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Hydrobiological monitoring on river sections of the "Rozhen", Rhodopes Mountains, and "Boatin" ("Steneto"), Balkan Mountains, regional background monitoring stations

[Hydrobiologische Gewässerüberwachung in einzelnen Flußabschnitten mit den regionalen Hintergrundstationen "Rojen", Rhodopen, und "Boatin" ("Steneto"), Balkan-Gebirge]

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With 1 Table

Schlagwörter: Makrozoobenthon, Ossam, Vit, Donau, Maritza, Balkan, Rhodopen, Bulgarien, Fluß, Gewässerüberwachung, Biozönose, Biomonitoring, Hintergrundmonitoring, Strukturparameter, Saprobie, Gewässergüte

Basic principles of background hydrobiological monitoring are examined. On the basis of a set of data drawn from selected points of the stations (structural parameters H, d, e, c, and the Saprobic index SR) gathered over the decade 1980-1990, conclusions are drawn.

Die Grundlagen einer hydrobiologischen Überwachung der Hintergrundsituation von Flüssen über Beobachtungsstationen an Hand von Strukturparametern der Biozönose wurden über die Dekade 1980-1990 an ausgewählten Meßstellen geprüft und daraus Schlüsse gezogen.

The principal goal of global monitoring of the environment is to gather information on contemporary transboundary pollution of the biosphere, on the direction and rate of spread of pollution, as well as the establishment of trends in changes in the quality of the environment. Contrary to impact monitoring, background monitoring is directed towards global or regional background state of the environment not affected by anthropogenic factors in regions of the biosphere and its regular monitoring with a view of indirectly establishing in time the route of transboundary emission. On the other hand the systematic observation of the studied processes aims at providing an assessment and forcast of future anthropogenic impact.

The basis of these assessments and prognoses appears in data gathered by background monitoring stations. Anthropogenically not-affected regions within a radius of 30 km., potentially subjected to global or regional spread of pollutions, are suitable. The basic principals for monitoring at background stations comprise their systematic features and complex nature. Systematic observations presuppose many years of accumulation of data on established sets of indices. Depending on the nature of observations, the frequency of studies within an annual framework varies. As to the keeping of the second principle - their complex nature - it should be seen as the underlying principle behind simultaneous systematic monitoring of the basic constituents of the biosphere - water, air and soil. Of course the realization of this principle in its ideal variant is rather complex and difficult to be carried out. It should also be applied at lower levels of monitoring - regional levels, local levels etc.

From this theoretical standpoint in the course of a decade, Hydrobiological Monitoring was carried out in several background monitoring stations in Balkan and Rhodopes Mountains (Rozhen and Boatin ["Steneto"]): the River Shiroka Luka, above the village of Shiroka Luka; the Trigrad River, above Trigrad, lower down the gorge, above the outlet of the Mugla River; the Chaira River, above the confluent; the Cherni Osam River, above the village of Cherni Osam and Cherni Vit, above the village of Cherni Vit. Frequency of observations within each year varies - one minimum, and six maximums. A set of indices were taken from each sampling point giving the characteristics and the structure of benthos zoocenoses. Both the objects of observation (benthos biocenoses), and the methods for assessment of indices were approved and unified by specialists on the problem within the framework of the former COMECOM (Council for Mutual Economic Aid 1989). Hydrochemical studies have also been carried out by another team.

Benthos zoocoenoses are the most suitable object of hydrobiological monitoring, as they are currently present at the respective station reacting adequately and recording precisely the respective conditions through changes in their composition and structure. Assessment methods of the above features of benthos zoocenoses include the main classical saprobiological method of ZELINKA & MARVAN (1961) through the modifications of the method of ROTHSCHEIN (1962), assessing river water on the basis of bioindicator organisms. Zoocoenosis structure is analyzed through the total number of species ("S"), the total number of specimens ("N"), the indice of total species variety ("d", after MARGALEFF 1958), for individual species variety ("H", after SHANNON & WEAVER, 1963), for equalization ("e", after PIELOU 1966) and dominants ("c", after SIMPSON, 1949). Determined was also the correlation between the number of specimens and number of species of the orders Ephemeroptera and Plecoptera (Ks and Kn) related to the total number of species and specimens of all gathered invertebrates from the respective point (RUSSEV & JANEVA 1987). Determined were the species from 17 benthos groups (Turbellaria, Oligochaeta, Gastropoda, Lamellibranchia, Hydracarina, Isopoda, Amphipoda, Ephemeroptera, Odonata, Coleoptera, Heteroptera, Trichoptera, Diptera incl. Chironomidae and Simuliidae as separate groups). The greatest number of species or taxa at the species rank were determined by Trichoptera, Ephemeroptera, Oligochaeta, Plecoptera, Coleoptera, Gastropoda and the family Simuliidae.

