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Preliminary report on the Middle Triassic sharks from Lugașu de Sus, Romania

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Abstract. Fish remains are present in the Middle Triassic sediments from Lugașu de Sus, Bihor County, North - Western Romania. Previous fish record included only a scale of *Colobodus* sp. (Jurcsak, 1978). The ichthyoliths recovered up to now from this locality represent a typical shallow marine assemblage, consisting of both chondrichthyan (*Lissodus*, *Palaeobates*) and osteichthyan (*Colobodus* sp.) fish fauna. *Lissodus* sp. is the first record of the genus from the Triassic of Romania.

Introduction

The Middle Triassic locality Lugașu de Sus is primarily known for its rich marine reptile fauna, including the prolacertiform *Tanystropheus biharicus* Jurcsak 1975. Marine reptiles: sauropterygians and cyamodontoid placodonts have been described by Jurcsak (1975, 1976, 1977, 1978), Popa et al. (1996) and Posmosanu (2008).

Microvertebrates from Lugașu de Sus have been studied only recently, previous work having dealt especially with the macrovertebrate remains. The

preliminary analyses reveal that the sediments are very rich in fish remains, given the small size of the prepared samples. Layers no. 3 and no. 4 are the most abundant in ichthyoliths, consisting of osteichthyan and chondrichthyan teeth, scales and dermal denticles. As preparation work is undergoing, a preliminary analysis of the shark remains is presented here, while the actinopterygian fishes will be the subject of another paper.

Previously described or cited fish from the Middle Triassic of Bihor

Previous work on the Lugaşu de Sus fauna revealed the presence of an osteichthyan fish, represented by a single scale of *Colobodus* sp. (Jurcsak, 1978). The other well-known Middle Triassic locality in Bihor County is Peştiş, situated in the vicinity of Lugaşu de Sus, which has yielded a more diverse fish fauna. Palaeontologist Tiberiu Jurcsak identified 3 selachian and 5 osteichthyan genera from Peştiş. The first report of selachian and osteichthyan genera from the Middle Triassic site of Peştiş (Jurcsak, 1976) was based on a tooth identified as *Hybodus reticulatus* and a scale of *Colobodus* sp. Latter, Jurcsak (1977) listed the selachians *Hybodus* sp. and *Acrodus* sp., as well as a chondrosteian fish identified as cf. *Birgeria* sp. Jurcsak (1978), and completed the list of ichthyofauna with the elasmobranchs *Hybodus* cf. *multiconus*, *Palaeobates angustissimus*, and the actinopterygians *Birgeria* sp., *Serrolepis* cf. *suevicus*, *Gyrolepis quenstedti*, *Saurichthys* sp, *Colobodus* sp. and *Ganoidea* indet.

Material and methods

The specimens discussed in this paper have been collected during the joint French-Romanian fieldwork, organized by Radu Huza and Dr. Jean Michel Mazin (University of Poitiers) in the summer of 1995. Eight different lithological layers were recorded for Locus Huza, Lugaşu de Sus, consisting of grey limestones, marly limestones or lumaschelles. Limited number of samples (approximately 1 kg of calcareous rocks for each layer) from the first four layers were subjected to acid preparation, respectively to weak (<10%) acetic acid. The disintegrated material was rinsed and sieved through 0,2 mm and 1 mm screens in order to separate the micro-faunal remains. This process was repeated several times. The fraction retained on the sieve was dried out and sorted under a stereomicroscope. The invertebrate and fish remains were picked from the residue using a “000” camel-hair brush and examined using a NIKON SMZ 1000 stereomicroscope.

All the specimens described in this paper are deposited in the collection of the Department of Natural Sciences, Țării Crișurilor Museum, Oradea.

Abbreviation: MTCO – Țării Crișurilor Museum Oradea.

Systematic palaeontology

Class Chondrichthyes Huxley, 1880
Subclass Elasmobranchii Bonaparte, 1838
Cohort Euselachii Hay, 1902
Order Hybodontiformes Zangerl, 1981
Superfamily Hybodontoidea Owen, 1838
Family Polyacrodontidae Gluckman, 1964
Genus *Palaeobates* Meyer, 1849
Palaeobates sp.
(Fig. 1 A, B)

Material: 2 isolated crowns, none of which preserved the root.

Description: The fragmentary crown MTCO 25.540/2 is a lateral tooth and has an oval shape in occlusal view. The occlusal crest is poorly developed, running longitudinally through the crown. Occlusally, the crown ornamentation consists of small, irregular, oval pits, an ornamentation typical of *Palaeobates*.

