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Fresh- to brackish water fish faunas from continental Early Oligocene deposits in the Transylvanian Basin (Romania)

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Abstract

The coaly levels of the Dîncu-Tămaşa Beds (late Early Oligocene) from two localities near Mera in the northwestern part of the Transylvanian Depression (Romania) yielded otoliths of 8 fish species, among which *Dapalis transylvanicus* is new. The composition of the fish fauna in "layer 6" of the Mera section as well as in the locality Cipcheş Creek indicate a brackish water environment. The monospecific *D. transylvanicus*-fauna in "layer 7" of the Mera section could have lived in fresh- or in brackish water. The climate was subtropical to tropical on condition that the ecology of Recent Ambassidae and Eleotridae is comparable to their Oligocene relatives. *D. angustus* REICHENBACHER, 1992 represents one of the rare elements in the studied fauna. The palaeobiogeographical distribution of this species reaches from Southern France to the Western Paratethys (Switzerland) to the Central Paratethys region (Romania). The large geographical distribution of *D. angustus* and its limited range (Early Oligocene) make the species valuable for biostratigraphy in continental deposits.

Key-words: Teleostei, otoliths, Early Oligocene, brackish, Romania.

Résumé

Les niveaux charbonneux des couches de Dîncu-Tămaşa (Rupélien terminal) dans deux gisements situés près de Mera dans la partie nord-ouest de la Dépression transylvanienne (Roumanie), ont livré des otolithes de 8 espèces de poissons dont une, *Dapalis transylvanicus* est nouvelle. La composition de la faune de poissons dans le "niveau 6" de la coupe de Mera ainsi que dans le gisement du ruisseau Cipcheş traduit un environnement saumâtre. La fauna monospécifique à *D. transylvanicus* du "niveau 7" de la coupe de Mera pourrait avoir vécu dans des eaux douces ou saumâtres. Le climat était subtropical à tropical pour autant que l'écologie des Ambassidae et Eleotridae récents et oligocènes soit la même. *D. angustus* REICHENBACHER, 1992 est un des éléments rares de la faune étudiée. La distribution paléogéographique de cette espèce inclut le sud de la France et les régions occidentale (Suisse) et centrale (Roumanie) de la Paratethys. La vaste aire de distribution de *D. angustus* et son extension stratigraphique restreinte au Rupélien supérieur en font une espèce de valeur pour la biostratigraphie des dépôts continentaux.

Mots-clefs: Teleostei, otolithes, Oligocène inférieur, saumâtre, Roumanie.

