# BIOLOGICAL EVALUATION OF THE WATER QUALITY IN THE WATER FLOW IN THE SOUTHWESTERN PART OF THE SLOVAK REPUBLIC

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***Abstract:*** *Assessment of the surface water quality in the whole Europe affected the Directive 2000/60/EC of the waters, according to which is the evaluation method of surface waters based on the the evaluation of the ecological and chemical status of the surface water bodies. For environmental assessment are key informations on the qualitative and quantitative composition of communities aquatic organisms. On this basis, we collected 28 samples of water flow at 7 sites Caradice brook during year 2009, in the southwestern part of the Slovak Republic. In the water flow Čaradice stream, which spring in the mountain of Pohronský Inovec and is righthand tributary of the Hron River, thus we obtained 30 776 individuals macrozoobenthos. By determining the mentioned number of the individuals, we found the presence of 146 kinds that were included into 16 systematic groups: Turbellaria, Oligochaeta, Hirudinea, Gastropoda, Bivalvia, Isopoda, Amphipoda, Ephemeroptera, Plecoptera, Odonata, Heteroptera, Megaloptera, Coleoptera, Trichoptera, Diptera, Chironomidae. From these systematic groups the largest number of representatives of the systematic group Amphipoda had regularly occurred at all sampling sites. Most widespread type of this systematic group and also the most numerous of all species of macroinvertebrate found in the waters of the Caradice stream was Gammarus fossarum, which we regard to its mass occurrence (28%) identified as eudominant species. The smallest numerous individuals were represented systematic group Megaloptera that monitored the water flow occurred infrequently, so we included them to subrecedent species. The greatest constancy, i.e. stability of in the community had species Eiseniella tetraedra, Gammarus fossarum, Pisidium obtusale, which we evaluated as the species always present. The species of Cloeon dipterum, Erpobdella octoculata, Hydropsyche angustipennis was species the almost always present. The greatest frequency had family Chironomidae (100%). The Saprobic indices in the reporting period ranged from 1.7151 to 2.2399 on the basis of what we categorized the water from Caradice stream to the level of beta - mesosaprobity. The average annual value of the saprobic index of benthic invertebrates of Čaradice brook (SAS=2,00) does not meet the requirements of the indicator of water quality - Part E "biological and microbiological parameters, which are set out in Government Regulation No. 269/2010 Coll. (SAS = 1,3).*

***Key words:*** *biodiversity, Čaradice stream, quality of water, macrozoobenthos, Slovak Republic*

## INTRODUCTION

Water is the largest part of the biosphere, which hides a rich variety of living conditions for many organisms, the most of which have specific requirements to their environment. MAKEĽ and TURBEK (2002), but also other authors report that it is primarily requirements to the water quality, which can be characterized by its physical, chemical as well as biological properties. Before the provisions of the Water Framework Directive 2000/60/EC in the year 2000 in Europe, there were several methods and systems for assessing the surface water quality. Through the Water Framework Directive was achieving comparability of water quality assessment methods in different countries of the European Union and in the Slovak republic too. Water quality affected the occurrence of organisms – i.e. bioindicators in the

aquatic environments under which we can infer what the characteristics of the environment are (VAČKÁŘ, 2007). It also affects the community features of aquatic organisms, especially the diversity and balance of community, the number of species and number of individuals (ELEXOVÁ, 2000; CHMIELOWSKÁ,2004). This is also one of the basic principles of the work of the every ecologist – hydrobiology, who in assessing of the biological condition of aquatic ecosystems and for the most important indicators of water quality is considered macrozoobenthos. Several authors (BULÁNKOVÁ ET AL., 2000; KRNO, 1999; RAJCHARD, 2002; ŘIHOVÁ AMBROŽOVÁ, 2007 and others) indicate that the macrozoobenthos communities colonize the bottoms of all aquatic habitats, regardless of their type. The macrozoobenthos communities, respectively benthic macrofauna are mainly *Mollusca, Tubellaria, Oligochaeta, Hirudinea, Crustacea, Insecta: Ephemeroptera, Plecoptera, Megaloptera, Trichoptera* and *Diptera*. Organisms of the mentioned systematic groups are in the hydrology practice considered the best indicators of water quality because they reflect the long term status of the water quality of the aquatic habitants, particularly in the recent years, are often used because most methods of biological water quality assessment is based on an assessment of their presence respectively absence (TIMM, 2002).