The tooth MTCO 25.542 is small; the mesiodistal extremities of the crown are more angular. The ornamentation on the occlusal surface is also composed of small, irregular oval hollows, lacking the occlusal crest.

Although these teeth resembles *Palaeobates angustissimus* Agassiz, 1838, a common species in the Lower and Upper Muschelkalk of Europe, the fragmentary nature of the specimens and the absence of roots make impossible to assign them with certainty to a species, so they are identified as *Palaeobates* sp.

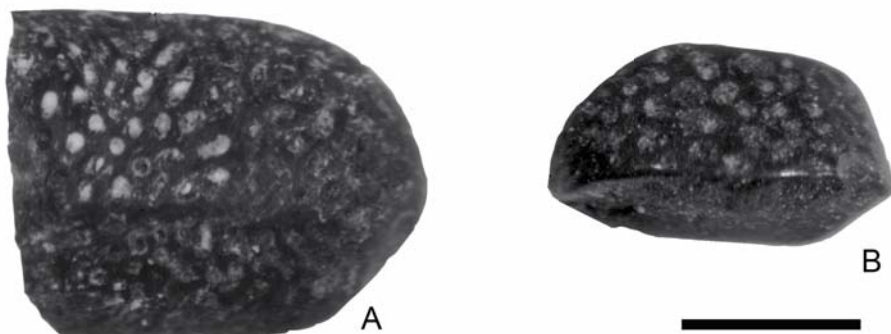


Figure 1. *Palaeobates* sp. teeth, occlusal view. A. MTCO 25540/2; B. MTCO 25542.
Scale bar indicates 1 mm.

Family ?Lonchidiidae Herman, 1977

Genus *Lissodus* Brough, 1935

Type species: *Hybodus africanus* Broom, 1909

Comments: Some authors (Cuny et al., 1998; 2001) preferred the use of histological analyses by cutting thin section through the tooth crowns. Others Blazejowski (2004) showed that histological analyses did not provide taxonomic information evidencing the coexistence of Ortho- and Osteo-dentine within the single taxon, *Lissodus angulatus*. Therefore, in the case of the Lugaşu de Sus specimens, the studied material being so limited, morphological description has been preferred. The terminology used to describe the *Lissodus* teeth in this paper (see Fig. 2) follows Duffin (1985).

The scarcity of articulated specimens of *Lissodus* might be an explanation for its controversial systematic position. Some authors placed *Lissodus* and *Polyacrodus* in the Polyacrodontidae (Delsate and Duffin, 1999; Cuny et al., 1998; Milner and Kirkland, 2006), others included it in Lonchidiidae (Rees and Underwood, 2002; Blazejowski, 2004). Rees (2008) considered that *Lissodus* has

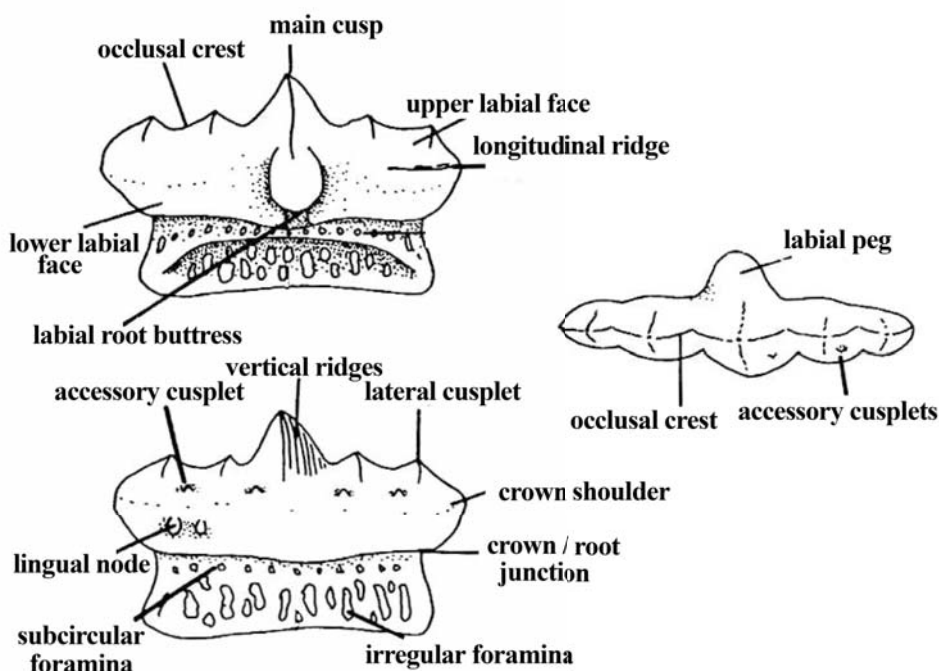


Figure 2. Terminology used for morfological description (modified after Duffin, 1985).

some unique characters but also shares characters with both the Lonchidiidae and Acrodontidae, therefore left it without family assignment.