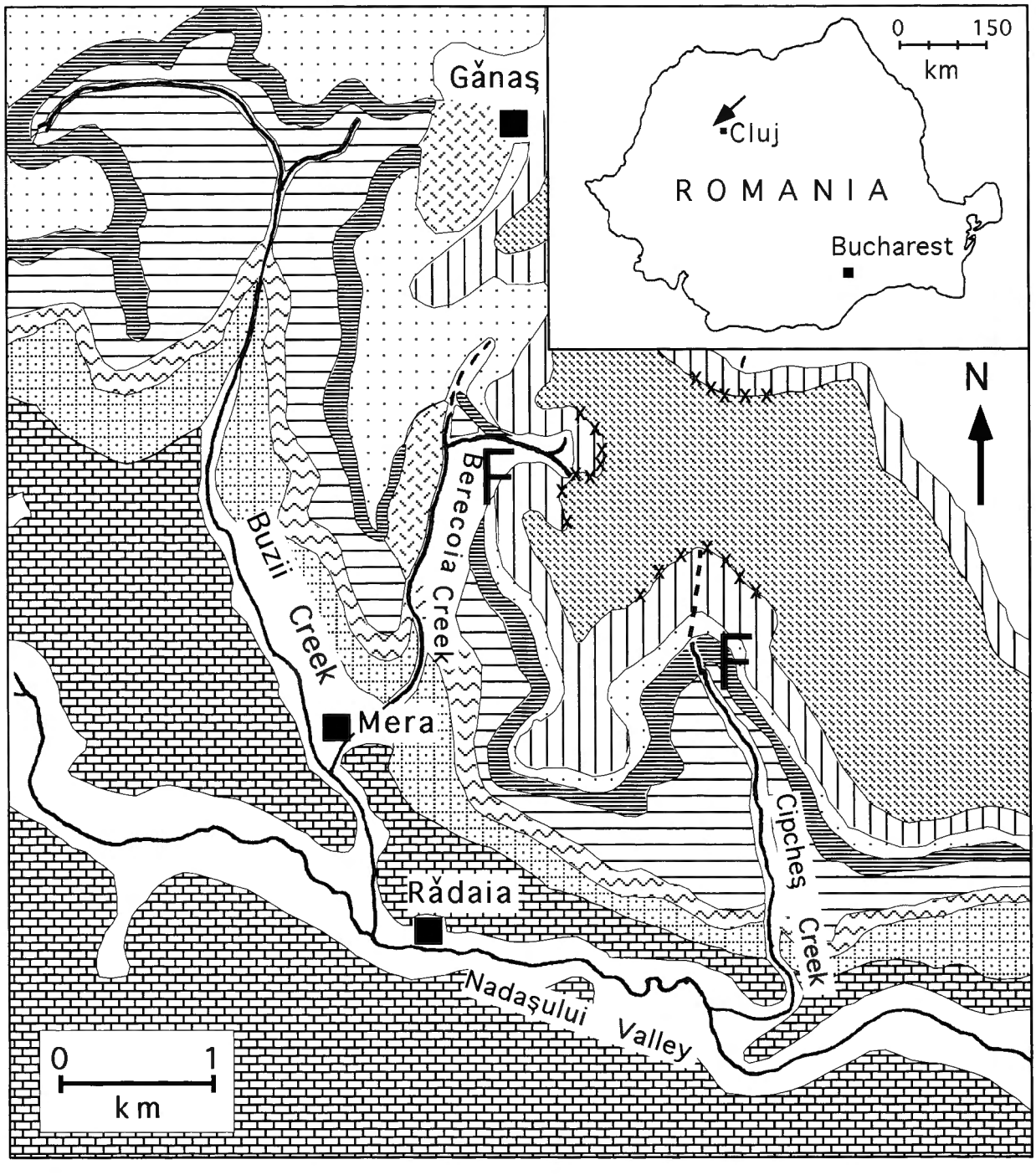
Introduction

The Transylvanian Depression, surrounded by the Carpathian Orogen, is one of the main structural units of the Romanian territory. Its basement is built up of variscan metamorphics. Since the Permian to the Late Cretaceous, the Transylvanian Depression was a sedimentary accumulation area. Deposits are the Permian molasse, Triassic platform carbonates, Jurassic rift sediments and Cretaceous sequences. Starting with the Laramian tectogenesis around the Cretaceous-Tertiary boundary, the evolution of the Transylvanian Depression changed. The thrusted structures were overlain by an alternating sequence of continental and marine sediments of Palaeogene age.

In the northwestern part of the Transylvanian Depression, three Palaeogene sedimentary areas can be distinguished: Gilău, Meseş and Preluca (RUSU, 1970). Each area is characterised by its specific lithostratigraphical units. The studied localities are situated in the Gilău area, near the village Mera, northwest of Cluj (Fig. 1). In this area, the Dîncu-Tămaşa Beds and the overlying Gruia Sandstone (Fig. 2) represent a very fossiliferous sequence. The basal part of the Dîncu-Tămaşa Beds contains a marker level with *Nuculana comta* (MOISESCU, 1975), which is overlain by a sequence of white sandy marls and grayish coaly clays with thin lignite layers. This sequence is considered to be deposited on a coastal plain with fluvial, brackish and lacustrine influences (HOSU & SYLVESTER, 1996; MÉSZÁROS & MOISESCU, 1991). Above these strata follows the Gruia Sandstone with intercalated shell lens dominated by Corbulidae. The Gruia Sandstone represents littoral deposits in a brackish mesohaline basin (RUSU, 1989). To the north, the Gruia Sandstone grade in the Ileanda Beds, represented by dysodiles which could be correlated with the nannoplankton zone NP 23 (upper part) and NP 24 (lower part) (MÉSZÁROS & IANOLIU, 1989).

At Mera, the coaly levels of the Dîncu-Tămaşa Beds yielded some reptile and mammal remains. The turtle *Chinemys strandi* (SZALAY), a taxon which is also present in the same level at Cluj (MLINARSKI & MÉSZÁROS, 1963), and two incisors probably belonging to ceratomorph perissodactyls (?Indricotheriinae) were found.

West of Mera, the coaly layers become thicker and the coals have been exploited at Ticu-Tămaşa or Aghires. From the coal bed named Francisc, a condylarth (*Kochictis centennii* KRETZOI) as well as some artiodactyls (En-



Eocene (undivided)

Brebi Marls (Late Eocene, Early Oligocene)

Mera Beds (Early Oligocene)

Moigrad Beds (Early Oligocene)

Dîncu-Tămaşa Beds and Gruia Sandstone (Early Oligocene)

Cubleşu Beds (Late Oligocene)

Ciceu-Giurgeşti Formation (Middle Miocene, Badenian)

x x Dej Tuff (Middle Miocene, Badenian)

Mireş Formation (Middle Miocene, Late Badenian)

Landslides

Fig. 1 – Geological map and location of the fossiliferous and otoliths bearing sites (F) north and east of Mera.