The results of samples from the points over the 1980-1990 period are given on Table 1. The analysis brings out the following observations: The saprobiological index ("SR") varies between 82,51 and 55,47 (xenosaproby, Category I and oligosaproby to beta-mesosaproby, Category II after Bulgarian State Standard-BDS). Mean values of this index are within the limits of the oligosaproby (Category I). The noted lowest limits of SR are related and explained by natural processes occuring in the river, the outcome of climatic factors (for instance water quantity, temperature etc.) and not of changes of the general background state in the region of the Regional monitoring stations.

The values of structural parameters of benthos zoocoenoses, as well as the nature of their dynamics support the above observation. The number of species and specimens, the indice of total and individual species variety, as well as the indice for equalization are rather high, whilethe indice of domination quite low. These values are an indication for optimal ecological conditions of life in zoocoenoses in the studied points. The mean values of these indices were respectively: H = 3,36; d = 12,15; e = 0,67 and c = 0,20. The same parameters, related to benthos zoocoenoses of the Iskar river, strongly affected by anthropogenic activities have quite different values: namely H = 1,96; d = 4,04; c = 0,35 (JANEVA & RUSSEV 1989). The nature of dynamics of values used parameter structures shows that benthos coenoses here were established on stable ecological copmlexes. They are capable of adapting to the negative impact of deteriorated climatic factors (high or low waters, more sensitive changes in the water temperature, hence of oxygen content etc).

These observations allow the following conclusions:

1. Regional background monitoring stations in Bulgaria and in particular their river sections used for the conducting of hydrobiological monitoring are suitable and meet the necessary requirements.
2. Employed methods and criteria allow the gathering of data, which successfully characterizes the real state of river ecosystems and ecological conditions for their existence. They also are highly sensitive to the slightest changes of conditions and can successfully be used for the purposes of background monitoring.
3. If possible, further accumulation of data should be carried out to allow a forcast of the development of natural processes in rivers, as well as possible changes in the background state of the separate points of measurements.

Tab. 1:. Dynamics of structure parameters and saprobiological Index of observed points for the 1980-1990 period. Explanations for the abbreviations see text above. v. = village

Station,	date	S	H	d	e	c	Ks	Kn	SR
Shiroko-	06.1980	13	2,8	6,4	0,77	0,20	46,15	42,10	81,83
lushka	04.1983	21	4,0	9,6	0,91	0,07	57,14	64,52	73,60
river,	09.1984	25	3,8	10,2	0,82	0,10	56,00	69,23	69,39
above v.	10.1985	24	3,0	10,0	0,66	0,24	33,33	70,77	72,23
Sh. luka	08.1986	33	3,2	11,4	0,63	0,20	39,89	47,30	69,13
	08.1987	35	3,4	12,2	0,67	0,15	25,71	37,29	58,16
	10.1987	32	3,8	13,2	0,77	0,11	34,38	54,88	71,00
	10.1988	44	3,5	14,2	0,64	0,16	36,36	71,96	80,85
	07.1989	38	4,0	15,0	0,76	0,11	28,95	67,93	64,86
	05.1990	36	4,0	12,2	0,78	0,10	38,89	39,04	60,14

