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Survey of echinoderms and a new ophiocistioid *Branzoviella talpa* gen. *et* sp. n. (Echinodermata, Ophiocistioidea) in the Lower Devonian, Lochkov Formation of the Barrandian area, Czech Republic

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A b s t r a c t. An updated list of echinoderm groups and species, which have been described, verified or newly ascertained from the Lochkovian, Lochkov Formation (Lower Devonian of the Barrandian area), is presented for the first time. The list is arranged in the form of a table with a brief introduction about the character of the echinoderm assemblages and their palaeoecology in both facies of the Lochkovian, i.e. the Radotín Limestone and Kotýs Limestone. In the systematic part, a new type of ophiocistioid goniodonts discovered in the Kotýs Limestone is described and a new taxon, *Branzoviella talpa* gen. *et* sp. n. (Ophiocistioidea, Echinodermata), is set for it.

A b s t r a k t. V práci je poprvé uveden seznam dosud popsaných, ověřených a nově zjištěných skupin a druhů ostnokožců z lochkovského souvrství spodního devonu Barrandienu. Seznam je tabelárně uspořádán a v úvodu doplněn informacemi o charakteru společenstev ostnokožců a jejich paleoekologii v obou základních faciích lochkovu, tj. vápencích radotínských a kotýských. Jako příloha je zde popsán nový typ ophiocistioidních goniodontů z kotýských vápenců lochkovu a na jejich základě stanoven nový taxon, *Branzoviella talpa* gen. *et* sp. n.

K e y w o r d s: Echinodermata, Ophiocistioidea, Lower Devonian, Lochkovian, Barrandian area, Czech Republic

Introduction

Echinoderms from the Devonian deposits of the Barrandian area are relatively poorly known compared to trilobites or brachiopods but the systematic research in the past two decades has significantly increased our knowledge of these, often rock-forming animals. In fact, echinoderm fauna represents a typical and quantitatively extremely abundant component of invertebrate assemblages in carbonate facies at all stratigraphical levels from the Lower to Middle Devonian of the Barrandian area, esp. from the Lochkovian to Eifelian, but it occurs rarely in non-carbonate facies. In general, its distribution clearly reflects a strong preference of echinoderms for environments of typical limestone sedimentation, regardless of the depth, temperature or wave energy.

In the Siluro-Devonian boundary beds, at the so-called "lobolith hillside" near Praha-Řeporyje, several crinoid genera seem to be restricted to the Silurian rocks (e.g. the camerates *Carolicrinus*, *Zenkericrinus*, and *Bohemicocrinus*), while other crinoid genera and species cross the boundary (camerate genera *Scyphocrinites* and *Hexacrinites*, or inadunate species *Pisocrinus ubaghsi*). Some other echinoderms also seem to cross the boundary: blastoids of the genus *Polydeltoideus* and echinoids (Prokop 1962, 1987, Prokop and Petr 1986a, b).

Two species of the large float-bearing genus *Scyphocrinites*, often with complete calyces, dominate the deep-water sediments of the Radotín Limestone facies. No other echinoderm fauna has been reported from the Radotín Limestone yet. It should be pointed out that only relatively smaller-sized specimens can be found in the relatively shallow-water transitional beds on the "lobolith hillside", while only a few problematic remains – isolated thecal plates or columnals of ?scyphocrinitids (Petr 1983) – were found in the typically shallow-water, high-energy biostromes of the Kotýs Limestone one hundred metres from the "lobolith hillside", i.e. in the Černá skála quarry.

The Kotýs Limestone facies is exposed at two important localities: "Černá skála" quarry in Praha-Řeporyje (biostrome-like beds of pink bioclastic limestones exposed on the northeastern limits of the quarry) and "Záloženský lom" quarry near Loděnice – Na Branžovech (grey, thick-bedded, finely bioclastic limestones exposed in the northwestern wall of the quarry). At both localities, the limestones – mostly weathered in the so-called "white beds" – contain abundant rock-forming echinoderm skeletal remains (predominantly crinoid columnals), which have been collected. The fauna is largely undescribed and consists of small inadunate crinoids (e.g. thick-walled calyces of pisocrinids, esp. *Parapisocrinus*), thecal plates of camerates (especially genus *Hexacrinites*), incomplete calyces of blastoids, thecal plates and stem remains of rhombiferan cystoids, abundant ambulacral and lateral plates of ophiuroids, thecal plates of asteroids, rare teeth of ophiocistioids belonging to the new taxa described herein, various skeletal remains of echinoids, submarginal plates of cyclocystoids, rare ossicles from peripharyngeal rings of holothuroids, etc. (Prokop 1980, 1992, 1993, Prokop and Petr 1986b, 1987).

