Navicula integra (*Bacillariophyceae*) in Bohemia

***Navicula integra* (*Bacillariophyceae*) v Čechách**

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The occurrence of *Navicula integra* (*Bacillariophyceae*), a diatom of salt waters, in the basin of the Lužnice river (South Bohemia, Czech Republic) is reported. The ecology of the species is characterized and its former findings in Europe are reviewed. The ecological conditions at one of the localities in which the species was found do not correspond completely to the knowledge of the species' autecology. It is concluded that the ecological amplitude of *Navicula integra* could be wider than inferred from available data.

Keywords: Diatom, *Navicula integra*, autecology, Lužnice river, South Bohemia, Czech Republic

Introduction

Diatom flora of the Lužnice river was studied by Poulíčková (1997) who reported on the first record of *Navicula integra* (W. Sm.) Ralfs (syn. *Pinnularia integra* W. Sm.) from the territory of the Czech Republic. The present paper provides a detailed characteristic of this species' occurrence in the Lužnice river basin.

Material and methods

Sediment samples were taken from the bottom of the Lužnice river, Dračice brook and Koštěnický potok brook in 1985–1987 and 1994–1995, and analysed for the occurrence of diatom species (according to Krammer et Lange-Bertalot 1986). The samples are deposited at the Department of Botany, Palacký University in Olomouc (Czech Republic). The determination of diatom species is based on the study of valve structures following their preparation (Hindák et al. 1975). Apart from living diatom cells, samples from river bottom sediments may contain some fossil or subrecent frustules. Consequently, living material must be used to verify each unusual finding. This is possible in *Navicula integra* as living cells of this species are easily recognizable.

The observation

In 1985–1995, single living cells of *Navicula integra* occasionally appeared in the bottom sediments of the Lužnice river (South Bohemia) sampled from August to October. I observed about 20 living cells of the species, hence it was rather rare. The species occurred in several sections of the stream, namely nearby the town of Veselí nad Lužnicí, and Stará Hlína, Kosky, Hrdlořezy and Halámky villages (Fig. 1). Behind the water-shed

