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Microflora of streams in the Šumava Mountains

Mikroflóra šumavských toků

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Abstract

Lacking data with regard to present-day microflora in streams of the Šumava Mountains were the major stimulus of my studies into the composition of microflora in Teplá Vltava river, Modravský and Roklanský brooks (Fig.1). In the course of the growing season of 1994 at 14 sampling sites (Table 1) , 47 species of blue-green algae and algae have been recorded. Highest species diversity was found in the group of blue-green algae (Fig.2). Each stream was unique with regard to its floristic composition, but there were practically no differences among the sampling sites within the individual stream. For instance, *Rhodophyta* were characteristic of Teplá Vltava river. Generally, *Chrysophyceae* were predominant in the streams in the spring and autumn period, while green algae prevailed in summer. We cannot draw general conclusions from the data collected during a single season. Nevertheless, these observations indicate that Šumava headwaters belong to undisturbed areas, and that the mountain streams retain their characteristic vegetation.

Key words: periphyton, blue-greens, running waters

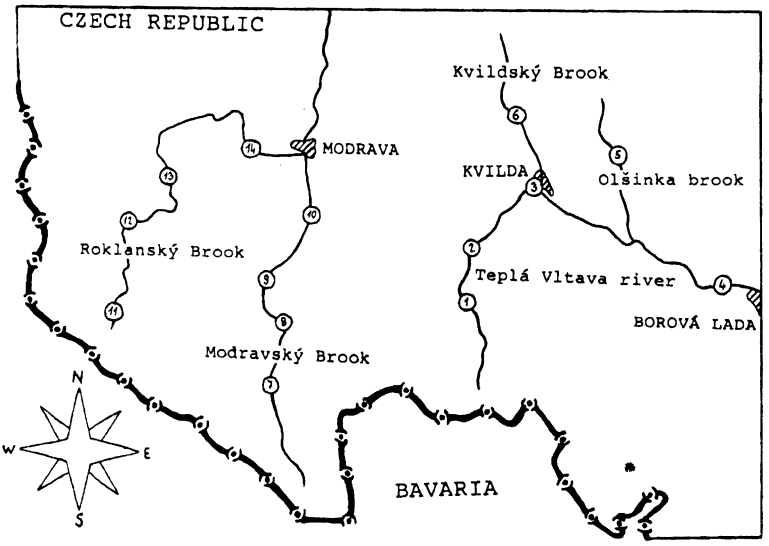
Introduction

Importance of running waters in central parts of the Šumava mountains is commonly acknowledged. In the accessible literature, so far, nothing has been written about the present composition of their aquatic microflora. This was the reason of my studies referring to the microflora of the following streams: the upper part of Teplá Vltava river and its major tributaries within this part (Olšinka brook, Kvildský potok brook), Modravský potok and Roklanský potok brooks. Similar research was carried out by KANN (1978a, b) and JOHANSSON (1982). The study published by WYSOCKA (1949, 1952) is also worth-while. Within the framework of hydrobiological analyses performed in the area of Šumava National Park, PAŘIL (1994) touched similar problem, too.

Material and methods

Altogether 14 sampling sites (Fig.1) in the five streams have been examined with regard to the periphyton (epiphytic, epilithic). Temperature was measured by a spirit thermometer. After the immediate determination, the samples were preserved in 4% formaldehyde solution. The selected species were brought into the culture. Species determination, followed classifications by HINDÁK & al. 1975, 1978, KANN (1985), KOMÁREK & FOTT (1983) and STARMACH (1985).

Obr. 1. –
Odběrová místa
Fig. 1. –
Sampling sites



Tabulka 1. – Přítomnost druhů v jednotlivých vodních tocích
Table 1. – Presence of species at individual brooks

	Teplá Vltava	Olšinka	Kvildský potok	Modravský potok	Roklanský potok
CYANOPHYTA					
Chamaesiphon britannicus	+	0	0	+	0
Ch. fuscus	+	+	0	+	+
Ch. incrustans	+	0	+	0	0
Ch. investiens	+	0	0	+	0
Ch. minutus	0	+	+	+	+
Ch. polonicus	+	+	0	+	+
Ch. subglobosus	0	+	0	+	0
Clastidium setigerum	0	+	0	0	0
Heteroleibleinia sp.	+	+	+	+	0
Homoeothrix janthina	0	+	0	+	0
H. varians	+	+	0	+	0
Hydrococcus cesatii	+	0	+	+	0
H. rivularis	+	+	+	+	0
Leptolyngbya sp.	+	+	0	0	+
Phormidium amoenum	+	+	0	+	0
P. retzii	0	0	0	+	0
Pseudanabaena galeata	+	+	0	0	0
Xenococcus kerneri	+	0	0	0	0
RHODOPHYTA					