In many, even in the Danube countries are currently in the evaluation of the quality of the water used Sedláček saprobic system, which uses the group of benthic organisms that are involved in the biological and biochemical processes of decomposition of organic matter in the water. Based is on the list of saprobes, or indicators of a certain degree of degradation of pollutants. The grade of saprobes of water is reflects by saprobic index of community that lives in. Each a certain degree of pollution corresponds certain biocenosis, which allows to evaluate the immediate, but also long-term water quality condition that affects the development of specific species of aquatic organisms (ANDĚL, 2011).

The most of the hydrobiology in their work presents the results of water quality assessment, mostly in the larger rivers, and other aquatic habitats. Rarely, on the basis of indicating characteristics of organisms of macrozobenthos, they evaluated characteristics water quality of small streams, so the aim of this paper is to extend the knowledge about the water quality one of these aquatic habitants of south-western Slovakia.

## MATERIAL AND METHODS

Čaradice brook springs in the southwestern part of the Slovak Republic in the mountains Pohronský Inovec on the southern foot of the hill Drienka (751.1m) at an altitude of 585m above sea level. Its length is 11.5 km. The brook flows through cadastral territory of villages Čaradice and Kozárovce in territories of Zlaté Moravce and Levice districts. It a right tributary of the river Hron, into the river Hron it flows south of the village Kozárovce in the area called Slovak gates, at an altitude of about 174 above sea level. Near the village of Kozárovce a uniform reservoir called "Dam" was built and it is used for irrigation and sports fishing. The flow direction is predominantly north-south, on the lower reaches north-east. Čaradice stream flows in the uplands - lowland area which is characterized by the type of rain-snow runoff with the highest flow rate in March and lowest in the month of September. (Konečný, 1998).

The territory belongs to the warm area and slightly dry subarea. During the monitored period the average temperature was 9.8°C, average rainfall 684.4 mm (source: precipitation measuring stations).

In the upper segment of the river basin watercourse forest ecosystems and permanent grassland are situated. The greater part of the stream flows through the agroecosystem of agricultural

crops on the arable land. The dominant soil types in the area of interest are: brown soil, carbons chernozem soil, chernozem and gley fluvial soil.

The territory ranks to the corn – sugar beet region. Plant production is focused mainly on cereals growing (wheat, winter rye, and spring barley, maize for grain and for silage), perennial forage crops (Lucerne) and oilseeds (rapeseed, sunflower). Livestock production is oriented on the cattle breeding. Farmed land near the watercourse belongs to the cadastre of the agricultural cooperative of Volkovce (source: Volkovce Agricultural Cooperative).

Biological material samples, i.e. benthic invertebrates at seven sampling sites of Čaradice brook at regular quarterly intervals in the second decade of the months of March, June, August and October were collected. Sampling sites in the longitudinal profile of the watercourse were chosen so that obtained results allow assessing the impact of forest, agricultural and urban ecosystems, but also more realistic sources of pollution on water quality.

- **1st sampling site** - the forest ecosystem Pohronský Inovec (48 ˚ 22 '56" north latitude and 18 ˚ 29' 73" east longitude). Bottom substrate consists from gravel, rocks, near the bank was muddy bottom.

- **2nd sampling site** – in the north point of Čaradice (48 ˚ 21 '91" north latitude and 18 ˚ 30' 53" east longitude). Bottom substrate was from large stones, gravel and direction to the bank from mud.