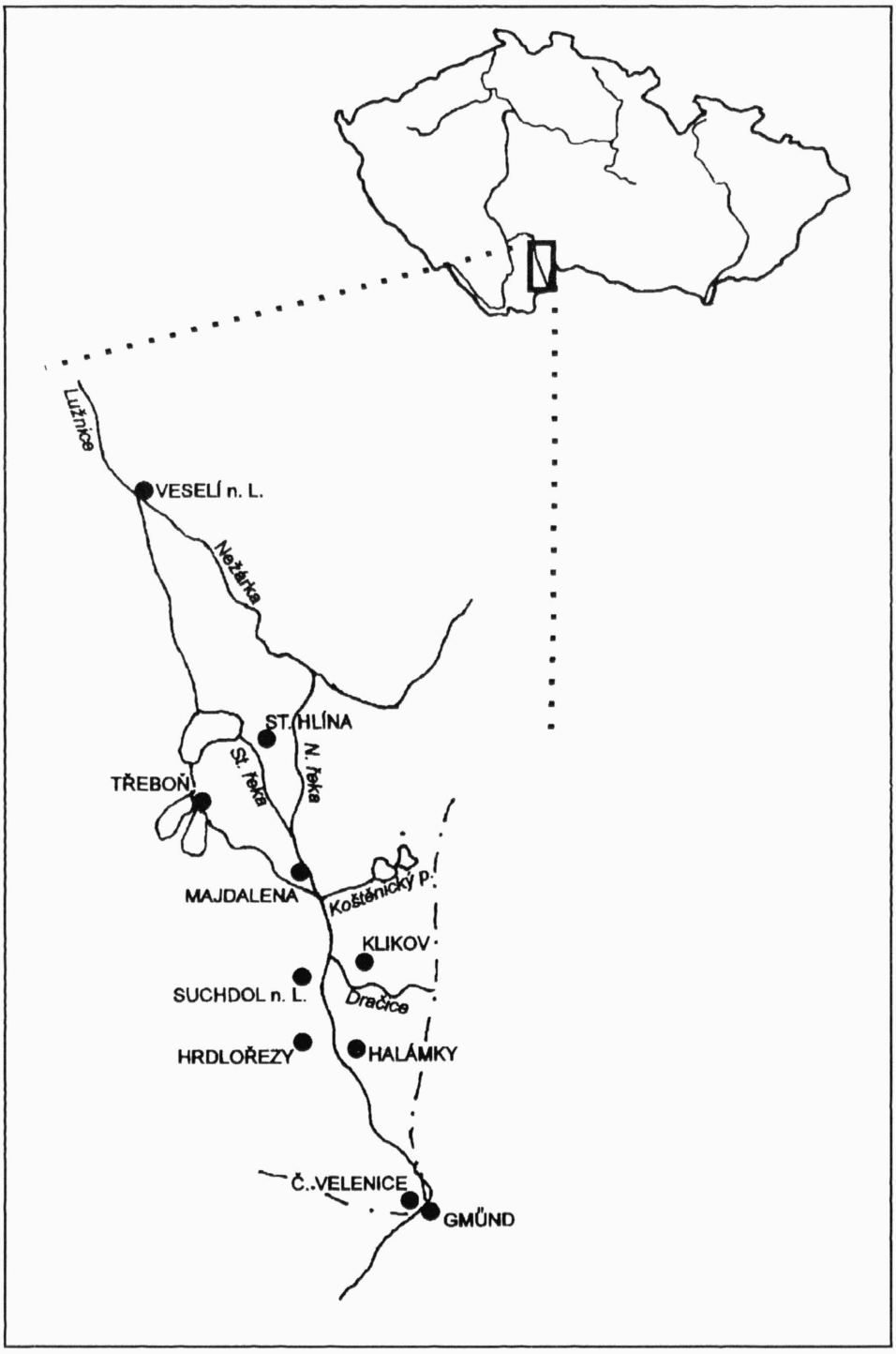

Fig. 1. – The map of the territory studied.

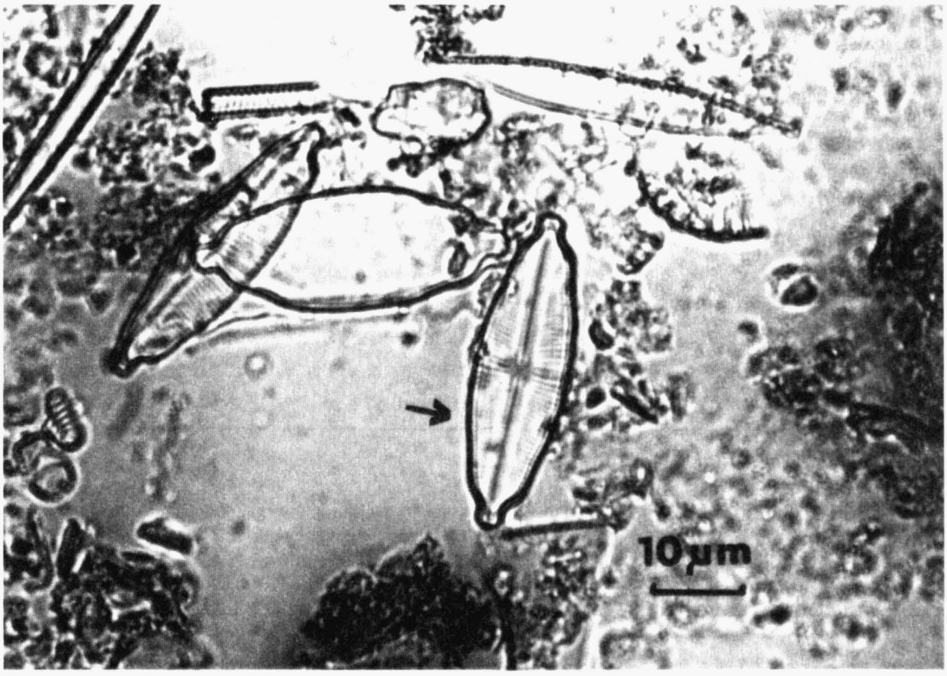

Fig. 2. – *Navicula integra* (Photo: J. Jurčák).