Tab. 1. Table of echinoderm species in the Lochkov Formation (Lower Devonian, Lochkovian, Barrandian area)

Echinodermata	Lochkov		Echinodermata	Lochkov	
	Kt	Rd		Kt	Rd
1. Crinoidea			scyphocrinids – isolated skeletal remains	12	all Rd
Apiastrum sp. (col.)	6, 8, 9		scyphocrinids ? – problematic skeletal		
Bactrocrinites ? sp. (isolated BB and RR)	6, 8		remains (col.)	6	
Brutopisocrinus bohemicus (Bouška, 1956)	6, 7		*Theloreus* ? sp. (isolated RR and BrBr)		
Camptocrinus sp. n. (col.)	8		(= Ramacrinus sp., in Prokop 1992)	6, 8, 9, 11	
Crinoidea ind. (col.) - enormous number			*Tiaracrinus* sp. n. (isolated RR		
of undescribed columnal types	all Kt, esp. 6		and limbrachioids)	6	
Dimerocrinites sp. ind.			2. Blastoidea		
= Exaesiodiscus sp. (col.)	6		*Leptoschisma ? pentagonum* Macurda, 1983	6, 8, 9	
Eohalysiocrinus sp., Prokop, 1992			*Polydeltoideus* cf. *plasovae* Prokop, 1962	6, 11	
(isolated BB and RR)	6, 8, 9		3. Rhombifera		
Gilbertsocrinus sp. (col.)	6		*Pleurocystitidae*, gen. *et* sp. indet (unde-		
Glyphidocrinus sp. (col.)	6, 8		scribed isolated thecal plates and columnals)	6, 8, 9	
Hapalocrinus ? sp., Prokop, 1992			4. Asteroidea		
(isolated BrBr)	*6*		*Asteroidea*, order, gen. *et* sp. indet.		
Hexacrinites cf. *ariel* Prokop, 1982	6, 8, 9		(undescribed isolated skeletal elements)	6, 8	
Icthyocrinus sp., Prokop, 1992 (isolated RR)	6		5. Ophiuroidea		
Kerrycrinus gen. n. (calyces and isolated RR)	8		*Cheiropterasteridae* gen. *et* sp. indet.,		
Lecanocrinus cf. *facietatus*			Hotchkiss, Prokop and Petr 1999		
(Angelin, 1878), in Prokop and Petr 1993	6, 8, 9, 10		(isolated Ambb)	8	
Myelodactylus spatulatus			*Ophiuroidea*, order, gen. *et* sp. indet.		
LeMenn, 1987 (col.)	6		(undescribed isolated skeletal elements)	6, 8, 9	
Oehlerticrinus sp. ind. (isolated RR)	6		6. Ophiocistioidea		
Parapisocrinus ollula grandis (Bouška, 1956)			*Branzoviella talpa* gen. *et* sp. n.		
(= Ollulocrinus quinquelobus (Bather, 1893),			(described herein)	8	
sensu Bouška 1956)	6, 9		7. Cyclocystoidea		
Parisocrinus sp. (col.)	6, 8		*Sievertsia* cf. *tartas* (Prokop, 1980)		
Pisocrinus ubaghsi Bouška, 1956			(isolated submarginal plates)	6, 8	
(= Trichocrinus crepidatus in Rozhnov 1981)	12		8. Echinoidea		
Pisocrinidae gen. et sp. indet.			*Xenocidaris* ? sp. (isolated spines)	8	
(isolated RR and BrBr)	8		*Echinoidea*, order, gen. et sp. indet.		
Platycrinitidae div. sp. (col.)	6, 8		(undescribed isolated skeletal elements		
Pygmaeocrinus rotundus			of Aristotle's lantern and thecal plates)	6, 8	
Prokop and Petr, 1997	6, 8, 9, 10, 11		9. Holothuroidea		
Ramacrinus ? sp., (isolated RR and BrBr)	6, 8, 9, 11		*Eocaudina* sp. *aff. maccormaki*		
Scyphocrinites sp. (col.)	12	all Rd	Frizzell and Exline, 1956 (sieve plates)	10	
Scyphocrinites elegans Zenker, 1833		1, 2, 3, 5	*Elasipoda* ? gen. *et* sp. indet.		
Scyphocrinites subornatus			(undescribed isolated ossicles		
Waagen and Jahn, 1899		1, 4	from peripharyngeal rings)	6, 8	