- **3rd sampling site** – in the south point of Čaradice (48 ˚ 21 '35" north latitude and 18 ˚ 30' 55" east longitude). Bottom substrates were big boulders and stones.

- **4th sampling site** - before the water tank, (48 ˚ 19 '82" north latitude and 18 ˚ 30' 50" east longitude). Bottom substrate was sand, mud and small stones.

- **5th** sampling site – water tank Kozárovce (48˚ 19´ 70´´ north latitude and 18˚ 30´ 50´´ east longitude). The bottom of the sampling site and its banks were from concrete panels.

- **6th sampling site –** the drain channel near the water tank Kozárovce (48 ˚ 19 '74" North latitude and 18 ˚ 30 '50" east longitude).Bottom substrates were mud sediments.

- **7th sampling site** - in the south point of Kozárovce where the brook flows into the river Hron (48 ˚ 18 '77" North latitude and 18 ˚ 32 '20" east longitude). Bottom substrates were large rocks and boulders.

Macrozoobenthos samples were collected by conventional hydrobiology methods, mostly so. "Kicking" technology using hydrobiology nets and kitchen sieve, and with their slowly dragged upstream the water. Stones and other large pieces of material have been crumbled against the stream of water immediately above the mesh, into which a stream of water shot down released organisms. Individuals sessile on the substrate located at the bottom of a watercourse, were carefully released by using a scraper or plastic spoons, in order not to damage them, and to their subsequent problematic determinations. Organisms after separation of the organic and inorganic material (plants, sand, mud, and stones) located at the bottom of

the watercourse were collected, and then we transferred them into the plastic containers marked by the label with the number of sampling site and with the date of collection and then fixed by 4% solution of formaldehyde. Obtained biological materials were in the laboratory thoroughly cleaned and free from residue of leaves, mud and other contaminants, and divided into taxonomic groups and on the Petri dishes determined by using binocular loupe, stereomicroscope, microscope and morphological keys to the lowest possible systematic level. After determining the benthic fauna results in the tables was reported. Determined biological material was inserted into the sample containers (glass bottles) marked by the date and place of sampling and drenched with 70% alcohol. In the community of benthic fauna selected characters of zoocoenosis were evaluated: species composition, number of species, number of individuals and their contribution to the composition of the zoocenosis. For identified species dominance was calculated and according to the percentage of presence on the structure of the zoobenthos species was assessed: eudominant type: D over 10%, dominant type: D = 5-10%, subdominant type: D = 2-5%, recendent type: D = 1-2%, subrecent type: D less than 1%.
Quality of the water in the Čaradice brook on the based on the saprobic index was evaluated, which was calculated according to the formula from Zelinka and Marvan, 1961 (Řihová, Ambrožová, 2007):

$$S = \frac{\sum S_i \,.\, h_i \,.\, I_i}{\sum h_i \,.\, I_i}$$

Where: S = saprobic index of the whole community,

$S_i$ = individual saprobic index of organisms

$h_i$ = abudance (number of) species in the sample

$I_i$ = indication weight of species.

**RESULTS AND DISCUSSIONS**

In the year 2009, from the seven monitored sampling sites of Čaradice brook 28 water samples with biological materials was taken, from which 30 776 individuals of macrozoobenthos were obtained. Determinate were 146 species, classified into the following 16 systematic groups: *Turbellaria, Oligochaeta, Hirudinea, Gastropoda, Bivalvia, Isopoda, Amphipoda, Ephemeroptera, Plecoptera, Odonata, Heteroptera, Megaloptera, Coleoptera, Trichoptera, Diptera, Chironomidae.* From the above mentioned systematic groups in the waters of the Čaradice brook in the largest number were representatives *Amphipoda* (32.48%), *Gastropoda* (11.70%), *Chironomidae* (11.20%) and *Trichoptera* (10,16%). In a smaller number, but at all sampling sites, has been reported the presence of representatives of systematic groups: *Ephemeroptera* (6.51%), *Diptera* (5.34%), *Oligochaeta* (4.67%), *Bivalvia* (3.54%), and *Coleoptera* (3.09%). Individuals of systematic groups Isopoda (3.55%) only at five sampling sites were found. (tab.1)