of the Lužnice river and Nová řeka river it was found in both streams. It has never appeared in the Koštěnický potok brook. In August 1994, three living specimens were found in the Dračice brook, a tributary of the Lužnice river.

The frustules of *Navicula integra* had typically developed valve terminations and central areas which are the main characteristic features (Fig. 2). The valves were 28.8–35.1 µm long and 8.1–9 µm wide. Physical and chemical parameters of the Lužnice river and its tributaries are summarized in Table 1 (see Drbal et al. 1991 for details). The Lužnice river belongs to the most polluted streams, but its tributaries are much cleaner. The Dračice brook is situated within the range of betamezosaprobity (S = 1.77) and harbours a lamprey species *Lampetra planeri* (Poulíčková et al. 1997). The water of the Koštěnický potok is polluted from the nearby glassworks (see Pb content, Table 1).

Ecology

Navicula integra is widespread in salt and brackish waters, but rare in fresh waters containing high amounts of electrolytes (Krammer et Lange-Bertalot 1986). Hustedt (1961–1966) reports on its occurrence in polluted waters. Table 2 summarizes ecological demands of the species, using the classification according to van Dam et al. (1994).

Other diatoms present in the samples containing *N. integra* belong to the species currently occurring in our streams (see Poulíčková 1997 for the list of diatoms of the Lužnice river). Accompanying species exhibit ecological requirements similar to those of *N. integra*, the only exception being the increased salinity in the former.

Table 1. – Selected chemical parameters according to Drbal et al. (1991).

Parametr		Lužnice river	Dračice brook	Koštěnický brook
pH		6.4–7.3	6.6–7.1	6.2–6.8
NO_3^-	(mg/l)	10.0–14.0	8.4–12.0	8.0–15.6
PO_4^{3-}	(mg/l)	0.3–1.4	0.29–0.49	0.3–0.54
SO_4^{2-}	(mg/l)	32.0–44.0	32.5–37.7	43.0–50.2
Cl^-	(mg/l)	–	9.7–11.3	10.9–14.5
TP	(mg/l)	170–414 eutraphentic	61–191 mesotraphentic	70–154 mesotraphentic
BOD5	(mg O_2)	2.0–5.1	2.55–3.37	1.88–3.04
Pb	(µg/l)	0.42–1.42	0.57	7.4

Table 2. – Classification of *Navicula integra* as related to ecological parameters (according to van Dam et al. 1994).

Parameter	Group no.	Characteristics
pH	3	mainly occurring at pH-values about 7
Salinity	3	brackish-fresh (500–1000 mg/l Cl^-; 0.9–1.8‰)
N metabolism	2	nitrogen-autotrophic taxa, tolerating elevated concentrations of organically bound nitrogen
O_2 demand	3	moderate (above 50% saturation)
Saprobity	3	alpha-mesosaprobous
Trophic state	5	eutraphentic

Table 3. – A summary of *Navicula integra* records.