Since the phylogeny of *Lissodus* is still under question, the author of this paper left it as questionable Family Lonchidiidae here.

Lissodus sp.

(Fig. 3)

Material: 4 isolated crowns and one fragmentary crown (MTCO 25025/1-5). None of the specimens preserved the root.

Detailed description: antero-lateral tooth MTCO 25025/1 is one of the best preserved teeth. The crown has a mesio-distal length of 2,2 mm, a labio-lingual width of 0,9 mm and a crown height of 0,7 mm. The crown shape is almost triangular in occlusal view, a moderate labial protuberance (labial peg) can be observed, where the crown is the widest. The labial peg projects at almost a right angle to the long axis of the crown. There is an evident occlusal crest which runs mesio-distally through the length of the crown, clearly separating the lingual side from the labial side of the crown. The main cusp is situated centrally (central cusp) and is slightly inclined labially and mesially (presumed). In labial view the central cusp is low and is flanked by two rather weak lateral cusplets, which decrease in height. The cusplets are better preserved mesially, the lack of the cusplets distally is due to preservation. A strong vertical ridge descends the central cusp labially from its apex toward the labial peg, reaching the crown shoulder and is the single vertical ridge on the labial crown facet. There is a longitudinal ridge around the crown shoulder, surrounding labially and lingually the tooth at the crown shoulder. The labial part of the longitudinal ridge presents short vertical striations along the crown shoulder, especially on the labial protuberance.

Comparison of *Lissodus* sp. from Lugașu de Sus with other Triassic species from Europe

The stratigraphic range of the genus *Lissodus* is documented from Late Devonian (Frasnian) to Late Cretaceous (Maastrichtian) marine, brackish and freshwater deposits (Fisher, 2008). With the exception of *Lissodus africanus* from the Early Triassic of South Africa, based on two almost complete and several partial skeletons (Rees and Underwood, 2002) and *Lissodus cassangensis*, based on two incomplete skeletons from the Early Triassic of Angola (Antunes et al. 1990), all the other European Triassic *Lissodus* species are based on isolated teeth and

cephalic spines (Duffin, 1985; Delsate and Duffin, 1999; Rees and Underwood, 2002; Fisher 2008).

Triassic deposits of Europe contain *Lissodus* teeth or cephalic spines in Spitzbergen, Poland, Germany, Luxembourg, France, Spain, United Kingdom and Hungary (Blazejowski, 2004; Delsate and Duffin, 1999; Duffin 1985, 1993; Cuny et al., 1998; Cuny et al., 2001; Rees and Underwood, 2002; Fischer, 2008; Pla et al., 2013; Korneisel, 2015; Ősi, 2013).

Early Triassic occurrence of *Lissodus angulatus* Stensio (1921) was recorded from Scythian deposits of Spitsbergen (Blazejowski, 2004). Although *L. angulatus* possesses a longitudinal ridge and may show incipient development of lateral cusplets in anterior teeth (Blazejowski, 2004), *Lissodus* sp. from Lugaşu de Sus differs from it by having a moderate labial peg and a more reduced coronal ornament.

Teeth of *Lissodus minimus* Agassiz, 1839 are present in Middle-Late Triassic sediments in Germany, UK, France and Luxembourg (Duffin, 1985; Duffin and Delsate, 1993; Cuny et al 1998; Godefroit et al, 1998; Korneisel et al, 2015). Although the crown of *L. minimus* possesses the longitudinal ridge and 2-4 pairs of lateral cusplets, the crown is more ornamented with vertical ridges radiating from the apex of the cusp and of the lateral cusplets on both labial and lingual side of the crown, differentiating it from the Lugaşu de Sus *Lissodus* tooth.