*Table.1*

Numerous and percentage representation of systematic macrozoobenthos groups at the sampling sites (SS)

| Systematic group | 1.SS | | 2.SS | | 3.SS | | 4.SS | | 5.SS | | 6.SS | | 7.SS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pcs | % | pcs | % | pcs | % | pcs | % | pcs | % | pcs | % | pcs | % |
| *Turbellaria* | | | 72 | 1,24 | 6 | 0,14 | | | | | 34 | 0,52 | 62 | 1,94 |
| *Oligochaeta* | 92 | 3,96 | 192 | 3,31 | 184 | 4,24 | 272 | 4,69 | 252 | 8,97 | 324 | 4,99 | 122 | 3,81 |
| *Hirudinea* | 48 | 2,07 | | | 62 | 1,43 | 88 | 1,52 | 126 | 4,49 | 234 | 3,60 | 164 | 5,12 |
| *Gastropoda* | 278 | 11,97 | 298 | 5,14 | 526 | 12,11 | 652 | 11,23 | 196 | 6,98 | 1442 | 22,21 | 210 | 6,56 |
| *Bivalvia* | 40 | 1,72 | 140 | 2,41 | 134 | 3,08 | 112 | 1,93 | 60 | 2,14 | 534 | 8,22 | 70 | 2,19 |
| *Isopoda* | 10 | 0,43 | | | | | 56 | 0,96 | 338 | 12,04 | 416 | 6,41 | 272 | 8,49 |
| *Amphipoda* | 308 | 13,26 | 3274 | 56,43 | 1926 | 44,34 | 3268 | 56,31 | 42 | 1,50 | 416 | 6,41 | 762 | 23,80 |
| *Ephemeroptera* | 112 | 4,82 | 598 | 10,31 | 274 | 6,31 | 234 | 4,03 | 298 | 10,61 | 222 | 3,42 | 264 | 8,24 |
| *Plecoptera* | 148 | 6,37 | 114 | 1,96 | 156 | 3,59 | 136 | 2,34 | | | 18 | 0,28 | | |
| *Odonata* | | | | | | | | | 34 | 1,21 | 32 | 0,49 | 20 | 0,62 |
| *Heteroptera* | | | 48 | 0,83 | 130 | 2,99 | 54 | 0,93 | 454 | 16,17 | 88 | 1,36 | 40 | 1,25 |
| *Megaloptera* | | | 12 | 0,21 | | | | | | | | | 8 | 0,25 |
| *Coleoptera* | 108 | 4,65 | 190 | 3,27 | 92 | 2,12 | 110 | 1,90 | 98 | 3,49 | 234 | 3,60 | 120 | 3,75 |
| *Trichoptera* | 488 | 21,02 | 400 | 6,89 | 388 | 8,93 | 258 | 4,45 | 326 | 11,61 | 722 | 11,12 | 544 | 16,99 |
| *Diptera* | 416 | 17,92 | 128 | 2,21 | 120 | 2,76 | 208 | 3,58 | 126 | 4,49 | 454 | 6,99 | 190 | 5,93 |
| *Chironomidae* | 274 | 11,80 | 336 | 5,79 | 346 | 7,97 | 356 | 6,13 | 458 | 16,31 | 1324 | 20,39 | 354 | 11,06 |
| sum | 2322 | 100 | 5802 | 100 | 4344 | 100 | 5804 | 100 | 2808 | 100 | 6494 | 100 | 3202 | 100 |

To the representatives of the rarely occurring, whose share of the overall structure of macrozoobenthos of the monitored water flow was lower than 3% (in the figure 1 marked as other), there were included representatives of systematic groups *Turbellaria* (0.57%), *Hirudinea* (2.35%) , *Plecoptera* (1.86%)*Odonata* (0.28%), *Heteroptera* (2.64%) and *Megaloptera* (0.06%).

