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New records of *Pisidium tenuilineatum* Stelfox, 1918 (Bivalvia, Sphaeriidae) from Slovakia

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So far, *Pisidium tenuilineatum* has been reported from Slovakia only from four sites. Six new sites of this pea mussel have been found during the last twenty years in Slovakia in both small karstic watercourses (e.g. rivulets, brooks and small rivers) and large lowland rivers. These new records show that *P. tenuilineatum* should be still considered as a rare species in Slovakia but some new populations are still likely to be discovered especially in lower elevations and in the areas of low anthropogenic influence.

Key words: Mollusca, Bivalvia, *Pisidium tenuilineatum*, new records, Slovakia

Introduction

Pisidium tenuilineatum (Fig. 1) is widely distributed across the western Palearctic from the Mediterranean to southern Sweden and eastwards to European part of Russia (Žadin 1952, Killeen & Seddon 2011, Welter-Schultes 2012, Vinarski & Kantor 2016). Its distribution is scattered in many countries and because it even declines in Europe, it was listed in the IUCN Red List in the category Least Concern (Killeen & Seddon 2011). This species is Red listed in several European countries and belongs to rare and declining species. Fine-lined pea mussel was listed as Critically Endangered in the Red List in Slovakia (Šteffek & Vavrová 2006).
This species was recorded in Slovakia for the first time in 1955 from a karstic pond and small rivulet near the town of Košice (Ložek 1956, 48°45'12.5"N, 21°12'56.2"E). The same author found this species also nearly 20 years later near the village of Súľov (Ložek 1974, 49°10'09.3"N, 18°36'02.9"E). Other records were reported from the Izra Lake (Lisický 1991, lgt. J. Brabenec, 48°34'12.2"N, 21°29'38.6"E) and from underground brooks near the Silica Plateau (Gulička 1975, 48°34'13.6"N, 20°29'44.2"E) (Fig. 2). Except the latter one, all these historical data were summarized in Lisický (1991). Recently, more data about the species occurrence in Slovakia have been obtained and are summarized in this paper.

Material and methods

Data were obtained during field malacological surveys. The main sampling method for aquatic molluscs applied also for this research is washing vegetation or sediments using a metal sieve (diameter 20 cm, 0.8 mm mesh) combined with collections by hand with searching on surfaces of stones, woods and artificial material (e.g. plastic bags and bottles). This species and other small bivalves were obtained mostly by washing sediments using the sieve. Freshwater molluscs were identified using shell characteristics (most species, including *P. tenuilineatum*) or dissected and then identified using their copulatory organs if the identification only based on shells was impossible. Selected material of shells of *P. tenuilineatum* is deposited in the authors' collections and M. Horsák's collection (Brno).

Results

Altogether six new sites with the occurrence of this rare species have been found during the last twenty years in Slovakia (Fig. 2).
1 – 48°19'23.4"N, 17°04'35.4"E, Lozorno, a small brook ca. 700 m upstream of its inflow into the dam water reservoir, 232 m a. s. l., 4 live specimens, 6 empty shells, lgt. & det. T. Čejka, 15. 5. 2010;
2 – 48°56'45.5"N, 17°54'48.5"E, Liešna, the Drietomica Brook, 323 m a. s. l., 1 live specimen, lgt. K. Brabec, det. & coll. M. Horsák, 11. 7. 2000;
3 – 47°56'12.8"N, 17°58'36.9"E, Kolárovo, the Malý Dunaj River branch, 111 m a. s. l., 2 live specimens, lgt. & det. T. Čejka, 18. 9. 2003;
4 – 48°47'37"N, 18°20'51.1"E, Kšinná, the Radiša Brook, 305 m a. s. l., 1 live specimen, lgt. S. Ščerbáková, det. T. Čejka, 24. 6. 2010;
5 – 49°01'49.8"N, 18°53'53.6"E, Košťany nad Turcom, the Turiec River by the bridge (Fig. 3), 415 m a. s. l., 15 live specimens, lgt. & det. L. Beran, 30. 6. 2017;
6 – 49°05'04.5"N, 19°21'20.5"E, Lisková, the Váh River, 485 m a. s. l., 3 empty shells, lgt. E. Mišíková-Elexová, det. T. Čejka, 2010.

Fig. 1. *Pisidium tenuilineatum*. Photo by M. Horsák.

All these records were obtained from the western part of Slovakia. Four new records came from smaller brooks and rivers while two more findings were conducted in larger watercourses with a width of about 50 m (site No. 3 and 6). In the case of the Malý Dunaj River branch, co-occurrence of 22 species was confirmed, while in the other sites co-occurrence of 2–7 species was documented (Tab. 1). *Pisidium tenulineatum* co-occurred with other sensitive or endangered molluscs in the Turiec River (*Unio crassus*, *Pisidium amnicum*) and Malý Dunaj River branch (e.g. *Theodoxus danubialis, Borysthenia naticina*, *P. amnicum*) (Tab. 1). The Turiec River was visited also in 2019 at the village of Socovce, ca. 12 km upstream of the site No. 5. The occurrence of *P. tenuilineatum* was not confirmed. Nearly in all cases, this pea mussel occurred in shallow parts of watercourses with fine sediment.

Discussion

Pisidium tenuilineatum inhabits in Slovakia both small karstic watercourses (rivulets, brooks, and small rivers) and large lowland rivers, while in the Czech Republic it is known from small rivers and brooks with a low anthropogenic influence (Beran & Horsák 2001, Beran 2016). In Great Britain species lives principally in clean, calcareous, unpolluted lowland rivers, large streams and occasionally also in ponds (Killen & Seddon 2011). In Poland Piechocki & Wawrzyniak-Wydrowska (2016) mentioned that the species is mainly associated with small rivers where it stays on sandy or clayey bottom.

