AN ANNOTATED LIST OF THE OLIGOCENE FISH FAUNA FROM THE OSÍČKO LOCALITY (MENILITIC FM.; MORAVIA, THE CZECH REPUBLIC)

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Abstract. The present article provides an annotated list of the Oligocene fish fauna from the Menilitic Formation of a new Osíčko locality (Silesian Unit), collected from two different parts of the formation, i.e., Subchert Member and Dynów Member. The specimens were classified as Keasius sp., Elasmobranchii gen. et spec. indet., Scopeloides glarisianus, Sardinella sardinites, Clupeidae gen. et spec. indet., “Glossanodon” musceli, Anenchelum glarisianum, and Perciformes gen. et spec. indet. The composition of the assemblage suggests meso-to benthopelagic environments.

Elasmobranchii; Teleostei; Oligocene; Moravia; Menilitic Formation.

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Introduction

The Menilitic Formation is a distinctive lithostratigraphic unit represented by Lower Oligocene (Rupelian) sediments originated from the Paratethys area. These sediments, developed in the Ždánice, Subsilesian and Silesian Units, are exposed at many Moravian localities (and other parts of the Western Carpathians) and have yielded numerous fish fossils (for reviews see e.g., Roth 1981, Stráník 1981).

Research on these fossil fish began in the 19th century – the oldest reference is possibly Heckel (1850) and is still continuing at the present time. They are represented by many Teleostei and Selachii families (for a review and complete list of the references see Kalabis (1981) and Gregorová (2011)).

Even after such long-term research new localities may provide information which can support (or occasionally contest) previous generally accepted results and ideas. The main goals of this contribution are: to briefly describe specimens from the Osíčko locality and comment on them within the context of other Moravian fish localities.

Material and methods

Specimens were collected in 2011 from the new Osíčko locality which is situated in the south of the village of Osíčko. The outcrop is discontinuously exposed on the right bank of the Moštěnka Creek (text-fig. 1; 49° 24’ 50.761294” N, 17° 45’ 14.2363071” E). The deposition is represented by sediments of the Menilitic Fm. (Silesian Unit, Menilite-Krosno Group of nappes) and specimens were collected from two collecting points (text-fig. 1C; P1 and P2). The sediments at point P1 are represented by grey to grey-brown claystones, and calcareous shales corresponding to the Subchert Member. Point P2 is situated at a higher stratigraphical position with exposed light brown marlstones (their lithology is typical for the Dynów Member). For details regarding the geology and sedimentology of the formation see Stráník (1981), Krhovský et al. (2001), and Švábenická et al. (2007).

The fossils are preserved in the bedding planes (rarely in the middle of the sediment layer) and they are occasionally accompanied by ichnofossils, such as regurgitates, coprolites and traces of burrowing (the ichnofossils are not described herein).

The specimens were left unprepared, or with only slight mechanical preparation using needles. They are housed in the collection of the National Museum, Prague (NM) under the following numbers: Pc 02870 – Pc 02892.

Abbreviations: SL – standard length.

Systematic palaeontology

Family Cetorhinidae Gill, 1862
Genus Keasius Welton, 2013

Keasius sp.

Material: NM Pc 02878a, b, Pc 02879; collected from the Dynów Mb.

Remarks: The specimens are represented by well preserved distal parts of isolated branchiospines, their half-elliptical bases are preserved only as an imprint on the surface of the sediment. Due to incomplete preservation, the specimens are classified using open nomenclature.
The Oligocene – middle Miocene branchiospines were traditionally classified in the genus *Cetorhinus* BLAINVILLE, 1816, in particular as *C. parvus* LERICHE, 1910. Welton (2013), however, transferred this species into the new genus *Keasius*. The specimens were found in many Moravian localities, namely Kelč, Špičky, Litenčice, Nikolčice, Mouchnice, Rožnov pod Radhoštěm, and Nítkovice (Kalabis and Schultz 1974, Kalabis 1975a, b, Schultz 1982, Gregorová 1988, 2011, 2012, Gregorová and Požár 2003).