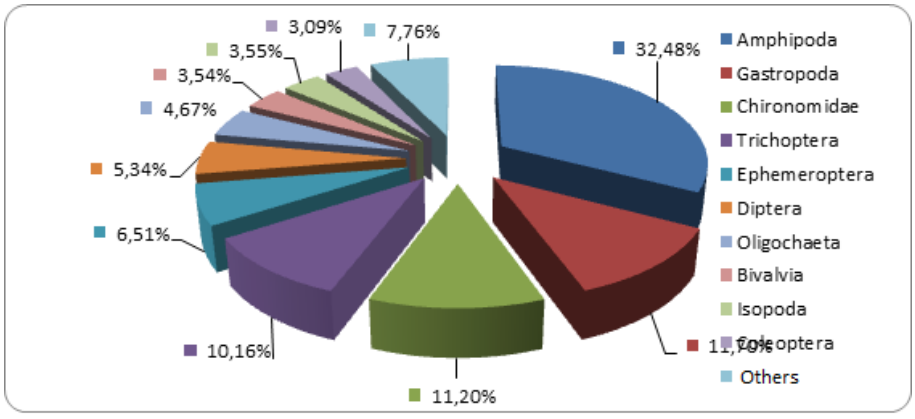


Fig. 1: the percentage representation of systematic groups of Čaradice brook.

From the total compositions of 146 kinds, respectively, higher taxa of zoobenthos of Čaradice brook the most widespread and the most numerous species of dominant systematic *Amphipoda* was species *Gammarus fossarum* that with the value of the dominance 28% was classified as the eudominant species. To the eudominant species with dominance value 11.20% were also included individuals from family *Chironomidae*. The occurrence of the both mentioned benthic organisms of invertebrates were regularly recorded at all seven sampling sites. Majority, to 129 species was evaluated as species subrecendent, with dominance less than 1%. From them exceptionally recorded only to 2 sampling points (2 and 7) was a species Sialis laturia. Total amount of 20 individuals representing systematic group Megaloptera at the structure of zoobenthos of Čaradice brook for only 0,06% was accounted.

Our results correspond with the results of the other authors. Pastuchová (2005) in their work indicates, that for the water flows is characterized a high proportion of shredders, mainly crustaceans (*Gammaridae*), but also the absence of the predatory species of stoneflies *Perlidae* families, and *Perlodidae Chloroperlidae*. We identify with the opinion of this author because species *Gammaruss fossarum and Gammaruss roeseli* belonging to the family *Gammaridae* were 32.48% of the total representation of macrozoobenthos of Čaradice brook. We do not record the presence of predatory species of families' stoneflies *Chloroperlodidae, Perlidae*. The exception was only a few individuals (28) of the family *Perlodidae,* which occurrence at the 1 sampling sites was recorded. Šporka, Hamerlík, Krno (2006), who made research on the lower flow of the river Hron, they found that the in the zoobenthos community representatives of the systematic group of *Amphipoda* was dominated, namely *Gammaruss roeseli*. In the macrozoobenthos of the Čaradice brook the highest value had the systematic domination group *Amphipoda*, namely species *Gammaruss fossarum*, preferring the cleaner water compared to species *Gammaruss roeseli*.

David (2008) made a research on the dragonflies (*Odonata*) in the mountain Pohronský Inovec in Tríbeč, Vtáčnik and Žiarska valley. He found that the observed of the geomorphological unit were among the dominant representatives species of *Libellula depressa, Platycnemis pennipes and Coenagrion puella*. In the Čaradice brook, which springs in the mountain of Pohronský Inovec, three species belonging to the systematic group of *Odonata*, which the dominant species was *Platycnemis pennipes* and *Coenagrion puella* were found.