Explanation to the letters and numbers in Tab. 1: Kt = Kotýs Limestone, Rd = Radotín Limestone
Numbers are used for particular localities in the Lochkov Formation in the Barrandian, localities 1–5 refer to the Radotín Limestone, 6–12 to the Kotýs Limestone. Sections 6–12 yield almost exclusively washings from the so-called "white beds", i.e. weathered limestones.
1. Karlštejn, section at Budňanská skála (Budňany rock) in front of the bridge across the Berounka River; 2. Lochkov, "Mramorový lom" (Marble Quarry) near the road to Radotín; 3. Velká Chuchle, "Žákův lom" quarry at the northern margin of the village near the road to Slivenec; 4. Klonk near Suchomasty, international stratotype of the Silurian-Devonian boundary, bed No. 20 (lowermost bed of the Devonian); 5. Praha-Radotín, roadcut of the path created in 1980, parallel to the road to Lochkov; 6. Praha-Řeporyje, lom "Černá skála" (Black Rock Quarry), northeastern upper edge of the wall (weathered pink or pink-grey biostrome beds); 7. Praha-Řeporyje, "Požáry" quarry (Bouška 1956); 8. Loděnice, Na Branžovech, "Záloženský lom" quarry, northwestern wall; 9. Trněný Újezd, "Čížovec" quarry, northeastern wall of the second etage; 10. Bubovice, quarries "Na Stydlých vodách" (Solway); 11. Praha-Řeporyje, "U kovárny" (Bouška 1956); 12. Praha-Řeporyje, eastern part of the "lobolith hillside" (lowermost Devonian layers).

Systematic part

Class Ophiocistioidea Sollas, 1899
Family uncertain
Genus *Branzoviella* gen. n.

Type species: *Branzoviella talpa* sp. n.
Diagnosis: as for the type species

Branzoviella talpa sp. n.
Text-figs 1– 4

Derivatio nominis: after shape of goniodonts, resembling the paw of a mole (*Talpa europea*).

Holotype: isolated goniodont, NM L 36527, figs 1a, b, 3a, b.

Paratype A: isolated goniodont, NM L 36528, figs 1a, b, 2.

Paratype B: isolated goniodont, NM L 36529, figs 1a, b.

Type horizon: Lower Devonian, Lochkovian, Kotýs Limestone.

Type locality: Loděnice-Branžovy, NW slope of the abandoned "Záloženský lom" quarry. Bohemia, Czech Republic.

Material: 11 isolated goniodonts (including types) from the washings of the weathered parts of the Kotýs Limestone, all from the type locality.

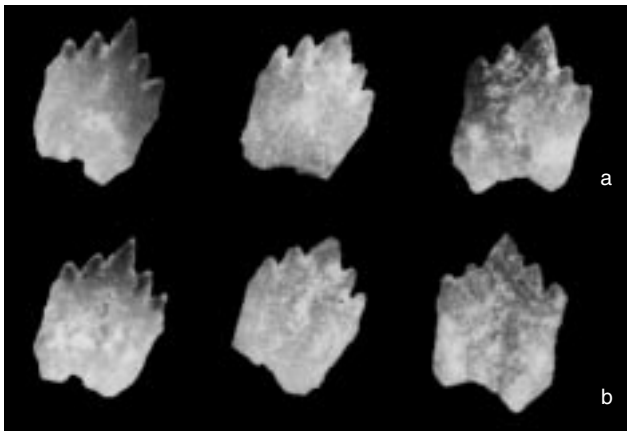

Fig. 1. *Branzoviella talpa* gen. *et* sp. n., isolated goniodonts from washings from the weathered parts of the Kotýs Limestone. a – ventral faces of holotype, Inv. No. L 36527 (above left), paratype A, L 36528 (above right) and paratype B, L 36529 (above centre); b – dtto, dorsal faces. × 16.5.

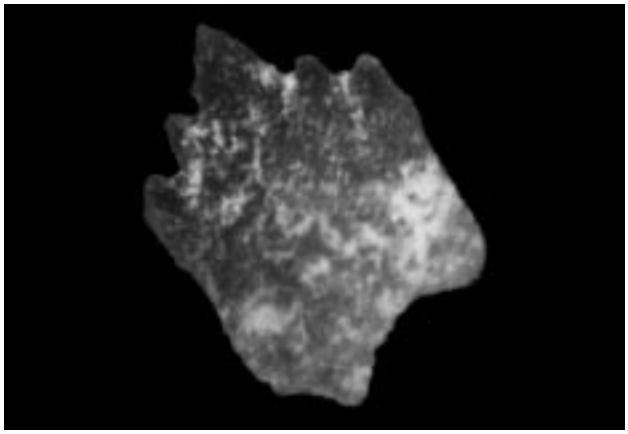

Fig. 2. *Branzoviella talpa* gen. *et* sp. n., paratype A, Inv. No. L 36528, ventral face. × 35.

