

# New finds of *Vadarocrinus vassa* Prokop, 1984 (Crinoidea, Petalocrinidae) in the Koněprusy and Loděnice Limestones (Lower Devonian, Pragian) of the Barrandian area, Czech Republic

## Rudolf J. Prokop<sup>1</sup> & Václav Petr<sup>2</sup>

<sup>1</sup>Department of Palaeontology, National Museum, CZ-115 79 Praha 1, Czech Republic; e-mail: rudolf. prokop@nm.cz

<sup>2</sup>Milánská 451, 109 00 Praha 10

Abstract. The paper presents the new find and description of fan-shaped arm plates of the unique crinoid *Vadarocrinus vassa* from the Koněprusy and Loděnice Limestones (Lower Devonian, Prag) of the Barrandian area. This find yielded more data on morphological variability of the fan-shape arm plates of Devonian petalocrinids and new paleobiological and paleo-ecological data on *Vadarocrinus*.

Keywords. Crinoidea, Petalocrinidae, *Vadarocrinus*, Lower Devonian, Pragian, Koněprusy and Loděnice Limestone, Barrandian area, Czech Republic.

#### INTRODUCTION

Petalocrinid crinoids, the only members of the family Petalocrinidae Weller et Davidson, 1896, were known only from the Silurian strata of Europe, USA and China until 1983 (see Weller & Davidson 1896, Bather 1898, Springer 1926, Pocock 1930, A.T. Mu 1949, 1974, Moore et al. 1978, E.Z. Mu & Lin 1987, Fearnhead & Harper 2007, Fearnhead & Donovan 2007, etc.). The family contained only a single genus *Petalocrinus* Weller et Davidson, 1896. Rare remains of complete cups were described for the type species *Petalocrinus mirabilis* Weller et Davidson, 1896, while other species were based only on isolated rigid fan-shaped arm plates showing better chance for preservation than the small, rather fine cup.

In 1983, a unique fan-shaped arm plate of a crinoid specimen regarded as a member of the family Petalocrinidae was discovered during the systematic research of the echinoderm fauna in the washings from the weathered layers of the Koněprusy Limestone (Lower Devonian, Pragian), exposed in the nothern wall of the "Císařský lom" quarry on the "Zlatý kůň" hill near Koněprusy. A unique crinoid ossicle was distinguished as a new member of the family Petalocrinidae and described by Prokop (1984) as a new genus and





Fig. 2: Vadarocrinus vassa Prokop, 1984 from the Lower Devonian, Koněprusy Limestone, Bohemia (a reconstruction of supposed living position). Drawing by J. Sklenář.

Fig. 1: Reconstruction of *Petalocrinus mirabilis* Weller et Davidson, 1896 from Silurian of the North America in living position. After Bather 1898, from Ubaghs (1953).

new species *Vadarocrinus vassa* gen. et sp. n. This skeletal ossicle represented not only the first record of petalocrinids from Bohemia but also the first remain of a petalocrinid ever found in Devonian strata (see Fig. 1).

The Devonian petalocrinid discovered in the Barrandian area in 1983 was also described on the basis of a single, isolated arm plate (Prokop 2000). Further specimens of *Vadarocrinus vassa* Prokop, 1984 have been newly found during the systematic research of echinoderm fauna in the Koněprusy reef complex in the years 2007 and 2008. Eight specimens (arm plates) were discovered in the washings from the coarse detrital layers of the Koněprusy Limestone at the locality "Velkolom Čertovy Schody – Západ" quarry near Koněprusy (Prokop 2000). This find yielded more data on the morphology and morphological variability of the curious arm plates of petalocrinids and new palaeobiological and palaeoecological data on *Vadarocrinus*.

A recent find of a fragment of the arm plate of *Vadarocrinus* cf. *vassa* in the washings from biosparitic and biomicritic layers of the Loděnice Limestone (Pragian) at the locality Praha-Klukovice, "Červený lom" quarry, is also remarkable. This locality is situated



Fig. 3: *Vadarocrinus* cf. *vassa* Prokop, 1984. Fragment of the distal part of isolated armplate,. NMP L 28037: a – ventral view showing the ambulacral grooves. b – dtto, dorsal view.

