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A morid cod (Gadiformes, Moridae) from the early Oligocene deposits of the Czech Republic

Un moridé (Gadiformes, Moridae) en provenance de dépôts de l'Oligocène inférieur de la République tchèque

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ABSTRACT

An articulated skeleton of a morid cod (Gadiformes, Moridae) is described from the Oligocene Menilitic Formation, exposed in the Kelč-Strážné locality (Moravia; Subsilesian Unit; Western Carpathians). The fossil, preserved in dorsal view, is only partially complete, and lacking most of the postcranial part of the body. It shows a suite of features that clearly separate it from other gadiform taxa frequently found in the Oligocene-Miocene deposits of the region, and suggest its attribution to the family Moridae (mainly due to the general architecture of the skull). Due to the incompleteness of the fossil, it is not possible to define precisely its taxonomic status. However, the possession of two pterotic processes suggests that the fossil documented herein represents a member of the "*Pseudophycis* Group" (according to Paulin, 1989), related to the genus *Lotella* Kaup, 1858.

Mots clés :
Gadiformes
Moridae
"Groupe *Pseudophycis*"
Formation Ménilitique
Oligocène

RÉSUMÉ

Un squelette de moridé (Gadiformes, Moridae) en connexion anatomique est décrit dans la formation ménilitique oligocène, affleurant dans la localité de Kelč-Strážné (Moravie, Unité sous-silésienne, Carpates occidentales). Le fossile, conservé en vue dorsale, n'est que partiellement complet, et la majeure partie postcrânienne du corps manque. Il montre un ensemble de caractères qui le différencie clairement des autres gadiformes fréquemment trouvés dans les dépôts oligo-miocènes de la région, et suggère son attribution à la famille des Moridae (principalement en raison de l'architecture générale du crâne). Du fait qu'il est incomplet, le statut taxonomique précis de ce fossile n'est pas définissable. Par ailleurs, la présence de deux processus ptérotiques suggèrent que le fossile présenté ici représente un membre du « groupe *Pseudophycis* » (selon Paulin, 1989), lié au genre *Lotella* Kaup, 1858.

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1. Introduction

Oligocene fish fossils of Moravia (Czech Republic; western Carpathians) have been described in numerous papers dealing with various groups of Elasmobranchii and Teleostei (e.g., Gregorová, 2011, 2013 and references therein), but only a few of these finds can be attributed to the order Gadiformes, and all of them belong to the single family Merluciidae (namely, the genus *Palaeogadus* von Rath, 1859; Gregorová, 2013; Gregorová and Požár, 2003), although otoliths, as usual, suggest a much higher diversity of this order during the Oligocene within this region (for example, otoliths from the early Oligocene Pouzdřany Unit indicate the presence of Bregmacerotidae, Macrouridae, Melanonidae, Gadidae, Merlucciidae, Phycidae, and Lotidae; see Brzobohatý and Krhovský, 1998). Also, the coeval sediments from other parts of the Paratethys sedimentary basins preserved a wider diversity of gadiformes, including representatives of the family Moridae.

Moridae is a relatively small family with about 108 extant species, classified within 18 genera (Nelson et al., 2016). Přikryl (2015) briefly summarised the main skeletal fossil records of the family globally. Within the Paratethys, some of the taxa described earlier as Moridae (based mainly on results published by Daniltshenko, 1953, 1960) were later reconsidered and transferred to the Gadidae (for discussion, see Świdnicki et al., 1990), Bregmacerotidae or left *incertae sedis* (Přikryl et al., 2016, Prokofiev, 2005, respectively). Nevertheless, the Oligocene deposits of the Paratethys also preserve remains of true morids, today referred to *Eophycis* Jerzmańska, 1968. Up until now, three species of the genus have been described from various parts of the Paratethys (Jerzmańska, 1968; Pharisat, 1991; Rozenberg and Prokofiev, 2004). The definitive attribution of any fossil to this family is difficult because the significant characters are rarely preserved in fossil material (namely the contact of the anteriorly enlarged horns of the gas bladder and otic capsules, the horizontal septum of the gas bladder, the specific morphology of the otoliths, the unique architecture of the caudal skeleton, and, most likely, the possession of a parasphenoid with a transversely aligned ascending process, e.g., Fitch and Barker, 1972; Howes, 1991; Paulin, 1983, 1988, 1989; Svetovidov, 1967; however, *in situ* otoliths identified in *Eophycis* represent key arguments for the correct classification (Rozenberg and Prokofiev, 2004). Although the newly described fossil is only partially complete, it clearly differs from *Eophycis*. The main goal, therefore, is to describe and to document this new record of the family Moridae from the Rupelian deposits of Moravia (Czech Republic).