Branchiospines are usually found mainly as isolated elements, but articulated specimens are also known (see Hovestadt and Hovestadt-Euler 2012). The recent *C. maximus* (GUNNERUS, 1765) is a coastal pelagic and semi-oceanic filter-feeder of the boreal to warm-temperate waters (Compagno 2002); the distribution in the water column is usually in the range of 200 to 2000 m, but they have also been sighted in the surface waters and in the oceanic basins at 2000 to 4000 m (Compagno 2002).

**Elasmobranchii gen. et sp. indet.**

Text-fig. 2A

**Material:** NM Pce 02876a, b, Pc 02883a, b, Pc 02884, Pc 02885; collected from the Dynów Mb.

**Remarks:** The specimens are represented by isolated amphicelous vertebrae. They appear as rounded objects with a small notochordal foramen in the middle region. The maximum size does not exceed 9 mm in diameter. They are distributed in several strata of the Dynów Mb., usually accompanied by ichnofossils and remains of “Glossanodon” skeletons. Due to the lack of any other preserved morphological features, more exact determination is not possible. Isolated elasmodbranchian vertebrae centrae were described only from the Litenčice locality in the Moravian region as *Keasius parvus* and *Carcharias* sp. (Gregorová 2011).

**Family Gonostomatidae Gill, 1893**

**Genus Scopeloides WETTSTEIN, 1886**

**Scopeloides glarisianus** (AGASSIZ, 1844)

Text-figs 2B, C

1886 *Scopeloides glaronensis* (AGASSIZ); Wettstein, p. 56, taf. 2, figs 7–13.
1901 *Scopeloides glarischenus* (AGASSIZ); Woodward, p. 255.
1908 *Thriisopteroides ? minutus*; Priem, p. 6, pl. 1, figs 5–6.
1908 *Copeichthys morgani*; Priem, p. 8, pl. 1, figs 9–11.
1929 *Mrazecia mrazeci*; Pauč, p. 115.
1934 *Mrazecia mrazeci* PAUCĂ; Pauč, p. 608, text-figs 10–11, pl. 2, figs 4–5, pl. 3, fig. 6.
1948 *Scopeloides glarischenus* (AGASSIZ); Kalabis, p. 136, pl. 1, fig. 1.
1960 *Scopeloides glarischenus* (AGASSIZ); Danilchenko, p. 27, text-figs 3, pl. 2, fig. 1.
1967 *Scopeloides glarischenus* (AGASSIZ); Arambourg, p. 43, text-figs 14, 15, 17, pl. 2, figs 2–7, 9.
1968 *Scopeloides glarischenus* (AGASSIZ); Jerzmańska, p. 395, text-fig 3.
1977 *Scopeloides glarischenus* AGASSIZ; Ciobanu, p. 67, pl. 16, fig. 1.
1977 *Scopeloides paucei*; Ciobanu, p. 68, pl. 17, fig. 1.
1989 *Scopeloides glarischenus* (AGASSIZ, 1844); Gregorová, p. 89, pl. 7.
1989 *Scopeloides sp.;* Gregorová, p. 89, pl. 1, fig. 1.
1997a *Scopeloides glarischenus* (AGASSIZ); Gregorová, p. 124, text-figs 1–5, pl. 1, figs 1–5, pl. 2, figs 1–6.
2005b *Scopeloides glarischenus* (AGASSIZ); Prokofiev, p. S99, figs 5–6.
2011 *Scopeloides glarischenus* (AGASSIZ); Gregorová, p. 9, pl. 3, fig. 2.

**Material:** NM Pce 02887a, b, Pc 02888; collected in the Subchert Mb.

**Remarks:** The species is represented by isolated dentary and a disarticulated skeleton at the locality. Although
the dentary is crushed, it is possible to recognize its low elongated shape with typical dentition: small teeth alternate with large teeth (their tips are marked by white arrows in text-fig. 2B). The disarticulated skeleton consists of only 15 vertebrae (others are not preserved) and a strongly disarticulated head and pectoral girdle bones. The specimen was determined on the basis of morphology of the cleithrum, the postcleithrum, and organization of the caudal skeleton. Other morphological data are not sufficiently preserved. The species was found at the Moravian localities Bohuslavice, Kélč, Špičky, Horní Těšice, Mouchnice, Litenčice, Nikolčice, Nosislav, Židlochovice, Křepice, Rožnov pod Radhoštěm, and Loučka (Kalabis 1948, 1975a, b, Kalabis and Schultz 1974, Gregorová 1988, 1989, 2011, Přikryl et al. 2012 and unpublished data).