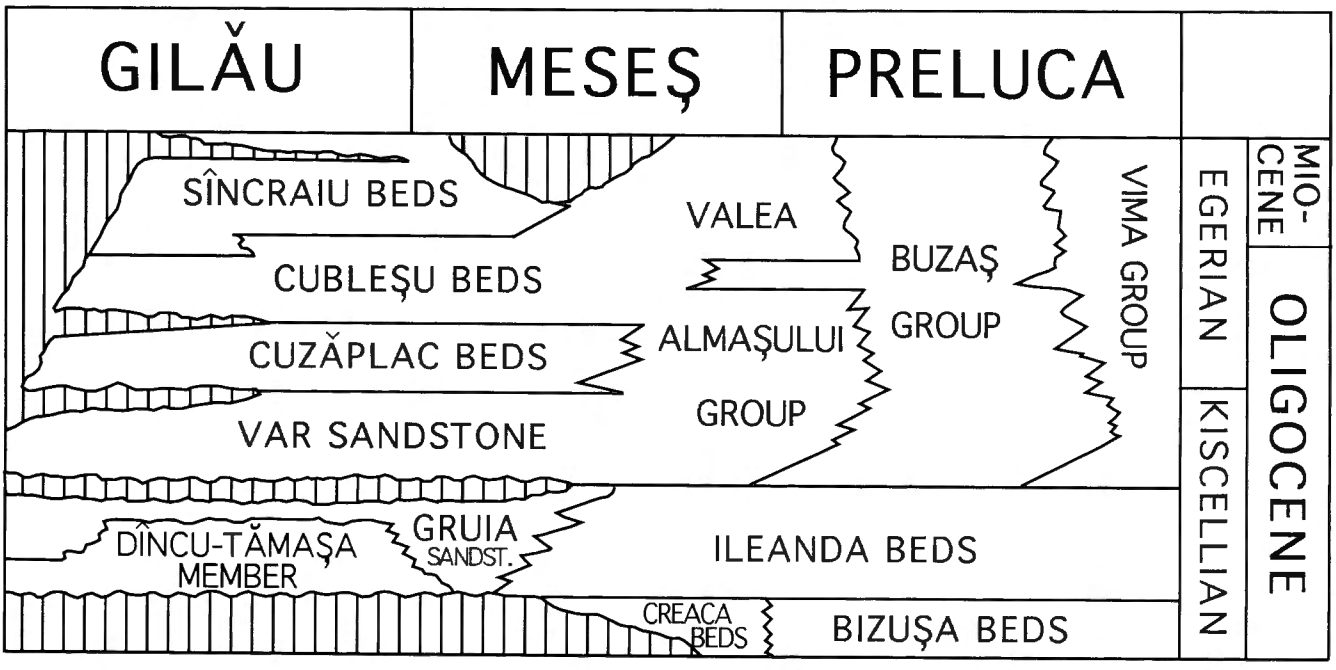


Fig. 2 – Correlation of Kiscellian (Early Oligocene) and Egerian (Late Oligocene, Early Miocene) deposits in the Transylvanian Basin (after MÉSZÁROS & MOISESCU, 1991, modified). The otolith bearing strata belong to the Dîncu-Tămaşa member.

telodontidae indet. cf. *Paraentelodon* sp. , *Anthracotherium* sp., large size; RADULESCU & SAMSON, 1989; CODREA & SURARU, 1989) were collected during exploitation works. On basis of this fauna, the Francisc coal bed was correlated with the La Ferté-Allais level. According to SCHMIDT-KITTLER (1987), the La Ferté-Allais level corresponds with the standard mammal zone MP 24 which represents the latest Early Oligocene (latest Rupelian) and earliest Late Oligocene (earliest Chattian). However, the age of the fauna from the Francisc coal bed could be also somewhat older (MP 23) (see below).

The otolith bearing sites

The otoliths have been collected from two outcrops near Mera (Fig. 1) near Cluj. All otoliths come from the coaly levels of the Dîncu-Tămaşa Beds (Fig. 2).

In the outcrop north of Mera (in this paper simply called "Mera"), the coal layer named Francisc bed was designated as "layer 7". The so-called "layer 6" underlies directly the "layer 7". From the Mera section, several 100 kg sediments were sieved, washed and picked for microfossils and yielded 237 otoliths (53 otoliths from "layer 7, coal level" and 184 otoliths from "layer 6").

From the outcrop "Cipcheş Creek" east of Mera, only 85 kg sediments provided 656 otoliths. That means Cipcheş Creek yielded around 8 otoliths per 1 kg sediment. Mostly, for example in the Western Paratethys, the ratio is 1 to 5 otoliths per 1 kg lacustrine or brackish deposits. Hence the locality Cipcheş Creek can be considered as very rich in otoliths. Cipcheş Creek is also highly fossiliferous for other fossil groups. Vertebrate remains like turtles, crocodilians and mammals (micro and macro) are common, and invertebrate shells also have been found.

Table 1 shows the distribution of fish species in Mera and Cipcheş Creek.

Description of the fish otoliths

All figured otoliths are deposited in the collections of the Institut Royal des Sciences Naturelles de Belgique (IRSNB).

Order Osmeriformes
Family Osmeridae REGAN, 1913
Genus *Enoplophthalmus* SAUVAGE, 1880

Enoplophthalmus sp.
Pl. 2, Fig. 15

Material. - two sagittae.

Locality. - Cipcheş Creek.

Description. - The sagittae show the characteristic pentagonal shape of the genus *Enoplophthalmus*. The dorsal rim is nearly horizontal and rises sligthly towards the posterodorsal angle. The posterior rim is obtuse, the ventral rim rather deeply rounded with a tip in the middle. Both sagittae have a pronounced rostrum (broken anteriorly) and a faintly developed antirostrum. The straight

Table 1 – Fish species based on otoliths in the Dîncu-Tămaşa Beds (Early Oligocene, Kiscellian) from the Gilău area in the Transylvanian Basin. The layer 7 in Mera section is identical with the coal layer also named Francisc Bed; layer 6 is underlying layer 7.

Stratigraphy / Localities		EARLY OLIGOCENE		
		Mera		Cipcheş
Families	**Species**	layer 6	layer 7	Creek
Osmeridae	*Enoplophthalmus* sp.			2
Atherinidae	*Hemitrichas* sp.			1
Ambassidae	*Dapalis angustus* REICHENBACHER 1992	1		15
	Dapalis transylvanicus n. sp.	171	53	620
	Dapalis sp. 1			2
Moronidae	*Morone*? sp.	1		
Eleotridae	"genus Eleotridarum" sp.	2		14
Gobiidae	"genus aff. *Lesueurigobius*" sp.			1

sulcus is divided in a narrow cauda and a slightly wider ostium.