2. Material and methods

The material under consideration was discovered by Mr. Bronislav Novosad at the "Kelč-Strážné" locality in 2008. The fossil was partially prepared using small scalpels or needles. Examination was made of the fossil specimen, as well as plaster casts or latex peels (in some cases, coated with ammonium chloride for better visibility of features). Photographs were taken using a Canon EOS 1000D camera attached to a Leica MZ6 stereomicroscope. The drawings were prepared using a camera lucida drawing tube and measurements of the specimens were based on the photos. The comparison with fossil and recent species of Moridae is based on the literature.

The fossil is housed in the collection of the National Museum in Prague (NMP).

Anatomical abbreviations: boc: basioccipital; br: branchiostegal rays; cl: cleithrum; co: circumorbitals; den: dentary; ect: ectopterygoid; end: endopterygoid; epio: epiotic; epn: epineural; exo: exoccipital; fr: frontal; hy: hyomandibula; le: lateral ethmoid; lpr: lower process of hyomandibula; mes: mesethmoid; mtp: metapterygoid; mx: maxilla; na: nasal; op: opercle; P: pectoral fin; pa: palatine; par: parietal; pcl: postcleithrum; pmx: premaxilla; pop: preopercle; prar: articular process of premaxilla; pras: ascending process of premaxilla; prop: opercular process of hyomanibula; prpm: postmaxillary process of premaxilla; pst: posttemporal; pter: pterotic; q: quadrate; r: ribs; rad: radials; scl: supracleithrum; soc: supraoccipital; sph: sphenotic; uh: urohyal; V: pelvic fin; vo: vomer; vert: vertebrae.

3. Geological note

The Kelč locality (Moravia, Western Carpathians; Subsilesian Unit) is historically well known for providing a rich fossil record (e.g., Kalabis, 1975; Knobloch, 1969; Prokop et al., 2007). Fossils were originally collected at "Kelč-Zámek" (Kalabis, 1975), but this area is now built up and as such is no longer accessible. All recently collected materials referred to the Kelč locality originate from the "Kelč-Strážné" area, situated about 1.5 km northwest of the city centre. Fragments of Dynów marlstones (one of the litho-stratigraphic members of the Menilitic Formation; for details regarding stratigraphy, see Bubík et al., 2016) are found in ploughed fields or meadows, and although no larger slabs of the sediments are available, the locality has provided relatively plentiful material (ongoing research).

4. Systematic section

Subdivision Teleostei Müller, 1845 *sensu* Arratia, 1999
Order Gadiformes Goodrich, 1909 *sensu* Endo, 2002
Family Moridae Goode and Bean, 1896
Genus et species unidentified
(Figs. 1–4a)

Referred specimens: NMP Pv 10054a and 10054b (part and counterpart).

Description: The fossil preserves the anterior part of the body and the dorso-ventrally flattened skull of a small fish. The length of the preserved portion is approximately 38 mm (measured on specimen NMP Pv 10054a), with an estimated standard length of not more than 80 mm.

The neurocranium is preserved in dorsal view. The frontal is narrow in the interorbital area, slightly wider in the ethmoid region and considerably wider in the postorbital region, making the lateral margins of the frontal broadly concave. Some parts of the supraorbital margin have a lobular, segmented appearance. The anterior-most tips of the frontal extend antero-laterally. The skull roof bears an X-shaped skull ridge (Figs. 3A, 4A). In the midline, anterior to the frontals, the remains of the mesethmoid are

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