The species was characterized as mesopelagic or bathypelagic (Prokofiev 2005b or Jerzmańska 1968 respectively), similar to the recent genus *Gonostoma*.

Text-fig. 2. A – Elasmobranchii gen. et spec. indet. specimen NM Pc 02876b; B – Scopeloides glarisianus dentary NM Pc 02888 (the white arrows mark the tips of the “fang-like” teeth); C – S. glarisianus disarticulated skeleton NM Pc 02887a; D – Sardinella sardinites scale NM Pc 02886; E – Clupeidae gen. et spec. indet. articulated skeleton without head NM Pc 02889; F – Anenchelum glarisianum body fragment NM Pc 02880a; G – Percoidi gen. et sp. indet. preoperculum (G-1) and its interpretation (G-2) NM Pc 02891. The arrow shows the enlarged spine in the angle between rami verticalis and horizontalis. Abbreviations: cl – cleithrum; op – operculum; pel – postcleithrum.
Material: NM Pc 02870a, b – Pc 02875a, b, Pc 02877a, b; collected from the Dynów Mb.

Remarks: The collected specimens are rather fragmentary, with a long slender body and maximal body depth close behind the head. It is possible to recognized ca. 47 vertebrae (22+25). The fin rays are insufficiently preserved and their numbers are not clearly discernable. The pectoral fin is totally unreadable. The dorsal fin is situated in the middle of the body length (with ca. 10 rays); the ventral fin (with more than seven rays) is shifted slightly anteriorly. Although the anal fin is not completely preserved it is possible to recognized ca. 7 rays. The skull bones are crushed and therefore, hardly readable (it is however possible to identify some of them, or their general positions; see text-figs 3C-2 and 3D). The fragmentary caudal skeleton (text-fig. 3E) is in accordance and confirms results published earlier by Danilchenko (1980) and Carnevale et al. (2006).

Clupeidae gen. et sp. indet.

Material: NM Pc 02889; collected from the Subchert Mb.

Remarks: The specimen is represented by an articulated postcranial section of a skeleton; with ca. 24 preserved vertebrae and insufficiently preserved fins. The body is covered by typical clupeid scales which are also preserved in the surrounding sediment. A more detailed description is not possible until preparation of the specimen is completed which may reveal other features.

Family Argentinidae BONAPARTE, 1846 vel Osmeridae REGAN, 1913

Genus Glossanodon GUICHENOT, 1867

“Glossanodon” musceli (PAUCĂ, 1929)

Material: NM Pc 02870a, b – Pc 02875a, b, Pc 02877a, b; collected from the Dynów Mb.

Remarks: The collected specimens are rather fragmentary, with a long slender body and maximal body depth close behind the head. It is possible to recognized ca. 47 vertebrae (22+25). The fin rays are insufficiently preserved and their numbers are not clearly discernable. The pectoral fin is totally unreadable. The dorsal fin is situated in the middle of the body length (with ca. 10 rays); the ventral fin (with more than seven rays) is shifted slightly anteriorly. Although the anal fin is not completely preserved in any of the specimens, the caudal peduncle in specimen Pc 02780a appears to be formed by 6–7 vertebrae (judging by the last preserved anal fin ray). The skull bones are crushed and therefore, hardly readable (it is however possible to identify some of them, or their general positions; see text-figs 3C-2 and 3D). The fragmentary caudal skeleton (text-figs 3B–1, 2) was tentatively reconstructed (text-fig. 3B–3).