Dimensions. - Length: 1.6 mm, 1.7 mm; height: 1.15 mm, 1.2 mm; thickness: 0.45 mm; l/h: 1.4.

Remark. - Oligocene strata have yielded up to now two *Enoplophthalmus* species: *E. schlumbergeri* SAUVAGE, 1880 from Céreste in Southern France and *E. alsaticus* GAUDANT, 1984 from the southern Upper Rhinegraben (Alsace, France). Both species are only known by skeletons in which the otoliths were not preserved. *Enoplophthalmus* skeletons with otoliths *in situ* have been described from the early Miocene of the Mayence Basin (Germany) by GAUDANT & REICHENBACHER (1998). These Miocene species, *E. rhenanus* (WEILER, 1963) and *E. robustus* (WEILER, 1963), have sagittae with a more angular shape and a more pronounced posterior rim than the *Enoplophthalmus* sagittae from Cipcheş Creek.

Order Atheriniformes
Family Atherinidae RISSO, 1826
Genus *Hemitrichas* PETERS, 1877 (= *Palaeoatherina* GAUDANT, 1976, see GAUDANT, 1998)

Hemitrichas sp.
Pl. 2, Fig. 17

Material. - one sagitta.

Locality. - Cipcheş Creek.

Description. - The sagitta has a rounded, elongate shape and a slightly convex inner and outer face. The dorsal rim is nearly horizontal and the antero- and posterodorsal angle faintly pronounced. The rounded posterior rim meets the shallowly rounded ventral rim on a small posteroventral angle. The rostrum, broken at the tip, is prominent. Also, the antirostrum is well developed. The narrow and straight sulcus is clearly divided in a small, deepened ostium and a much longer, shallow cauda.

The assignment of the present sagitta to *Hemitrichas* is based on the typical development of the sulcus and also on the small size and rounded shape of the sagitta.

Dimensions. - Length: 1.15 mm; height: 0.8 mm; thickness: 0.25 mm; l/h: 1.4.

Remark. - This species differs from the known *Hemitrichas* (formerly *Palaeoatherina*) species by its elongate shape and the horizontal dorsal rim.

Order Perciformes
Family Ambassidae BOULENGER, 1904
Genus *Dapalis* GISTL, 1848

Dapalis angustus REICHENBACHER, 1992
Pl. 2, Figs. 8-10

v* 1992 *Dapalis angustus* n. sp. - REICHENBACHER *in* REICHENBACHER & WEIDMANN: 31, Taf. 6, Fig. 15.
v 1996 *Dapalis angustus* REICHENBACHER 1992. - REICHENBACHER *et al.* 73, Fig. 6A- D.

v 1997 *Dapalis angustus* REICHENBACHER 1992. - REICHENBACHER & PHILIPPE: 414, Fig. 10A-B.

Material. - 16 sagittae.

Localities. - Mera, layer 6 (1), Cipcheş Creek (15).

Description. - Oval, thin sagittae with nearly flat inner- and outer face. The dorsal rim is rounded in the middle, the short posterior rim faintly pointed and the ventral rim moderately deep rounded. Generally, the rims are finely crenulated, but on some sagittae they are smooth. The rostrum is prominent, but not very wide compared with other *Dapalis* species. Generally, the antirostrum is well developed. The sulcus shows the narrow ostium which is typical for this species. The cauda is straight and becomes slightly hooked at its posterior end.

Dimensions. - Length: 1.60-2.65 mm; height: 1.0-1.85 mm; thickness: 0.3-0.55 mm; l/h: 1.4-1.6; l/th: 4.0-5.3.

Stratigraphical range. - Early Oligocene (Rupelian, Kiscellian), comparable with the range of the mammal zones MP 21 to MP 23.

Distribution. - Apt Basin (Vaucluse, France), Calcaires de la Fayette, mammal zone MP 21 (cf. REICHENBACHER & PHILIPPE, 1997); Western Switzerland and Haute-Savoie (NE-France), Lower freshwatermolasse, niveau de Lovagny (cf. REICHENBACHER & WEIDMANN, 1992) corresponding to mammal zone MP 23 (cf. BERGER, 1992; ENGESSER & MÖDDEN, 1997); Swiss Jura, Calcaire de la Verrerie and Molasse alsacienne, comparable with the time span of mammal zones MP 22 to MP 23/?24 (REICHENBACHER et al., 1996).

Dapalis transylvanicus n. sp.
Pl. 1, Figs. 1-10; Pl. 2, Figs. 1-7

Holotype. - Right sagitta (Pl. 1, Fig. 3; Pl. 2, Fig. 1) (IRSNB P 7300).

Paratypes. - 619 sagittae (among them 45 juvenile otoliths up to a length of 1.3 mm), 9 paratypes are figured (Pl. 1, Figs. 1, 9-10; Pl. 2, Figs. 2-7) (IRSNB P 7298, 7306-7307, 7312-7317).

Locus typicus. - Cipcheş Creek.

Stratum typicum. - Dîncu-Tămaşa Beds.

Derivatio nominis. - Derived from the distribution of the new species in the Transylvanian Basin.

