ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS
SBORNÍK MENDELOVY ZEMĚDĚLSKÉ A LESNICKÉ UNIVERZITY V BRNĚ

Volume LVI 26 Number 5, 2008

ZOOBENTHOS OF SMALL BROOKS OF THE SVITAVY REGION

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Received: February 11, 2008

Abstract

SUKOP, I: *Zoobenthos of small brooks of the Svitavy region.* Acta univ. agric. et silvic. Mendel. Brun., 2008, LVI, No. 5, pp. 199–202

The qualitative and quantitative composition of macrozoobenthos of two brooks of the Svitavy region was studied. Both brooks rise in the region with formerly mines. Altogether, 61 taxa of macrozoobenthos were determined. Saprobical indices of both brooks correspond to beta–mesosaprobity class at all sampling sites.

small brooks of the Svitavy region, quality and quantity of zoobenthos, index of saprobity

In May, August and October 1997, a hydrobiological survey was carried out in two small brooks (the Udánecký and Kunčický brooks) in the area of the Moravská Třebová town Spurný et all (1998). The aim of the study was the evaluation of the level of hydrocoenoses ecological stability and its possible disturbance due to anthropogenic effects (mining activities and municipal pollution in particular). Both brooks rise in the area of former mines of fireproof clays and shales with residues of mining activities in form of slag heaps of overburdens and extracted material with increased iron content. Due to this, the beds of upper parts of both streams are covered by orange to brown sediments consisting of iron hydroxide precipitates. Their origin is in mine waters and in rainwaters leaking from slag heaps of rubbish. Risk of municipal pollutin of the Udánecký potok brook appears in its lower part passing through the town of Moravská Třebová. In case of the Kunčický potok brook, it concerns the whole stream stretch passing through the settlements of Nová Ves, Kunčina and Moravská Třebová.

LOCALITIES

The Udánecký potok brook rises on the slopes of the Hřebečovský Hill in the area of former mines Emil, Václav and Bernard and subsequently flows through agricultural land with the last part of the stream in the town of Moravská Třebová. Four sampling sites were selected in the Udánecký potok brook: $\mathbf{U}_1$ – small brook upstream the pond with higher current avoiding higher sedimentation of iron hydroxide, which makes the submersed objects orange, stream width is 0.5–1 m. $\mathbf{U}_2$ – pond outflow with the bottom covered by small gravel and sand with orange to brown sediments of iron hydroxide, stream width is 0.5–2 m. $\mathbf{U}_3$ – the stream nearby the Udánky village with channelized bed, high gradient and gravel to stony bottom, stream width is 1–1.5 m. $\mathbf{U}_4$ – stream in the Moravská Třebová town (upstream its confluence with the Kunčický potok brook), the bottom is stony and covered by bryophytes and filamentous algae, stream width is 2–2.5 m.

The Kunčický potok brook rises also on the slopes of the Hřebečovský Hill in the area of former mine Hugov-Karel. The majority of the stream flows first through the settlements of Nová Ves and Kunčina, followed by shorter strech of agricultural land. The lowest part of the brook is located in the area of the Moravská Třebová town. Five sampling sites were surveyed in the Kunčický potok brook: $\mathbf{K}_1$ – upstream the Nová Ves village approximately 500 m downstream the cascades which are supposed to support quicker oxygenation and precipitation of iron hydroxide. The sediment is flushed out from cascades and all submersed objects (stones, branches, roots) are covered with orange sediments of iron hydroxide, stream width is 0.3–0.5 m. $\mathbf{K}_2$ – stream in the Nová Ves village with channelized river bed, stony substrate partly covered by orange sediment, stream width is 0.5–1 m. $\mathbf{K}_3$ – downstream the Kunčina village, with channelized bed and fast current, stream width is 1 m. The bottom consists of sandy sediments and stones covered by filamentous

algae. **K_4** – the brook upstream the Moravská Třebová town, meandering in soil banks. The bottom is formed by sandy sediments, gravel and stones overgrown by filamentous algae, stream width is 1.5–2 m. **K_5** – channelized stream entering the Moravská Třebová town with stony bottom and extensive sandy and muddy sediments and beds of Canadian pondweed, stream width is 2–2.5 m.

METHODS

Macrozoobenthos samples were collected quantitatively using the hand net on two small brooks – the Udánecký potok and Kunčický potok brooks. The areas of the bottom was measured according to Schräder (1932). Sampling was carried out in 1997 (May, August and October) in the area of interest. The saprobical evaluation was performed according to Zelinka, Marvan (1961).