New records showed that *P. tenuilineatum* should be still considered as a rare species in Slovakia. This situation is similar to the Czech Republic (Beran & Horsák 2001, Beran 2002, 2016) or Poland (Piechocki & Wawrzyniak-Wydrowska 2016), while e.g. in Great Britain this species is more common as was considered during more detailed research (Killeen & Willing 2004). It is probable that in the case of more detailed research, some new sites with the occurrence of this rare pea mussel will be find also in Slovakia, especially in low elevations and in the areas with low anthropogenic influence. The more detailed research of adjacent parts of watercourses with the recent occurrence (e.g. Turiec River, Drietomica Brook, Radiša Brook) and also a revision of historical sites is needed.

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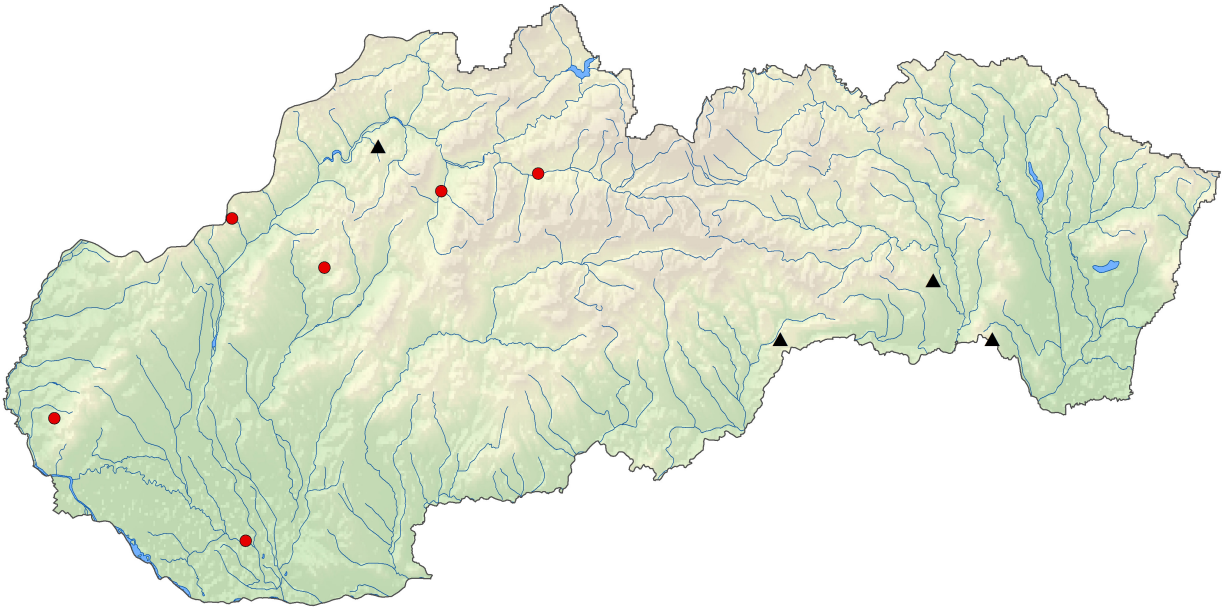

Fig. 2. Distribution of *Pisidium tenuilineatum* in Slovakia: black triangles – historical records, red circles – new records. Drawn by J. Vrba. Data source: © GADM 2015, © NCA CR 2019.

Fig. 3. The Turiec River (site no. 5). Photo by L. Beran.

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Table 1. The list of aquatic molluscs recorded at particular sites.

Species/Site No.	1	2	3	4	5	6
Theodoxus danubialis (C. Pfeiffer, 1828)			x			
Viviparus acerosus (Bourguignat, 1862)			x			
Bithynia tentaculata (Linnaeus, 1758)			x			
Potamopyrgus antipodarum (Gray, 1843)			x			
Lithoglyphus naticoides (C. Pfeiffer, 1826)			x			
Valvata cristata O. F. Müller, 1774						
Valvata piscinalis (O. F. Müller, 1774)			x			
Borysthenia naticina (Menke, 1845)			x			
Galba truncatula (O. F. Müller, 1774)	x					x
Stagnicola cf. *palustris* (O. F. Müller, 1774)			x			x
Radix ampla (Hartmann, 1821)					x	
Radix auricularia (Linnaeus, 1758)			x			
Radix balthica (Linnaeus, 1758)			x			x
Radix labiata (Rossmäessler, 1835)				x		
Lymnaea stagnalis (Linnaeus, 1758)			x			
Ancylus fluviatilis O. F. Müller, 1774			x	x		x
Unio pictorum (Linnaeus, 1758)			x			
Unio crassus Philipsson, 1788					x	
Anodonta anatina (Linnaeus, 1758)			x			
Corbicula fluminea (O. F. Müller, 1774)			x			
Sphaerium corneum (Linnaeus, 1758)			x		x	x
Sphaerium rivicola (Lamarck, 1818)			x			
Musculium lacustre (O. F. Müller, 1774)			x			
Pisidium amnicum (O. F. Müller, 1774)			x		x	
Pisidium casertanum (Poli, 1791)	x	x		x		x
Pisidium henslowanum (Sheppard, 1823)			x			
Pisidium personatum Malm, 1855	x	x		x		
Pisidium subtruncatum Malm, 1855	x				x	x
Pisidium supinum A. Schmidt, 1851			x			
Pisidium tenuilineatum Stelfox, 1918	x	x	x	x	x	x
Dreissena polymorpha (Pallas, 1771)			x			
Number of species	5	3	23	5	6	8