Material. - About 840 sagittae.

Other locality. - Mera, layer 6 (170), layer 7/coal layer (50).

Diagnosis. - The sagittae have a rounded to moderately elongate shape with a short, pointed rostrum. Also they are characterised by the prominent convexity of the outer face.

Description. - The dorsal rim is moderately rounded. Generally, it terminates in a pronounced posterodorsal angle. The posterior rim is short, truncated or slightly pointed, the ventral rim deep rounded. Most sagittae have a pronounced rostrum and antirostrum, between them is the shallow excisura. The sulcus shows the features of the genus *Dapalis*. The ostium is large and has a concave lower rim, the cauda is straight or terminally slightly hooked.

The variability mainly concerns the shape, differing from elongate (see pl. 2, figs. 6-7) to nearly round (see pl. 1, fig. 2, 8-9). Further, some sagittae have no pronounced antirostrum. Also, the posterodorsal angle can be absent.

Dimensions. - Holotype: Length: 2.5 mm; height: 1.75; thickness: 0.9 mm; l/h: 1.4; l/th: 2.8.

Other sagittae: Length: 1.45-4.30 mm; height: 1.2-3.2 mm; thickness: 0.4-1.2 mm; l/h: 1.2-1.4 (mostly 1.3); l/th: (1.6) 2.0-3.0 (3.5).

Differential diagnosis. - *D. transylvanicus* n. sp. generally differs from the previously known *Dapalis* species because of its shape of rostrum and ostium and its strongly convex outer face. Compared with *D. ventricosus* NOLF & REICHENBACHER (1999, this vol.) and *D. hungaricus* (SCHUBERT, 1912) from the Middle Eocene of Italy and Hungary, the new species is characterized by a more prominent and more pointed rostrum. *D. borkensis* WEILER, 1961 from the earliest Oligocene (former Latdorfian; nannoplankton zone NP 22) of Northern Germany shows a rostrum and ostium similar to *D. transylvanicus* but has better rounded dorsal and posterior rims. However, the elongate variants of the new species have a morphology close to *D. carinatus* STINTON, 1968, which is widespread in late Oligocene sediments of the Paratethys. The differences are the somewhat higher dorsal rim and more prominent rostrum of *D. carinatus* as well as the more narrow ostium. Moreover, the rounded variants of *D. transylvanicus* seem to be similar to *D. rhomboidalis* STINTON, 1968, also widespread in the late Oligocene of the Paratethys. Here the differences are more distinct: *D. rhomboidalis* has a deeper rounded ventral rim and its ostium has a much more concave lower rim than at *D. transylvanicus*. Finally, it is noticeable that *D. rhenanus* (KOKEN 1891) from the early Miocene of Germany presents a variability of the shape just like *D. transylvanicus*. But the Miocene species differs distinctly from the new species by its more prominent rostrum and the larger ostium.

Remark. - The new species *D. transylvanicus* can be considered as the ancestor of the late Oligocene *D. carinatus* and *D. rhomboidalis* because of its similar features

as discussed above. Comparing the *Dapalis* species from Middle Eocene to early Miocene, the better developed rostrum can be interpreted as an evolutionary trend. However, a large ostium with a concave lower ostial rim also seems to be a progressive feature.

Dapalis sp. 1
Pl. 1, Fig. 13

Material. - two sagittae.

Locality. - Cipcheş Creek.

Description. - The sagittae differ from *D. transylvanicus* because of the more elongate shape, the more prominent rostrum and the cauda terminally distinctly hooked.

Dimensions. - Length: 2.5-3.2 mm; height: 1.72-2.15 mm; thickness: 0.64-0.8 mm; l/h: 1.45-1.5; l/th: 3.9-4.0.

Family Moronidae FOWLER, 1907
Genus *Morone* MITCHELL, 1814

***Morone*?** sp.
Pl. 1, Fig. 14

Material. - one sagitta.

Locality. - Mera (layer 6).

Description. - Sagitta of elongate shape with convex inner and outer face. The undulant dorsal rim is horizontal, the posterior rim steep and fitted with a posteroventral angle, the ventral rim rather deeply rounded. A prominent rostrum of medium size and a well developed antirostrum are present. The sulcus is clearly divided in a large ostium and a long, straight cauda becoming slightly hooked and tapering to a point terminally. The sulcus resembles that of *Morone* species from the late Oligocene and early Miocene of the Western Paratethys and the Mayence Basin (cf. WEILER, 1963, 1966; REICHENBACHER & MÖDDEN, 1996; REICHENBACHER & WEIDMANN, 1992), but differs concerning the ostium, especially because of the long upper ostial rim.

Dimensions. - Length: 3.7 mm; height: 2.3 mm; thickness: 1.1 mm; l/h: 1.6; l/th: 3.3.

Family Eleotridae BLEEKER, 1877
Genus *incertae sedis*

"genus Eleotridarum" sp.
Pl. 1, Figs. 11-12; Pl. 2, Figs. 11-14

Material. - 16 sagittae.

Locality. - Mera, layer 6 (2), Cipcheş Creek (14).

Description. - Rectangular sagittae with slightly convex inner and outer face. The characteristic features are a pronounced posterodorsal angle, a very prominent posteroventral angle sometimes prolongated to the back, and also a marked praeventral angle which can be prolongated to the front. The dorsal rim is faintly rounded and distinctly crenulated, the ventral rim nearly horizontal and at most sagittae smooth. The sulcus has a shoe sole like shape and is opened to the front as it is known of Recent and fossil Eleotridae sagittae.