The number of species and number of individuals of studied zoocenoses varied depending on the location and time of sampling of monitored biological material, i.e. macrozoobenthos organisms. In doing so, like state Krno (2006) and Leštáková (2006), was strongly influenced by seasonality and developmental cycles of organisms. Appreciation of zoobenthos species compositions in longitudinal profile of Čaradice brook was found that the species-richest was 6.sampling sites situated near the water tank Kozárovce, where over four samplings have been detected presence up to 62 kinds of benthic invertebrates, with an average over the entire period 45.5 species. At this sampling site not only the greatest number of species, but also the largest number of individuals was found.

Throughout the whole monitored period there has been detected 6,494 individuals, making a total amount of 30,776 determinated individuals is up to 21.10%. The smallest number of species in a single collection (21), but also in the average for the whole period (29.25) to 1.sampling site, i.e. in the forest ecosystem of the Pohronský Inovec was found. This was also the sampling point with the minimum number of individuals (table 1 and 2). Changes in species and also in numerous represented of benthic organisms, depending on the sampling sites show significant influence of ecosystem which monitored watercourse flows. Decrease in

the number of species and the number of individuals was evident at sampling sites located southern the villages which Čaradice stream flows.

*Table2*

Number of determinate species of zoobenthos on the individual sampling sites.

| Number of sampling sites | Sampling sites | sampling | | | | Average number of species per sampling site |
|---|---|---|---|---|---|---|
| | | I. | II. | III. | IV. | |
| 1. | The forest ecosystem Pohronský Inovec | 21 | 44 | 31 | 21 | 29,25 |
| 2. | In the north point of Čaradice | 32 | 45 | 36 | 33 | 36,5 |
| 3. | In the south point of Čaradice | 38 | 47 | 39 | 22 | 36,5 |
| 4. | Before the water tank Kozárovce | 43 | 47 | 47 | 34 | 42,75 |
| 5. | Water tank Kozárovce | 38 | 53 | 38 | 30 | 39,75 |
| 6. | Behind the water tank Kozárovce | 36 | 62 | 50 | 34 | 45,5 |
| 7. | In the south point of Kozárovce | 22 | 41 | 36 | 28 | 31,75 |
| Average number of species per sampling | | 32,86 | 48,43 | 39,57 | 28,86 | 37,43 |

*Table. 3*

The number of determinated individuals of macrozoobenthos on the individuals sampling sites.

| Number of sampling sites | Sampling sites | Sampling | | | | Sum (ks) |
|---|---|---|---|---|---|---|
| | | I. (pcs) | II. (pcs) | III. (pcs) | IV. (pcs) | |
| 1. | The forest ecosystem Pohronský Inovec | 348 | 846 | 768 | 360 | 2322 |
| 2. | In the north point of Čaradice | 486 | 1688 | 2058 | 1570 | 5802 |
| 3. | In the south point of Čaradice | 832 | 1194 | 1722 | 596 | 4344 |
| 4. | Before the water tank Kozárovce | 1544 | 1526 | 1690 | 1044 | 5804 |
| 5. | Water tank Kozárovce | 450 | 976 | 952 | 430 | 2808 |
| 6. | Behind the water tank Kozárovce | 642 | 2564 | 2076 | 1212 | 6494 |
| 7. | In the south point of Kozárovce | 248 | 1194 | 1074 | 686 | 3202 |
| Sum | | 4550 | 9988 | 10340 | 5898 | 30776 |
| Average | | 650 | 1426,9 | 1477,14 | 842,57 | 4396,57 |

In terms of constancy i.e. constancy of occurrence, species, respectively higher taxa like: *Aelosoma hemprichi*, *Eiseniella tetrahedron*, *Gammarus fossarum*, *Chironomidae*, *Lymnaea truncatula*, *Pisidium obtusale*, *Potamophylax nigricornis*, *Simulium sp*., *Tubifex tubifex*, which were located at all sampling sites were rated as always present benthic fauna. Species respectively strains that absences at the one sampling site were evaluated as almost always present species. These included: *Cloeon dipterum*, *Corixa punctata*, *Culicoides Nubeculosus*, *Erpobdella octoculata*, *Erpobdella vilnensis*, *Halesus digitatus*, *Haliplus ruficollis*, *helodes sp*., *Hydropsyche angustipennis*, *Nepa cinerea*, *Pisidium casertanum*, *Bithynia leachii*.