Lower Devonian, Pragian, Loděnice Limestone. Praha-Klukovice, "Červený lom" quarry. about 30 km from the Koněprusy area, where the Loděnice Limestone layers probably represent a deeper sedimentary environment at the periphery of the detrital talus of the Koněprusy reef.

All figured specimens are housed in the repository of the Palaeontological Department of the National Museum (Museum of Natural History) Prague, catalogue L.

## SYSTEMATIC PART

#### Class: Crinoidea J. S. Miller, 1821

#### Subclass: Cladida Moore et Laudon, 1943

## Family: Petalocrinidae Weller et Davidson, 1896

#### Genus: Vadarocrinus Prokop, 1984

TYPE SPECIES: *Vadarocrinus vassa* Prokop, 1984, Lower Devonian, Pragian, Koněprusy Limestone, Koněprusy, Bohemia, Czech Republic.

EMENDED DIAGNOSIS: Brachials completely fused into a single, robust, fan-shaped arm plate, with slender ambulacral grooves on its ventral side. Plates variable in shape (see Fig. 3), slightly to strongly bent in lateral view. Distal margin of plates rounded or undulate. Articulation facet broad, smooth, with small, rounded, centrally located orifice of axial canal. Ambulacral grooves on such plates symmetrical, endotomously branching three times. Dorsal wall of arm plates weakly concave, smooth.

REMARKS: While the Silurian petalocrinid arm plates are relatively fragile and their ambulacral groove system is more intricated, the arm plates of Devonian representatives are robust and their ambulacral system is less complex due to the reduction of grooves. The reason probably lies in the fact that almost all fossil remains of *Vadarocrinus vassa* are restricted to specific carbonate sediments representing particularly high-energy life conditions on the surface of the algal and coral core of the Koněprusy bioherm as well as strong water movement in the outer parts of the morphologically differentiated reef.

#### Vadarocrinus vassa Prokop, 1984

(Figs. 2, 4/1-8)

1984 Vadarocrinus vassa gen. et sp. n.; Prokop 1984: 187, pl. I, figs. 1-3,1 text-fig.

HOLOTYPE: Isolated arm plate NMP L 20040, figured by Prokop (1984) in pl. 1, figs 1-3.

TYPE HORIZON: Koněprusy Limestone, Pragian, Lower Devonian.

TYPE LOCALITY: Koněprusy, "Zlatý kůň hill", Velkolom Čertovy schody - Západ quarry, north wall of the fifth bench.

MATERIAL: The holotype and eight isolated arm plates from the type locality.

DESCRIPTION: See emended diagnosis of the genus.

REMARKS: The robustness and strong arching of some fan-shaped arm plates indicate a possibility, that *Vadarocrinus vassa* had a short, massive stem (and large holdfast) and that some of the distal border of the heavy fan-shaped arms leaned (in extreme cases) against the relatively steady, coarse-detrite substrate.



Fig. 4: Vadarocrinus vasa Prokop, 1984: Variability of the isolated fan-shaped arm plates. 1a – NMP L 40515, isolated distal part of an arm plate, ventral view. 1b – dtto, dorsal view. 2a – NMP L 40516, irregulary developed arm plate, ventral view. 2b – dtto, dorsal view. 3a – NMP L 40517, arm plate with undulate distal margin, ventral view. 3b – dtto dorsal

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view. 4a – specimen NMP L 40522, ventral view. 4b – dtto, dorsal view. 5a – NMP L 40518, extremely bended arm plate, dorsal view. 5b – dtto, ventral view. 5c – dtto, ventrolateral view. 6a – NMP L 40521, arm plate with central notch at distal margin and extremely deep, regularly branched ambulacral furrows, ventral view. 6b – dtto, dorsal view 7a – NMP L 40520, anomalous arm plate vith reduced ambulacral furrows, dorsal view. 7b – dtto, ventral view. 7c – dtto, lateral view. 8a – NMP L 40519, irreguraly developed arm plate, ventral view. 8b – dtto, dorsal view.

Lower Devonian, Pragian, Koněprusy Limestone. Koněprusy, "Velkolom Čertovy Schody -Západ" quarry.

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