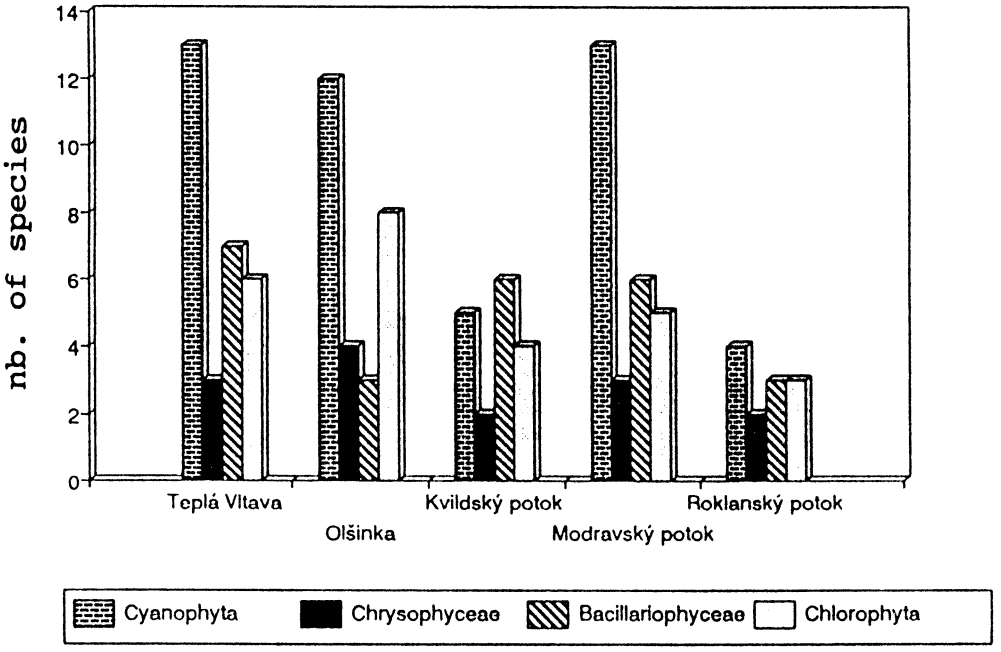
Audouinella sp.	+	+	0	0	0
Batrachospermum moniliforme	+	0	+	0	0
Lemanea fluviatilis	+	0	0	0	0
CHRYSOPHYCEAE					
Chrysosphaera sp.	+	+	+	+	+
Gleochrysis turfosa	+	+	+	+	+
Hydrurus foetidus	+	+	0	+	0
Synura sp.	0	+	0	0	0
XANTOPHYCEAE					
Tribonema sp.	+	+	0	+	0
BACILLARIOPHYCEAE					
Diatoma sp.	+	+	+	+	+
Eunotia curvata	+	0	+	0	0
Eunotia sp.	0	+	+	+	0
Frustulia rhomboides	+	0	0	0	0
Meridion circulare	+	0	+	+	+
Navicula rhynchocephala	+	0	0	+	0
Pinnularia gibba	+	0	+	+	0
Tabellaria flocculosa	+	+	+	+	+
CHLOROPHYTA					
Chlamydomonas ambigua	+	0	+	+	+
Draparnaldia glomerata	0	+	0	0	0
Klebsormidium flaccidum	+	+	+	0	0
Koliella sp.	0	+	0	0	0
Microspora amoena	+	+	+	+	+
Podohedra bicaudata	+	+	0	+	+
Stichococcus bacillaris	+	+	0	+	0
Stigeoclonium sp.	+	+	+	+	0
Tetraspora lubrica	0	+	0	0	0
CONJUGATOPHYCEAE					
Closterium sp.	+	0	+	+	+
Cosmarium sp.	0	0	+	+	+
Cylindrocystis brebissonii	+	+	0	+	0
Mougeotia sp.	0	+	0	0	0

+ – occurence, 0 – absence

Results

Forty seven species of blue-greens and algae were recorded at 14 sampling sites. Highest species diversity was found on the upper part of Teplá Vltava river. Detailed summary is in the Table 1.

Teplá Vltava river is characterized by the occurrence of the *Rhodophyta*. Macroscopic



Obr. 2. – Druhová pestrost
Fig. 2. – Species diversity

clusters of *Stigeoclonium* sp., predominant in the spring period, were found on Modravský brook.
The species diversity of streams is described in Fig.2.

Seasonal changes

Generally, the *Chrysophyceae* were predominant in the brooks in the spring and autumn period, while green algae prevailed in the summer. Detailed summary is given in Table 2. During the growing season 1994 the average temperature ranged as follows: 5 °C in spring, 13 °C in summer, 2 °C in autumn.