The specimens were traditionally classified as Glossanodon musceli (Argentinidae), but Prokofiev (2005a) revised Caucasian and Turkmenistan Procatanhophterygii on the basis of important morphological features which have been overlooked for many years. His results showed that his specimens pertain to the family Osmeridae (rather than to the Argentinidae) and were thus placed in the new genus Austromallotus.

Material from the Osičko locality cannot be similarly classified mainly due to the unsatisfactory preservation. The important morphological features, such as (1) presence of the notch on the dorsal edge of the operculare, (2) transformation of the neural spines on the anterior abdominal vertebrae (significant shortening is not present in all specimens, or it is not clearly visible), and (3)
arrangement of 1st and 2nd infraorbitals (if they are in contact or not) are not recognizable, or they were destroyed or are different from those described by Prokofiev (2005a). Furthermore, the studied specimens show a longer caudal peduncle (6–7 vertebrae) and slightly different morphology of the caudal skeleton than in A. musceli (according to Prokofiev 2005a: fig. 6c). Thus it is impossible to unify both forms and the specimens described herein are classified traditionally as members of the genus "Glossanodon". A higher taxonomical position of the taxon...
is uncertain due to the lack of clarity regarding construction of the circumboreal series.

The species (sensu Pauč, 1929) is distributed in many Moravian localities, such as Litenčice, Kelč, Špičky, Nikolče, Mouchnice, Rožnov pod Radhoštěm and others (Kalabis and Schultz 1974, Kalabis 1975a, b, Gregorová 1988, 2011, Gregorová and Požár 2003).

As was mentioned above, the construction of the circumboreal series is unclear and thus also any concrete higher taxonomic position. Consequently it is difficult to estimate the bathymetric demands of these specimens. If we take into account the original classification (i.e., Argentinidae) these are found at a depth of 1000 m, but adults are commonly taken from the margin of the continental shelves (Weitzman 1997).

**Family Trichiuridae Rafinesque, 1810**

**Genus Anenchelum Blainville, 1818**

**Anenchelum glarisianum Blainville, 1818**

- Text-fig. 2F

1818 Anenchelum glarisianum; Blainville, p. 314.
1844 Anenchelum glarisianum DeBlainville; Agassiz, vol. 5, p. 70, pl. 37, figs 1–2.
1850 Lepidopides leptospondylus; Heckel, p. 240, pl. 22.
1859 Anenchelum Glarisianum Blainville; von Rath, p. 122, pl. 3, fig. 5.
1886 Lepidopus glaronensis; Wettstein, p. 42, pl. 5, figs 1, 3–6, 9–10, pl. 6, figs 1–3, 5–8.
1901 Lepidopus glarisianus (Blainville); Woodward, p. 477.
1934 Lepidopus glarisonis (Blainville); Pauč, p. 615, text-figs 15–17, pl. 3, fig. 3.
1958 Lepidopus glarisianus (Blainville); Jonet, p. 58, pl. 6, fig. 2.
1960 Lepidopus glarisonis (Blainville); Danilechenko, p. 143, text-fig. 29, pl. 14, figs 1–2.
1968 Lepidopus glarisonis (Blainville); Jerzmańska, p. 463, text-fig. 23, pl. 7, fig. 1.
1977 Lepidopus glarisonis (Blainville); Ciobanu, p. 119, pl. 40, fig. 1.
1977 Anenchelum glarisianum Blainville; Ciobanu, p. 120, pl. 41, figs 1–2.
1991 Lepidopus glarisonis (Blainville); Pharisat, p. 60, text-figs 47–50.
2003 Anenchelum glarisonis Blainville; Gregorová and Požár, p. 200, photos 8–10.
2010 Anenchelum glarisonis Blainville; Gregorová, p. 142, photos 1–11.
2011 Anenchelum glarisonis Blainville; Gregorová, p. 17, pl. 6, figs 1–2.

**Material:** NM Pe 02880a, b, c, Pc 02881a, b, Pc 02882a, b; collected from the Dynów Mb.

**Remarks:** The specimens are represented by fragments of the body and a disarticulated head. The elongated body is composed of vertebrae with straight neural spines which are articulated with the pterygiophores of the dorsal fin. Ribs are attached to the ventral margin of the vertebrae. In the disarticulated head it is possible to recognize the premaxillare, maxillare, and dentale. The teeth are large, with marked striation.