Dimensions. - Length: 1.3-2.75 mm; height: 1.15-1.9 mm; thickness: 0.4-0.65 mm; l/h: (1.1) 1.2-1.4; l/th: 3.2-4.3.

Remark. - It is not possible to decide whether these sagittae belong to "genus Eleotridarum" *sectus* STINTON, 1968 from the late Oligocene of the Western Paratethys or to "genus Eleotridarum" *schwarzhansi* (RÜCKERT-ÜLKÜMEN, 1992) from the "Oligo-Miocene" (time span from nannoplankton zone NP 25 to NN 6) of Turkey or to a new species. "Genus Eleotridarum" *sectus* seems to have less prominent angles, but some sagittae of the Transylvanian species also have no marked angles. The holotype of "genus Eleotridarum" *schwarzhansi* is characterised by a praeventral angle prolongated to a tip (RÜCKERT-ÜLKÜMEN, 1992: pl. 3, fig. 3), a feature which is not developed in this manner in our sagittae. But the dorsal rim of the Turkish species, from which only 2 sagittae are known, is crenulated and rounded just like in the case of the Transylvanian sagittae. However, the intraspecific variability of Eleotridae species seems to be high and makes it impossible to describe new species on basis of few and only moderately preserved sagittae.

Family Gobiidae BONAPARTE ,1832
Genus *Lesueurigobius* WHITLEY, 1950

"genus aff. *Lesueurigobius*" sp.
Pl. 2, Fig. 16

v 1994 "genus aff. *Lesueurigobius*" sp. - NOLF & BRZOBOHATY: 235, pl. 9, figs. 14-16.

Material. - one sagitta.

Locality. - Cipcheş Creek.

Remark. - Probably this small sagitta represents the same species that NOLF & BRZOBOHATY (1994: 235) have described from the Eger Formation (early Egerian) in northeastern Hungary.

Dimensions. - Length: 0.81 mm; height: 0.85 mm; thickness: 0.25 mm; l/h: 0.95.

Palaeoecology, palaeobiogeography, biostratigraphy

The fish fauna from the Dîncu-Tămaşa Beds consists of 8 species (Table 1). The coal layer or "layer 7" in the Mera section provided a monospecific fauna of *D. transylvanicus*. The fauna of "layer 6" (beneath the coal layer) is a little bit more diverse. The highest diversity was the fauna of Cipcheş Creek with 7 species (Table 1).

Dapalis transylvanicus is the dominating species in all samples, making up 95.8% of the investigated fish fauna. The Eleotrid species and *Dapalis angustus* both are present in small quantities (1.8% each). The remaining 5 species are extremely rare.

The fauna from "layer 7" at Mera consisting only of *D. transylvanicus* could be a fresh- or a brackish water fauna because in Oligocene times species of the extinct genus *Dapalis* were widespread in fresh- and brackish water biotopes (cf. REICHENBACHER & WEIDMANN, 1992; REICHENBACHER, 1996). Only in deposits of Miocene age *Dapalis* species were bound to brackish environments (cf. BRZOBOHATY, 1969; MARTINI, 1983; REICHENBACHER, 1993).

The composition and low diversity of the faunas from "layer 6" at Mera and from Cipcheş Creek, combined with the mass occurrence of *D. transylvanicus*, can be interpreted as a signal for a brackish environment. However, the second nominal *Dapalis* species present (*D. angustus*) was known so far only from freshwater deposits. Fossil Eleotrid species have only poor palaeoecological significance. These fishes have a fossil record in shallow marine, brackish and freshwater deposits (cf. NOLF & CAPPETTA, 1980; STINTON & KISSLING, 1968; REICHENBACHER, 1996). The remaining rare species in the association all belong to very euryhaline fish families which is true for the Osmeridae, Atherinidae, Moronidae and Gobiidae. But it is evident that true freshwater species like Umbridae or Palaeoesocidae are missing in both faunas. For this reason, we conclude that the fish faunas from the Dîncu-Tămaşa Beds from "layer 6" at Mera and from Cipcheş Creek probably lived in a brackish environment, certainly of low (oligohaline) salinities because true marine species are absent.

Recent Ambassids and Eleotrids are widespread in the tropical Indopacific area. If the ecology of Recent Ambassidae and Eleotridae is comparable to their Oligocene relatives, then the climate was subtropical to tropical during the sedimentation of the Dîncu-Tămaşa Beds.

From a palaeobiogeographical point of view, the distribution of *Dapalis angustus* is remarkable because the species was distributed from Southern France to the Western Paratethys to the Transylvanian Basin in the Central Paratethys (for references, see above). The remaining fish species are not known from other localities, except "genus aff. *Lesueurigobius*" sp. which occurs in the late Oligocene Eger Formation at Eger in northeastern Hungary (cf. NOLF & BRZOBOHATY 1994). However, if *D. angustus* lived in inland waters from Southern France to the Transylvanian Basin, then the *Enoplophthalmus* species described in this paper may be identical with *E. schlumbergeri* SAUVAGE 1880, known only by skeletons from early Oligocene freshwater deposits in Southern France.