Station, date		S	N	d	e	c	Ks	Kn	SR
Trigrad-	06.1980	32	4,2	11,9	0,84	0,09	34,38	55,42	71,64
ska	04.1982	18	3,1	6,9	0,75	0,15	44,44	61,82	81,46
river,	07.1982	26	3,0	9,0	0,64	0,19	50,00	80,20	66,84
above v.	09.1984	14	2,6	6,6	0,70	0,24	71,43	94,62	56,43
Trigrad	06.1985	38	3,2	12,0	0,62	0,19	47,37	83,67	55,47
	08.1986	33	3,4	11,4	0,69	0,13	30,30	26,02	74,98
	08.1987	33	3,6	11,3	0,72	0,12	27,27	24,54	68,49
	10.1988	45	3,7	14,6	0,67	0,14	40,00	74,66	70,52
Trigrad-	06.1980	42	4,0	15,8	0,75	0,10	28,57	62,56	60,56
ska	04.1982	15	2,8	7,3	0,22	0,72	33,33	29,27	82,51
river,	07.1982	12	2,4	5,1	0,69	0,29	58,33	87,86	73,53
lower	09.1984	10	2,2	4,4	0,28	0,67	10,00	5,50	75,00
down the	06.1985	24	3,1	5,1	0,18	0,68	37,50	67,15	75,07
gorge	08.1987	21	2,5	6,6	0,58	0,31	28,57	65,95	80,20
	10.1988	50	3,5	15,3	0,63	0,15	26,00	47,30	76,41
Trigrad-	06.1980	32	3,7	11,7	0,75	0,10	40,62	60,18	73,66
ska ri-	04.1982	30	3,8	12,2	0,49	0,09	26,62	47,79	73,33
ver, abo-	07.1982	22	2,5	8,3	0,58	0,27	40,91	90,09	72,15
ve the	09.1984	25	2,6	9,2	0,56	0,25	52,00	48,42	56,00
outlet of	06.1985	21	2,8	8,6	0,65	0,20	38,10	70,81	69,43
the Mugla	08.1986	34	2,3	11,2	0,46	0,41	32,35	82,68	74,14
river	08.1987	45	4,1	14,2	0,74	0,08	37,73	42,51	58,00
	10.1988	35	3,7	12,6	0,74	0,10	40,00	68,04	78,95
Chaira	06.1980	15	3,2	6,1	0,81	0,14	53,33	39,90	77,51
river,	04.1982	16	3,2	8,1	0,82	0,14	43,75	64,79	66,70
above	09.1984	14	2,0	5,5	0,52	0,43	64,28	42,17	65,92
the con-	06.1985	30	3,7	10,0	0,75	0,12	70,00	46,01	75,62
fluent	08.1986	36	3,1	11,2	0,61	0,19	36,10	52,95	75,84
	08.1987	46	3,0	13,8	0,55	0,21	36,96	33,78	72,74
	10.1988	38	3,7	11,8	0,72	0,11	42,11	50,89	77,47
Cherni	06.1984	16	3,1		0,42	0,14	62,50	66,49	82,35
Osam ri-	05.1985	44	4,8	17,4	0,79	0,09	45,45	31,61	72,44
ver, abo-	08.1986	32	3,5	10,8	0,70	0,14	46,87	80,73	57,25
ve v. of	05.1987	58	4,7	19,9	0,80	0,06	13,79	21,56	82,76
Ch. Osam	04.1988	24	3,3	10,9	0,72	0,18	45,33	82,81	70,75
	05.1988	31	3,8	12,0	0,77	0,10	45,16	68,54	73,43
	07.1989	19	3,2	7,3	0,76	0,13	36,84	65,89	63,17
	04.1990	25	3,4	9,5	0,75	0,14	48,00	77,19	67,83
	05.1990	19	3,1	7,8	0,73	0,16	63,16	87,25	81,48
	07.1990	27	2,8	9,2	0,60	0,26	40,74	40,60	71,56
	08.1990	30	3,7	10,8	0,76	0,11	40,00	68,36	52,66
	09.1990	27	3,3	9,6	0,70	0,14	40,74	55,51	58,45
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v. of Ch.	09.1990	26	3,9	10,1	0,84	0,08	50,00	63,23	70,34
Vit	11.1990	25	3,1	10,0	0,67	0,22	44,00	73,02	66,62

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