Evaluation of the frequency of macrozoobenthos of Čaradice brook, which often occur species in different types of series of samples was found. The species with the highest frequency, i.e., 71-100% belonged total 9 species respectively higher taxa: *Chironomidae*, *Gammarus fossarum*, *Eiseniella tetrahedron*, *Tubifex tubifex*, *Hydropsyche angustipennis*, *Pisidium obtusale*, *Erpobdella vilnensis*, *helodes sp.*, *Simulium sp.* Of these, only the individuals of family *Chironomidae* with frequency 100% in the waters of Čaradice brook in each sampling and at all monitored sampling sites was situated.

Based on the individual saprobic index (Si) the benthic fauna whose occurrence in the Čaradice brook in 2009, had the largest representation types favoring beta – mezosaprobe zone, i.e. moderately highly contaminated water (Figure 2) was recorded. Of these, the greatest number of individuals occurrence: *Hydropsyche angustipennis*, which was in the six sampling sites, *Gammarus roeseli* whose occurrence at four sampling sites was recorded; *Eiseniella tetrahedron* occurring at all sampling sites. From the 146 species of macrozoobenthos in the waters of the Čaradice brook in the monitored period occurrence just one of species preferred polysaprobe i.e. strongly polluted water was recorded. It was *Tubifex tubifex*, which occurrence at all sampling sites was recorded.

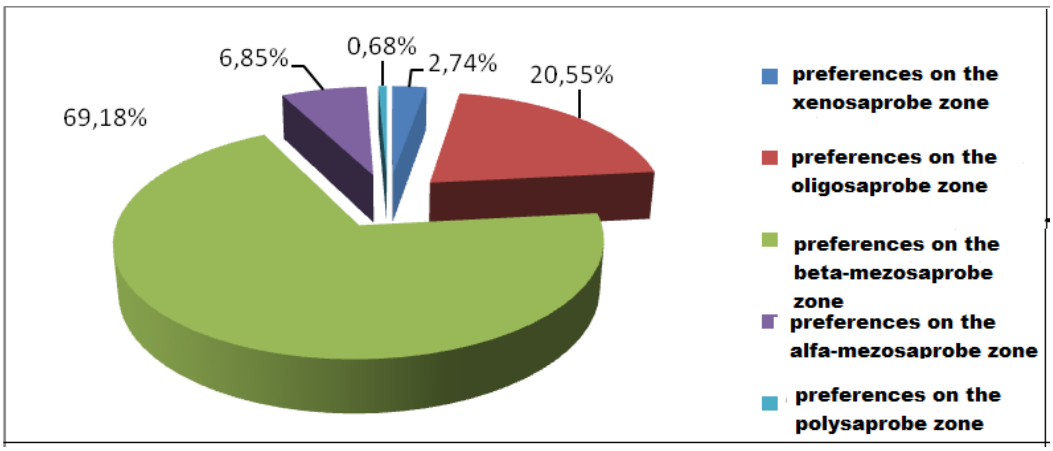


Fig. 2: Percentage share of species of preference for zone saprobe.

Water quality in the Čaradice brook based on the saprobic index, which was calculated for each sampling sites was evaluated. The average annual value of the saprobic index with a limited value of saprobic index, which is included in the Regulation of the Government of Slovak Republic 269/2010 Coll., was compared. On average, the lowest value

of saprobic index for the whole monitored period (1.8385) at the sampling site 2 - the village Čaradice was found. At the sampling site 3 – southern point of the village Čaradice has been observed a slight increase of the average saprobic index (1.8746). Degradation of the water quality was probable cause by domestic waste water usually discharged directly to the watercourse.