The large geographical distribution of *D. angustus* and its range limited to the Early Oligocene (Rupelian, Kiscellian) makes the species valuable for biostratigraphical purposes in continental deposits. So far, the main distribution of *D. angustus* was the time interval corresponding to the mammal zone MP 23. Hence, on basis of this fish species, the Dîncu-Tămaşa Beds should be somewhat older than assumed on basis of the mammals (see introduction) and correspond to mammal zone MP 23.

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Explanation of plates

All figured specimens come from the Dîncu-Tămaşa Beds (Early Oligocene, Kiscellian) in the Gilău area in the northwestern part of the Transylvanian Basin (Romania). They are deposited in the collections of the Institut Royal des Sciences Naturelles de Belgique (IRSNB). In the captions, L stands for left otolith and R for right otolith. All figures show inner views.

PLATE 1

Figs. 1-10 – *Dapalis transylvanicus* n. sp.
1 = R, paratype (IRSNB P 7298); Cipcheş Creek.
2 = R (IRSNB P 7299); Mera, layer 6.
3 = R, holotype (IRSNB P 7300); Cipcheş Creek.
4-6 = R (IRSNB P 7301-7303); Mera, layer 6.
7-8 = L (IRSNB P 7304-7305); Mera, layer 6.
9-10 = L, paratypes (IRSNB P 7306-7307); Cipcheş Creek.
Figs. 11-12 – "genus Eleotridarum" sp.
11 = L (IRSNB P 7308); Cipcheş Creek.
12 = R (IRSNB P 7309); Mera, layer 6.
Fig. 13 – *Dapalis* sp. 1. L (IRSNB P 7310); Cipcheş Creek.
Fig. 14 – *Morone*? sp. R (IRSNB P 7311); Mera, layer 6.

PLATE 2

Figs. 1-7 – *Dapalis transylvanicus* n. sp.
1 = R, holotype (IRSNB P 7300, enlargement of pl. 1, fig. 3); Cipcheş Creek.
2-7 = paratypes (IRSNB P 7312-7317); Cipcheş Creek. 2-3, 5-7 = R, 4 = L.
Figs. 8-10 – *Dapalis angustus* REICHENBACHER 1992.
8, 10 = L (IRSNB P 7318, 7320); Cipcheş Creek.
9 = L (IRSNB P 7319); Mera, layer 6.
Figs. 11-14 – "genus Eleotridarum" sp.
11, 14 = L; 12-13 = R (IRSNB P 7321-7324); Cipcheş Creek.
Fig. 15 – *Enoplophthalmus* sp.
L (IRSNB P 7325); Cipcheş Creek.
Fig. 16 – "genus aff. *Lesueurigobius*" sp.
L (IRSNB P 7326); Cipcheş Creek.
Fig. 17 – *Hemitrichas* sp.
R (IRSNB P 7317); Cipcheş Creek.