RESULTS

Zoobenthos species composition

Porifera: *Ephydatia fluviatilis* – U_2
Hydrozoa: *Hydra* sp. – U_2
Oligochaeta: *Nais communis* – U_1, U_4, K_2, K_3, K_4, *N. elinguis* – K_3
Hirudinea: *Erpobdella octoculata* – U_2, U_4, *Glossiphonia complanata* – K_4, K_5
Mollusca: *Lymnaea peregra* – U_2
Acari: Hydracarina g. sp. – K_4
Isopoda: *Asellus aquaticus* – K_5
Amphipoda: *Gammarus fossarum* – U_1, U_3, U_4, K_2, K_3, K_4, K_5
Ephemeroptera: *Alainites muticus* – U_2, U_4, K_2, K_4, *Baetis rhodani* – U_1, U_2, U_3, U_4, K_2, K_3, K_4, K_5, *B. vernus* – U_1, U_2, U_3, U_4, K_3, K_4, K_5, *Caenis macrura* – U2, *Ecdyonurus dispar* – K_2, K_3, *Electrogena lateralis* – U_3, *E. guadrilineata* – K_4, *Ephemera danica* – U_3, *Ephemerella ignita* – U_3, U_4, *E. mucronata* – K_4, *Habrophlebia fusca* – U_1, *H. lauta* – K_2, K_4
Plecoptera: *Amphinemura sulcicollis* – U_1, U_3, K_3, *Leuctra* sp. – U_1, K_2, K_3, K_4, *Nemoura cinerea* – U_1, K_2
Odonata: *Platycnemis pennipes* – U_2
Megaloptera: *Sialis fuliginosa* – K_1
Trichoptera: *Anabolia laevis* – U_2, K_4, K_5, *A. nervosa* – K_5, *Chaetopteryx villosa* – U_1, U_3, *Halesus digitatus* – K_5, *H. radiatus* – U_1, *H. tesselatus* – U_1, U_2, U_3, U_4, K_3, K_4, *Hydroptila* sp. – U_3, *Hydropsyche angustipennis* – U_1, U_2, U_3, U_4, K_3, K_4, K_5, *H. instabilis* – K_5, *H. modesta* – U_2, U_4, *H. pellucidula* – U_4, K_3, K_4, *H. siltalai* – K_5, *Limnephilus* sp. – U_1, *Plectrocnemia geniculata* – K_2, *Potamophylax latipennis* – K_2, *P. rotundipennis* – K_4, *Rhyacophila nubila* – U_2, U_3, U_4, K_3, K_4, K_5, *R. obliterata* – U_3
Coleoptera: *Agabus* sp. – K_1, *Elmis aenea* – U_3, K_2,
Diptera: Chironomidae: *Brillia modesta* – U_2, U_4, K_3, K_4, *Cricotopus inaequalis* – K_3, *Diamesa insignipes* – K_3, K_5, *Diplocladius cultriger* – K_4, *Eukiefferiella* sp. – U_4, K_3, K_4, *Micropsectra* sk. *praecox* – U_4, K_2, K_3, K_4, K_5, *Orthocladius* sp. – K_5, *Prodiamesa olivacea* – K_1, **Ceratopogonidae** g. sp. – U_4, K_2, K_3, K_4, **Cylindrotomidae:** *Phalacrocera replicata* – K_3, **Limoniidae:** *Dicranota* sp. – U_3, K_3, K_4, **Simuliidae** g. sp. – U_1, U_2, U_3, K_2, K_3, K_4, K_5, *Odagmia ornata* – U_3, **Tipulidae:** *Tipula* sp. – K_3

Zoobenthos quantity

I: *Zoobenthos density (ind.m^{-1}) in the Udánecký potok brook*

Site	U_1	U_2	U_3	U_4
30. 5. 1997	1518	2568	1898	1386
19. 8. 1997	415	1174	758	247
30. 10. 1997	-	1013	2411	94

II: *Zoobenthos density (ind.m^{-1}) in theKunčický potok brook*

Site	K_1	K_2	K_3	K_4	K_5
31. 5. 1997	133	1321	1741	1249	1459
19. 8. 1977	57	827	1175	347	744
30. 10. 1977	-	-	1101	962	854

Saprobity

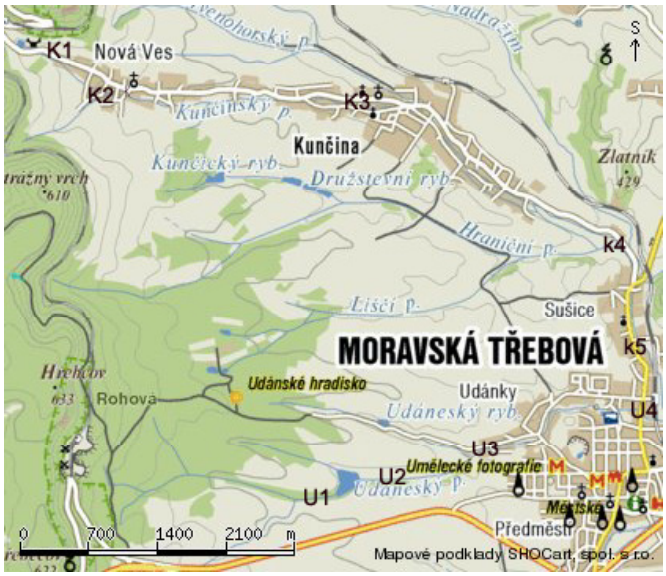
In the period of investigation, both brooks proved a sufficient self–purification capability and so the pollution from associated settlements did not exceed the level of beta–mesosaprobity. The oxygen and temperature conditions in both brooks enable the occurrence of brown trout particularly in their upper nad middle stretches. The lower stream stretches, which pass through the Moravská Třebová town, show already signs of certain organic pollution from the outlets of house waste water reservoirs, which are discharged into the brook bed, which leads already to certain degradation of water quality, and brook trout are missing on these sites.