As can be seen from the data presented in the tab. 4, average the highest saprobic index values at sampling sites 5, 6 and 7 was recorded. The water quality at these sampling sites may be affected by organic or inorganic substances, which enter to the water by the domestic sewage water, livestock excrement, an illegal dump or other source of pollution. Based on the calculated values of saprobic index for each sampling sites were Čaradice brook included in the beta-mezosaprobe zone, i.e. water slightly strongly polluted. The calculated average annual value of saprobic index of benthic invertebrates of the Čaradice brook (SAS = 2.00) not satisfying the requirements of the indicator of the water quality – Part E "biological and microbiological indicators", which are referred in the Government regulation of the Slovak Republic 269/2010 Coll. (SAS = 1.3).

*Table 4*

Values of saprobic index

| Number of sampling sites | Sampling sites | Sampling | | | |
|---|---|---|---|---|---|
| | | I. | II. | III. | IV. |
| 1. | The forest ecosystem Pohronský Inovec | 1,7864 | 1,8399 | 1,9968 | 2,1943 |
| 2. | In the north point of Čaradice | 1,8524 | 1,9357 | 1,8507 | 1,7151 |
| 3. | In the south point of Čaradice | 1,7184 | 1,8658 | 1,9349 | 1,9794 |
| 4. | Before the water tank Kozárovce | 1,7509 | 2,0074 | 1,9177 | 1,9832 |
| 5. | Water tank Kozárovce | 2,231 | 2,0524 | 2,1658 | 2,1851 |
| 6. | Behind the water tank Kozárovce | 2,1115 | 2,0786 | 2,1374 | 2,2399 |
| 7. | In the south point of Kozárovce | 2,0635 | 2,1827 | 2,0836 | 2,1791 |
| Average per sampling | | 1,9306 | 1,9946 | 2,0124 | 2,0680 |
| Annual average | | 2,00 | | | |

## CONCLUSIONS

Communities of the aquatic organisms provide important information about the state of water flows, because they are used to indicate and monitoring the water quality. By hydrobiology the most using community for such targets is macrozoobenthos, which is sensitive to any changes in the aquatic environment, mainly by changes in numerous and

species representation. In the year 2009 from the seven sampling sites of Čaradice brook, which in the southwestern part of the Slovak Republic flows through territories of Zlaté Moravce and Levice districts, 28 water samples was taking and we found 30 776 individuals of macrozoobenthos, which determination have been detected 146 species. They were classified into 16 systematic groups: *Turbellaria, Oligochaeta, Hirudinea, Gastropoda, Bivalvia, Isopoda, Amphipoda, Ephemeroptera, Plecoptera, Odonata, Heteroptera, Megaloptera, Coleoptera, Trichoptera, Diptera, Chironomidae.* The most dominant, regularly occurring at all sampling sites were the representatives of the systematic group *Amphipoda*, from which the most numerous and also eudominant species of the whole communities of mocrozoobenthos of the Čaradice brook was *Gammarus fossarum*. The smallest species and numerous representations of individuals had systematic group *Megaloptera* which in the monitored water flow occurred only rarely, and therefore in the subrecent species were included. Saprobe indices characterizing water quality in the reporting period ranged from 1.7151 to 2.2399, according to the water of the Čaradice brook was rated as the slightly heavily polluted, beta - mezosaprobe. The average annual value of saprobic index of benthic invertebrates of Čaradice brook (SAS = 2.00) not satisfying the requirements of the indicator of the water quality - Part E "biological and microbiological indicators", which are referred in the Regulation of the Government of the Slovak Republic 269/2010 Coll. (SAS = 1.3). Degradation of the water quality was probable cause by organic or inorganic substances that get into the water for example by sewage from households, livestock excrement, illegal dumps, or by other sources of pollution.

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