – 3).

Table 3

COMPARATIVE CONDITION OF THE NGBI GRADES FOR THE STATIONS OF THE SASAR RIVER

Station	Valea Măriuţii	Am. Baia Sprie	Valea Limpedea	Av. Baia Sprie	Valea Morii	Valea Gordanului	Am. Blidari	Valea Firiza	Am. Baia Mare	Av. Baia Mare
NGBI	14	8	12	4	12	9	14	1	3	3

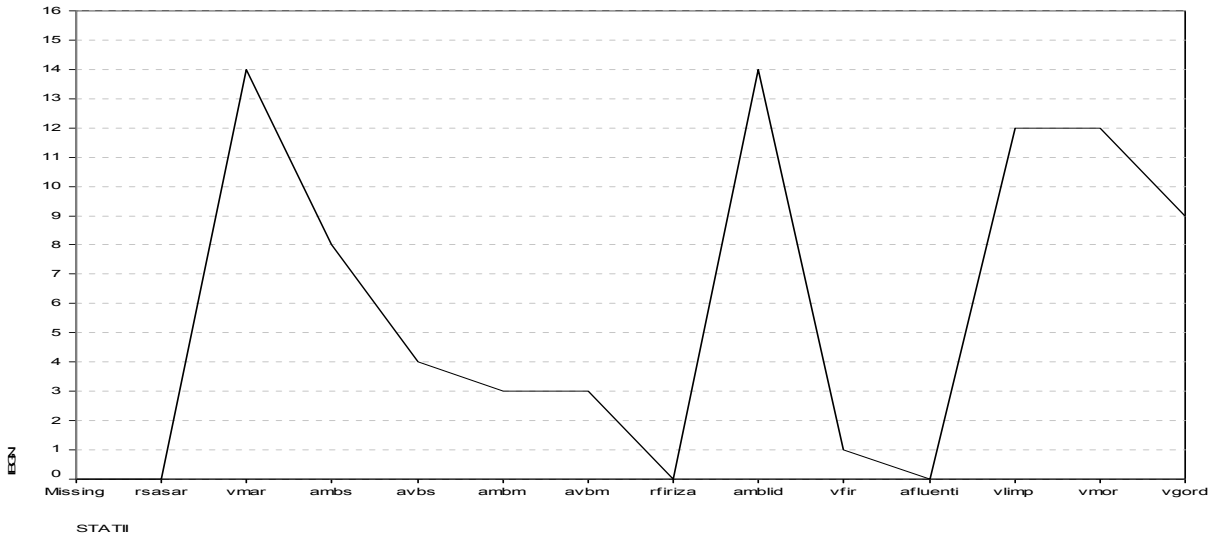

Fig. 3 The distribution of the Normalized Global Biologic Index within the Sasar River basin

CONCLUSIONS

A complete prospecting of the benthic substratum was carried out using the NBGI sampling methodology. So, this methodology could be also a starting point for the elaboration of other methodologies regarding the bio-monitoring activity.

The areas undergoing the anthropic pressure as well as the response of benthic organisms to the actions of the stress factors were identified based on the NGBI grades. Thus, the zoobenthic communities were well set up for the stations of Valea Mariutii and upriver of Blidari; a reshaping of the specific composition of the analyzed communities function of the intensity of disturbances, for the stations: Valea Limpedea, Valea Morii, Valea Gordanului and upriver of Baia Sprie. While downriver of the urban centers of Baia Sprie and Baia Mare, owing to the extremely high impurity, the benthic groups heterogeneity is reduced.

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