III: *Saprobity of the Udánecký potok brook*

Site	U_1	U_2	U_3	U_4
30. 5. 1997	1.76	2.05	1.35	1.96
19. 8. 1997	1.51	1.64	1.71	1.72
30. 10. 1997	–	2.16	0.99	2.14
mean	1.63	1.95	1.35	1.94

IV: *Saprobity of the Kunčický potok brook*

Site	K_1	K_2	K_3	K_4	K_5
31. 5. 1997	2.35	1.67	2.10	2.01	2.02
19. 8. 1997	1.50	1.47	1.49	1.49	1.52
30. 10. 1997	–	–	1.56	1.71	1.92
mean	1.93	1.57	1.72	1.74	1.82



1: *The Kunčický and Udánecký potok brooks – sampling sites location*

DISCUSSION

As a part of monitoring, also basic hydrochemical parameters were recorded. The oxygen saturation values in both brooks never dropped bellow 80% during the period of monitoring. Also the pH determinants did not prove any extreme values, mainly showing a slightly alkaline range (the acidic reaction of pH 5.00 recorded just in one case). There is evident from the results of the monitoring that the aquatic animals were not endangered by extreme chemical values.

Many underground mines was closed in Europe in 90´s of the last century. Some of them were flooded and after certain period of time, the concentrations of dissolved compounds dramatically raised in mine waters. The assumptions supposed that the concentrations of these compounds will remain on the stable level afterwards but they increased rapidly on all sites under observations during several months after flooding of mines. It was found that when tunnels and holes are not flooded with water, the rocky environment is provided with atmospheric oxygen and both rocky and ore minerals are oxidized. Products of oxidization remain mostly on site. After flooding the mines, the oxidized parts are shifted again into zone of reduction and former products of oxidization begin to dissolve. This is the way how the amount of sulphates, chlorides and other compounds is transferred into water. Seasonal fluctuations of their concentrations are very characteristic (lower in spring/summer turn, highest in summer) – the reason is unclear up to now. The concentrations of iron, manganese and other metals decline during several years following deposit watering, however suplhate and chlorides concentrations remain without any changes. Rising mine waters eliminate crustacean and fish populations in a smaller stream distance, regardless its loading in the form of heavy and radioactive metals. In nature, mine waters are often manifested as rusty coloured mucous covers or encrustations.

SUMMARY

The hydrobiological survey of two selected brooks (the Udánecký potok and Kunčický potok brooks) in the region of Moravská Třebová was performed in 1997 (in the period of May, August and October). The aim of the study was to evaluate the level ecological stability of hydrocoenoses of both brooks and of their possible disturbance by anthropogenic impacts (mainly due to mining activities and municipal pollution). Both streams rise in the area of former mines of fireproof clays and shales with residues of mining activities in the form of slag heaps and extracted material with increased iron content. In the period of monitoring, both streams proved sufficient self-purification capability so as the pollution from adjacent setlements did not exceed beta-mesosaprobity. The data presented may serve as a basis for future monitoring of water quality and zoobenthos composition.

SOUHRN

Zoobentos malých toků Svitavska

V roce 1997 (v období květen, srpen, říjen) byl proveden hydrobiologický průzkum dvou vybraných potoků (Udánecký a Kunčický) v oblasti Moravské Třebové. Cílem studie bylo posouzení stupně ekologické stability hydrocenóz obou potoků a jejich případného narušení antropogenními vlivy (zejména důlní činností a komunálním znečištěním). Oba potoky pramení v oblasti bývalých dolů na těžbu žáruvzdorných jílů a lupků s pozůstatky po důlní činnosti v podobě hald, skrývek a vytěženého materiálu se zvýšeným obsahem železa. V důsledku tohoto stavu se koryta horních toků obou potoků pokrývají oranžovým až hnědým sedimentem sraženiny hydroxidu železitého. Původ těchto sedimentů je v důlních vodách a ve vodách srážkových, prosakujících z hald hlušiny. Riziko komunálního znečištění Udáneckého potoka je v jeho dolní části protékající Moravskou Třebovou. V případě Kunčického potoka jde o celou délku toku, protékajícího obcemi Nová Ves, Kunčina a Moravskou Třebovou.

malé toky Svitavska, kvalita a kvantita zoobentosu, saprobní indexy

ACKNOWLEDGEMENT

This study was supported by the Research plan No. MSM 6215648905 „Biological and technological aspects of sustainability of controlled ecosystems and their adaptability to climate change“, which is financed by the Ministry of Education, Youth and Sports of the Czech Republic.

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