The *Lissodus* sp. tooth from Lugaşu de Sus differs from *Lissodus nodosus* Seilacher, 1943 (Middle-Late Triassic of Germany) because the latter is lacking the longitudinal ridge and is possessing nodes along the length of the labial crown shoulder (Duffin, 1985). It also differs from *Lissodus lepagei* Duffin 1993 (Upper Triassic of Luxembourg, France, Spain), *L. lepagei* having a more crenulated occlusal crest, a distinct single cusplet on the labial peg connected to the main cusp by a vertical ridge (Duffin 1993; Cuny et al, 1998; Pla et al, 2013).

The Lugaşu de Sus tooth of *Lissodus* closely resembles *Lissodus cristatus* Delsate and Duffin, 1999 (Anisian deposits, possibly very close to the Anisian/Ladinian border of Luxembourg and France), by possessing a longitudinal ridge which surrounds labially and lingually the crown shoulder, vertical striations on the labial part of the longitudinal ridge, a low coronal profile with no ornamentation beside the coarse vertical ridge descending the central cusp and the labial peg projecting at right angle to the main axis of the crown. *Lissodus* sp. from Lugaşu de Sus differs from *L. cristatus* by the presence of weak lateral cusplets.

Due to the limited size of the *Lissodus cristatus* material described up to now and the few rootless teeth of *Lissodus* recovered from Lugaşu de Sus, it is more cautious to identify them as *Lissodus* sp.

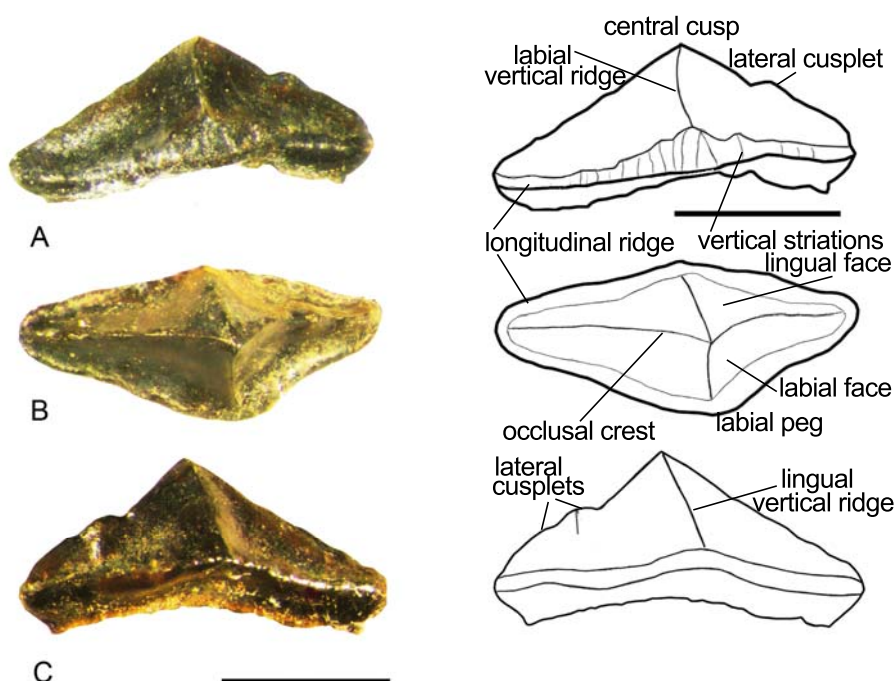


Figure 3. *Lissodus* sp., anterolateral tooth MTCO 25025/1. A. labial view, B. occlusal view, C. lingual view. Scale bar indicates 1 mm.

Conclusions

The taxonomic composition of fish remains from the Middle Triassic of Lugașu de Sus does not differ significantly from the Triassic fauna of Germany, Poland or Luxembourg. *Lissodus* Brough, 1935 is a genus already known in Europe from Triassic deposits of Spitsbergen, Germany, Poland, United Kingdom, France, Spain and Hungary. *Lissodus* sp. from the Middle Triassic of Lugașu de Sus completes the list of Triassic European species and is the first record of the genus *Lissodus* in the Triassic of Romania, as already has been announced at the 10th Romanian Symposium of Palaeontology (Posmoșanu, 2015).

The preparation of carbonate samples from Lugașu de Sus is still in progress in order to get more chondrichthyan material from these layers. Hopefully further preparation of the samples with acetic acid as well as with buffered formic acid will provide new fish fauna for the Middle Triassic of Lugașu de Sus, Bihor County, North-Western Romania.

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