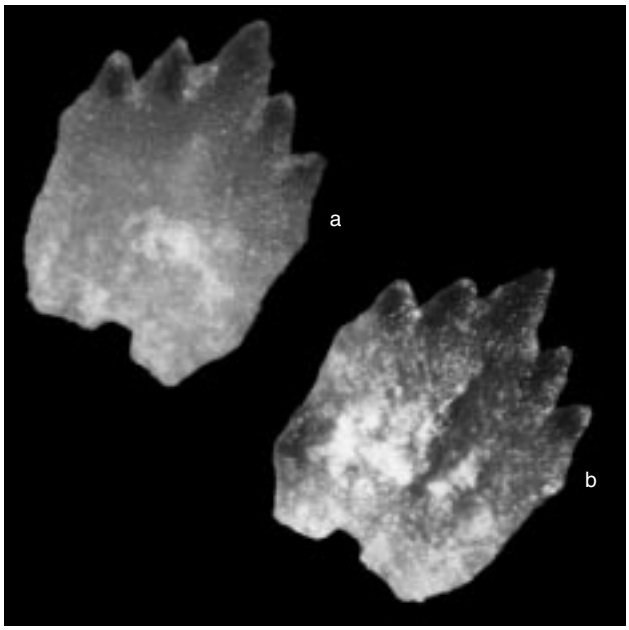

Fig. 3. *Branzoviella talpa* gen. *et* sp. n., holotype, Inv. No. L 36527. a – ventral face, b – dorsal face with imprints of the tips of the following goniodont. × 35. Photo R. J. Prokop.
Lower Devonian, Lochkovian, Kotýs Limestone. Loděnice-Branžovy, "Záloženský lom" quarry, Barrandian, Bohemia, Czech Republic. All specimens are deposited in the collections of the Department of Palaeontology, Museum of Natural History, National Museum, Praha.

D i a g n o s i s: Goniodont of minute size but relatively robust, elongate subpentagonal in outline (its length/width ratio is approx. 1.5 : 1). The main tip is distinctly wider and longer than the side tips, with sharply pointed distal end. One tooth flank bears only two (exceptionally three) side tips that are shorter and of the same shape as the central tip. The imprint of the following goniodont on the dorsal side of the holotype (and of other goniodonts, too) is inexpressive but well visible.

R e m a r k s: Goniodonts of *Branzoviella talpa* gen. *et* sp. n. are closely related to those of *Gillocystis polypoda* Jell, 1983, from the Lochkovian of Australia, Victoria (Jell 1983). Goniodonts of *Branzoviella* are wider, more robust, possessing only 4 (two on each side), rarely 6 side tips (10 or more in *Gillocystis*). Central tip of *Branzoviella*, unlike that of *Gillocystis*, becomes wider at its base, side tips of *Branzoviella* do not turn toward the centre but rather tend to reach outwards.

The discovery of the ophiocistioid *Branzoviella talpa* gen. *et* sp. n. in the Lochkov Formation of the Bohemian Massif is important first of all from the stratigraphic point of view because it represents the second find of the class Ophiocistioidea in the earliest Lower Devonian (i.e. Lochkovian) in the world. The herein described goniodonts are accompanied by very abundant and excellently preserved conodonts mostly belonging to the several species of the genus *Ancyrodeltoides.* The conodonts, preserved in the same manner as the teeth of *Branzoviella* in the white-grey, finely bioclastic Kotýs Limestone exposed in the "Záloženský lom" quarry at Loděnice-Branžovy, point to the Upper Lochkovian age and belong to the *Ancyrodeltoides delta* Conodont Zone. The conodonts were kindly determined by Dr. L. Slavík (Institute of Geology, Academy of Sciences of the Czech Republic, Praha).

Dimensions (in mm; terminology after Haude and Langenstrassen 1976)	
Length of tooth	1.4
Width of tooth	0.9
Height of main tip	0.4
Maximal height of side tip	0.2
Distance of tips of two following goniodonts	0.4

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