Author	Morphological variability			Occurrence
	Length (µm)	Width (µm)	Number of striae per 10 µm	
Fischer 1927–1928	–	–	–	Moravia region
Pascher 1930	25–37	8–10	21–23	sea coast, inland waters with increased salinity
Zabelina 1951	25–37	8–10	21–23	rare in bottom sediments of the Dněpr river
Hustedt 1961–1966	25–42	8–10	21–23	Europe, salt and polluted waters
Sieminska 1964	25–37	8–10	21–23	fresh waters, sea coast – frequent
Krammer et al. 1986	25–45	8–10	17–23	especially in salt and brackish waters
Hindáková 1995	–	–	–	the Morava river in Slovakia, plankton
Poulíčková (this study)	29–35	8–9	17–20	rare in bottom sediments of the Lužnice river and the Dračice brook

The occurrence of *Navicula integra* in the Czech Republic has been reported only once (Fischer 1927–1928) from Moravia. The diatom flora of the Lužnice river was studied in the past decades by Procházka (1924), but this species was not discovered then. It is missing from the list of Slovakian species either (Lhotský et al. 1974). The first occurrence of this species in Slovakia was reported in 1995 in the plankton of the Morava river nearby Bratislava (Hindáková 1995). Table 3 summarizes records of *N. integra* reported so far, with the information on its morphological variability.

The present data show, that *N. integra* can be an interesting object of further study, especially from the autecological point of view. The species is being overlooked species due to its rare occurrence in specialized microbiotopes. The diatom flora of streams and its sediments in particular have not been studied thoroughly until present. It is thus probable that the ecological amplitude of *N. integra* can be wider than expected on the basis of available data.

Acknowledgments

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Souhrn

V článku je popsán nález halofilní rozsivky *Navicula integra* (W. Sm.) Ralfs v povodí řeky Lužnice (jižní Čechy). Zvláště zajímavý je nález na lokalitě Dračice, protože lokalita neodpovídá dosud publikovaným ekologickým nárokům tohoto druhu.

References

Drbal K. [red.] (1991): Studium vybraných biocenóz a chemismu vod Horní Lužnice. – Acta Scient. VŠZ, České Budějovice, 38:1–153.

Fischer R. (1927–1928): Methodische Untersuchungen der halophilen Algenflora. – Mikrokosmos, Stuttgart, 21:96–100,.

Hindák F. et al. (1975): Kľúč na určovanie výtrusných rastlín I. Riasy. - SPN Bratislava, 399 pp.

Hindáková A. (1995): Planktónové rozsievky stojatých a tečúcich vod v intraviláne Bratislavy a v rieke Dunaj. – Ms. [Disert. Pr.; depon. in: Knih. Kat. bot. UK Bratislava, 195 pp.]

Hustedt F. (1961–1966): Die Kieselalgen 3. – In: Rabenhorsts Kryptogamenflora, Leipzig, 7(3):1–816.

Lhotský O., Rosa K. et Hindák F. (1974): Súpis siníc a rias Slovenska. – SAV, Bratislava, 202 pp.

Krammer K. et Lange-Bertalot H. (1986): *Bacillariophyceae* 2/1. – In: Ettl H., Gerloff J., Heynig H. et Mollenhauer D., Süsswasserflora von Mitteleuropa, 2/1, Gustav Fischer Verlag, Stuttgart.

Pascher A. (1930): Die Süsswasserflora Mitteleuropas. Heft 10: *Bacillariophyta*. – Jena, 463 pp.

Poulíčková A. (1997): Rozsivková flóra povodí řeky Lužnice. – Preslia, Praha, 68 (1996):257–264.

Poulíčková A., Hanel L. et Duchoslav M. (1997): Algological evaluation of small streams with recent or past occurrence of lamprey species. – Arch. Hydrobiol./Suppl. Algological Studies, Stutgart (in press).

Procházka J.S. (1924): Katalog českých rozsivek. – Arch. Přírodov. Výzk. Čech, vol. 17, no. 2 (107):1–114.

Siemińska J. (1964): *Bacillariophyceae* (Okrzemki). – In: Starmach K., Flora słodkowodna Polski 6:1–600, Warszawa.

Van Dam H., Mertens A. et Sinkeldam J. (1994): A coded checklist and ecological indicator values of freshwater diatoms from the Netherlands. – Netherl. J. Aquat. Ecol., Amsterodam, 28:117–133.

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