The species is common in Moravian localities, such as Litenčice, Kelč, Špičky, Nikolče, Mouchnice, Moušník, Nítkovice, Jestrabice, Kožušice, Rožnov pod Radhoštěm (Kalabis and Schultz 1974, Kalabis 1975a, b, Gregorová and Požár 2003, Gregorová 2010, 2011).

Today living trichiurids are benthepelagic predators of the continental shelf and slope with depth up to 2000 m (in tropical and temperate regions; Gago 1998).

**Perciformes gen. et sp. indet.**

- Text-fig. 2G

**Material:** one specimen NM Pe 02891; collected from the Subchert Mb.

**Remarks:** The specimen is represented by an isolated preoperculum, preserved partly as an imprint, partly as a fossilized bone. Its ramus horizontalis is short (and robust) whereas the ramus verticalis is about twice longer. Both arms join together at almost a right angle. The posterior edge of the preoperculum is irregularly serrated, with one enlarged spine at the flexion point (see arrow in text-fig. 2G). The distal part of the enlarged spine is incompletely preserved. Classification of the specimen is difficult even though its morphology is relatively specific and it is comparable with some percichthyids, moronids, or polyprionids (see Schultz 2000: pl. 1, figs 18, 20, pl. 2 figs 29, 32). Although it is not possible to determine the specimen precisely, it is possible to say, that it does not belong to the species "Serranus" budensis.

**Discussion**

As was pointed out by Gregorová (1997b), the fossil fish remains found in the Subchert Mb. of the Moravian localities are very rare. The published material is concerned with the Litenčice locality (Gregorová 1997b, Bubík et al. 2006) where the assemblage is represented by Myctophidae, Trichiuridae, Clupeidae, Gadidae, Phosichthyidae, and Teleostei indet. and accompanied by remains of terrestrial flora. All these findings are related to the Pteropod Horizon. Baciu (2010) reported Keasius parvus, Clupea, Vinciguerria, Anenchelum, Gadidae, Palimphyes, and Myctophidae from the same locality and horizon. Brzobohatý (1981) described clupeid scales from the Subchert Mb. captured in the Křepeč – 5 borehole.

Clupeidae, Sardinella sardinates, Scopeloides glarisonis, and an unspecified perciform were found in the Subchert Mb. at the Osičko locality. The fossils are accompanied by undetermined fish bones (numerous debris), and fragments of carbonized and mineralized (?) malachitized) organic material. The Subchert Mb. documents isolation of a sedimentary area from the World Ocean (Švábenická et al. 2007) which resulted in an insufficiently ventilated environment (Báldi 1980) which was then followed by mass mortality as documented by the Pteropod Horizon (Křhovský 1993).

The assemblage collected from the Dynów Mb. is characterized by the presence of Keasius sp., undetermined elasmobranchs and 3 types of Teleostei fishes, namely Sardinella sardinates, "Glossanodon" musceli, and Anenchelum glarisianum. These are commonly accompanied by fishes with light organs (mainly Myctophidae and Gonostomatidae) and other additional types of fishes at other Moravian localities (for conclusive data and the latest results see
Gregorová 1997b, 2011). The depletion of fish with light organs maybe an artificial result and more related to the limited number of findings.

From a bathymetric point of view, in accordance with other Moravian localities, the fish composition suggest mesopelagic to benthopelagic environments.

From the biostratigraphical point of view (sensu Kotlarczyk and Jerzmańska 1976, Kotlarczyk et al. 2006), the presence of Scopeloides glarissianus (in the Subchert Mb.) suggests the beginning of the IPM1 Zone while the “Glossanodon” fossils (in the Dynów Mb.) indicate the IPM2 Zone. On the other hand it is necessary to mention the fact that this biostratigraphic division is not completely valid (if at all) and in some parts of the Paratethys individual zones obviously overlap (Gregorová 1997b).

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