Cultivation

Simulation of running water is the main methodical problem in cultivation. The conditions in our laboratory did not allow the growth of the *Chrysophyceae*. Green algae were cultivated successfully (*Klebsormidium flaccidum, Podohedra bicaudata, Stichococcus bacillaris).*

Conclusions and discussion

We cannot draw general conclusions from data collected during a single season. The species composition and diversity probably oscillate every year. The species composition described by KANN (1978b) and JOHANSSON (1982) correspond with our results. Both papers indicate *Batrachospermum moniliforme, Lemanea fluviatilis, Hydrurus foetidus, Draparnaldia glomerata, Stigeoclonium* sp., *Mougeotia* sp. KANN (1985) examined the blue-green algae in greater detail. JOHANSSON mentions *Microspora amoena.* Our results correspond well with those described by KANN (1988). Growth of *Hydrurus foetidus* depended on the limiting

Tabulka 2. – Sezónní změny ve složení mikroflóry
Table 2. – Seasonal changes in the composition of microflora

spring
genus *Chamaesiphon* (7)
genus *Hydrococcus* (2)
genus *Phormidium* (2)
Batrachospermum moniliforme
Chrysosphaera sp.
Gloechrysis turfosa
Hydrurus foetidus
Stigeoclonium sp.

summer
genus *Homoeothrix* (2)
Pseudanabaena galeata
class *Bacillariophyceae*
Microspora amoena
Podohedra bicaudata
Stichococcus bacillaris

autumn
genus *Chamaesiphon* (7)
Chrysosphaera sp.
Hydrurus foetidus
class *Bacillariophyceae*
Microspora amoena
Stigeoclonium sp.

16 °C water temperature (KANN, 1978a). Although the temperature level was not much higher, the occurrence of this species significantly declined in consequence of low light intensity. The species composition was reduced to a half at the Kvilda sampling site. These observations probably refer to local pollution. Absence of *Batrachospermum moniliforme* was evident. PAŘIL (1994) received similar results with water invertebrates. He mentioned lower quantity of invertebrates in Roklanský brook. The species composition in other streams did not show significant oscillations. Streams in the Šumava Mountains, apparently preserve their characteristic microflora.

References

HINDÁK F., KOMÁREK J., MARVAN P. & RÚŽIČKA J., 1975: Klúč na určovanie výtrusných rastlín. I.diel, Riasy [Key to non-vascular plants, part I, Algae]. *SPN, 397 pp.*

HINDÁK F. & AL., 1978: Sladkovodné riasy [Freshwater algae]. *SPN, 724 pp.*

JOHANSSON C., 1982: Attached algal vegetation in running waters of Jämtland, Sweden. *Acta phytogeogr.suec. 71: 1–84.*

KANN E., 1978a: Systematik und Ökologie der Algen österreichischer Bergbäche. *Arch. Hydrobiol., Suppl. Monographische Beiträge 53: 405–643.*

KANN E., 1978b: Typification of Austria streams concerning algae. *Verh. Internat. Verein. Limnol. 20: 1523–1526.*

KANN E., 1985: Bentische Cyanophyten – Gemeinschaften in Bächen und Seen. *Arch. Hydrobiol., Suppl. Algological Studies 71: 307–310.*

KANN E., 1988: Zur Autökologie bentischer Cyanophyten in reinen europäischen Seen und Fließgewässern. *Arch. Hydrobiol., Suppl. Algological Studies 80: 473–495.*

KOMÁREK J. & FOTT B., 1983: Chlorophycae (Grünalgen), Ordnung: Chlorococcales. *In: Das*

Phytoplankton des Süßwassers 7/1, Die Binnengewässer. Schweizeibartische Verlagsbuch, Stuttgart, 1044 pp.

PAŘIL P., 1994: Výsledky hydrobiologických rozborů v NP Šumava v rámci monitoringu CHÚ v roce 1993 [Results of hydrobiological research in Šumava NP within monitoring of Protected Areas in the year 1993]. *Depon. in Šumava NP, Kašperské Hory, 7 pp.*

STARMACH K., 1985: Chrysophycae und Haptophycae. Süßwasserflora von Mitteleuropa, Band 1. *Gustav Fischer Verlag, Jena, 515 pp.*

WYSOCKA H., 1949: Glony Wisly na odcinku Warszawy. Czesc I: Seston. *Acta Societatis Botanicorum Poloniae 20: 69–118. (in Polish).*

WYSOCKA H., 1952: Glony Wisly na odcinku Warszawy. Czesc II: Periphyton. *Acta Societatis Botanicorum Poloniae 21: 369–400. (in Polish).*