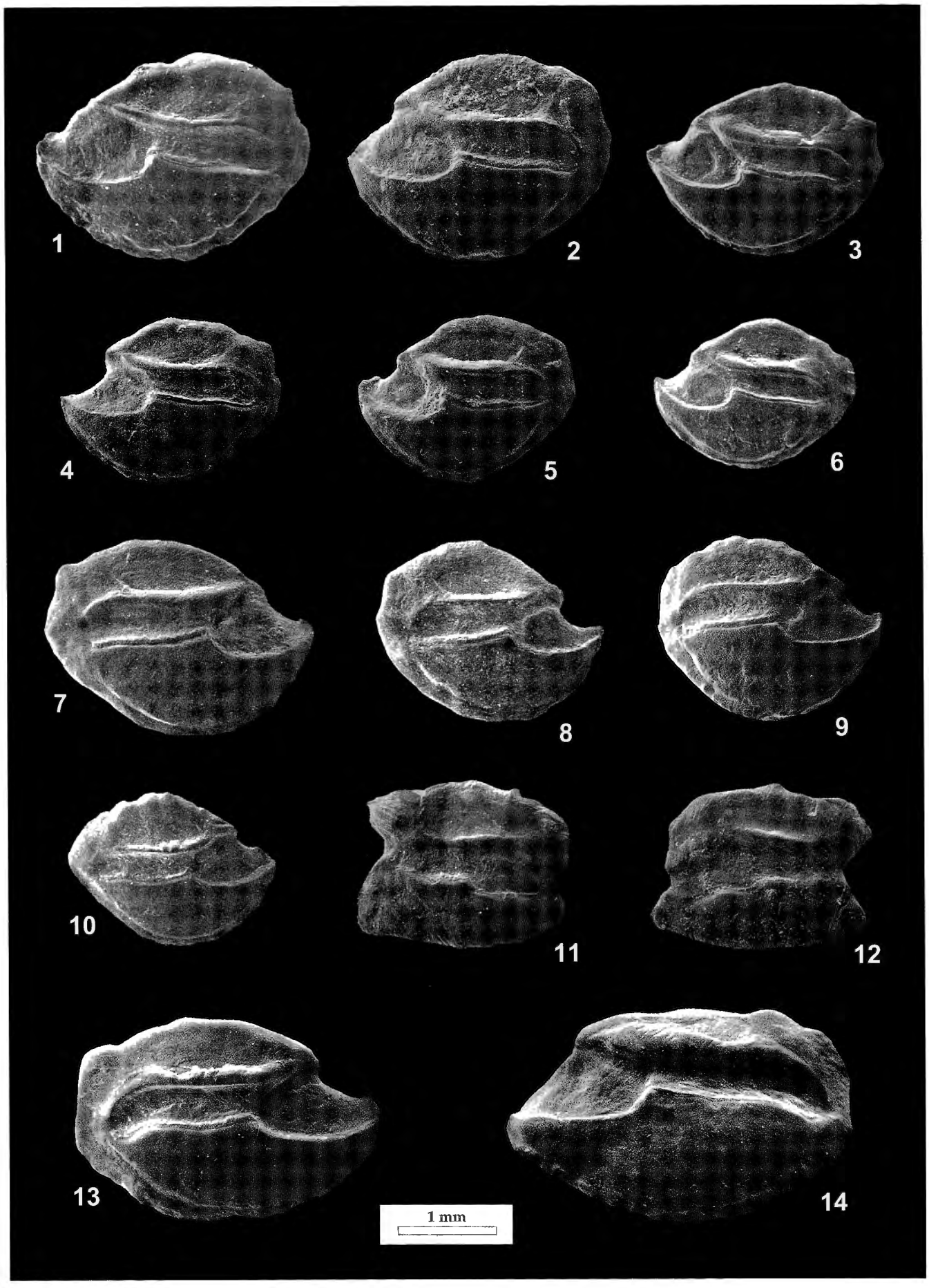

PLATE 1

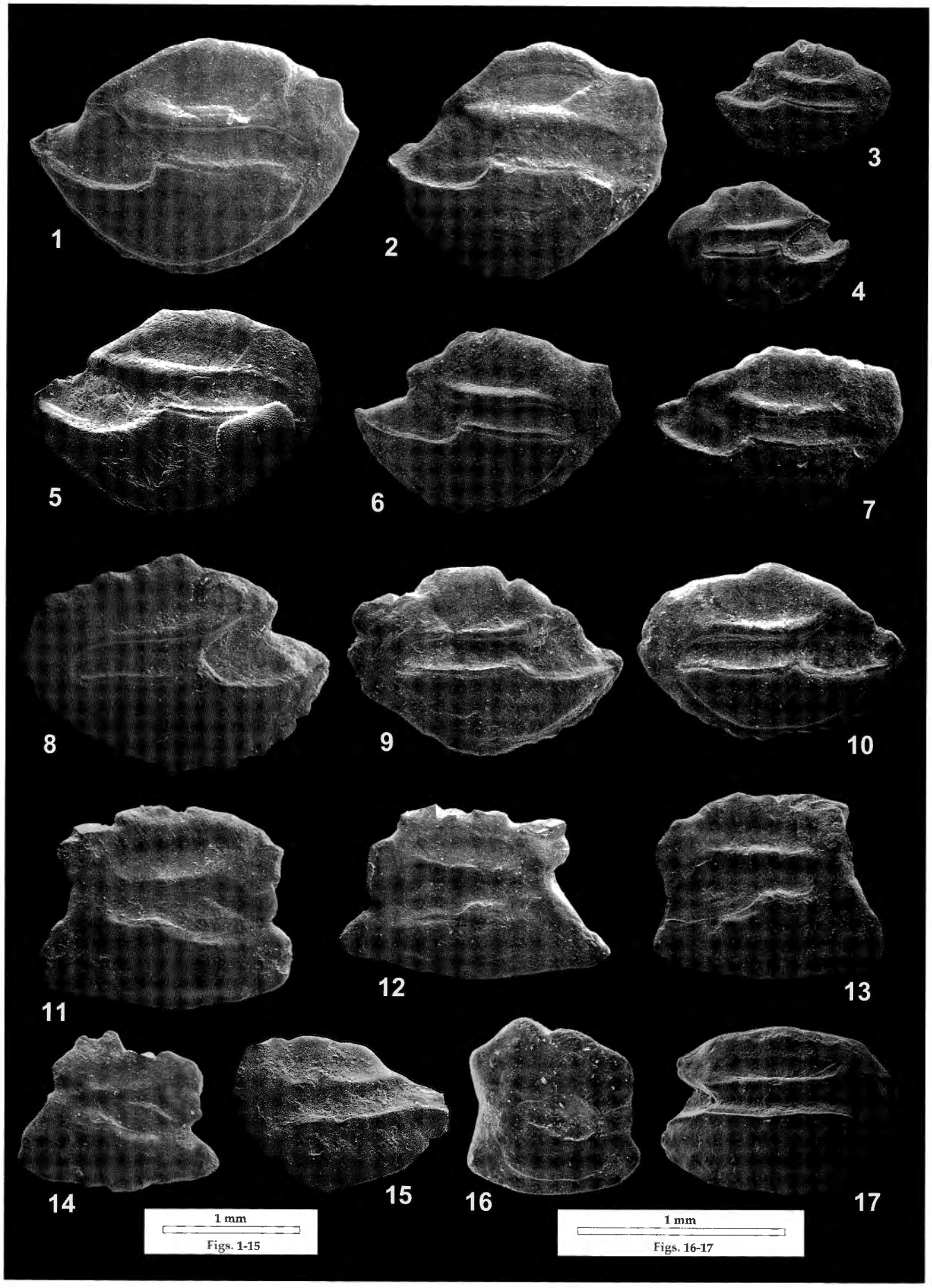

PLATE 2