

## A REVIEW OF THE EOCENE DIODONTIDS AND LABRIDS FROM TRANSYLVANIA

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**ABSTRACT.** This paper reviews two diodontids and labrids species: *Chylomicterus hilgendorfi* and *Lachnolaimus multidentis*. The paleontological material is represented only from jaws and pharyngeal bones, which had been recently collected from Cluj Limestone (Cluj Napoca and Turbuța areas), and Nişului Valley Formation (Turnu Roşu) as well as from older collections. The holotypes of these species are reconsidered and the paleoecological significances are also discussed.

**KEYWORDS:** Diodontidae, Labridae, Late Eocene, Transylvania.

### INTRODUCTION

The present study is focused on two families: Diodontidae and Labridae, with special remarks on the Romanian forms. The actual correspondents of these families are very well known, while the fossil forms are only summary studied, even if they are relatively frequents.

The paleontological material consists only from jaws and pharyngeal bones, originating from older collections or recent collected in the field missions.

In the older descriptions belonging to several contributors, these fishes originated from the following Upper Eocene Formations:

a) Cluj Limestone (Şuraru & Şuraru, 1966), from the outcrops: Pleşca Valley and Baciú quarries (Cluj Napoca area): *Scaroides gatunensis* TOULA, 1908; Şuraru et al. (1980), Someş dam outcrop (western side of Cluj Napoca): *Progymnodus hilgendorfi* (DAMES), 1883, *Nummopalatus cf. multidentis* (MUNSTER), 1846, *Scaroides gatunensis*; Şuraru & Şuraru (1987), from Văratec Valley (Turbuța, Sălaj district) and Baciú quarry (near Cluj-Napoca) outcrops: *Progymnodus cf. hilgendorfi*, *Scaroides gatunensis*.

b) Nişului Valley Formation from Satului Valley, Turnu Roşu (= Porcesti, Sibiu district; Şuraru & Şuraru, 1966): *Scaroides gatunensis*.

The new material was collected from the same outcrops, excepting the Văratec Valley one.

The identified fishes (*Chylomicterus hilgendorfi*, *Lachnolaimus multidentis*) were compared with the holotypes and with the actual correspondents.

The most interesting formation is the Cluj Limestone, well known for its fossil biota, studied since the beginning of the XIX<sup>th</sup> century. The fossil assemblages are very diverse, including invertebrates (mollusks, crustaceans, corals, foraminifers

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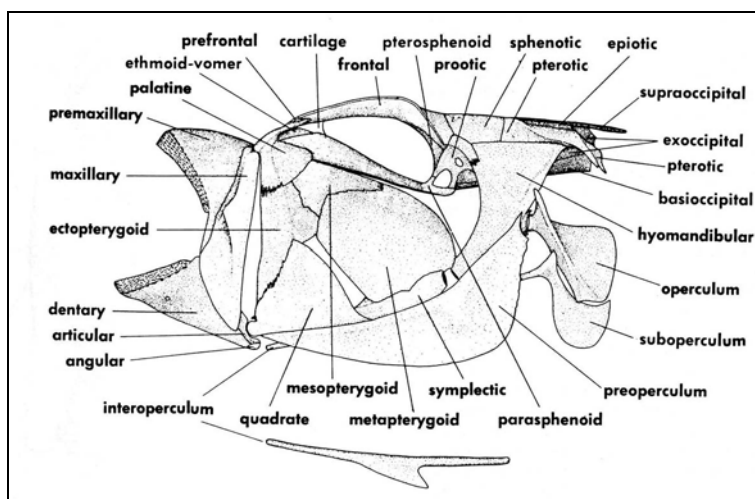
etc) and vertebrates (fishes, turtles, crocodylians and mammals). However, the diodontids and labrids remained for very long time, unmentioned. Such studies begun only after the middle of the last century and the number of contributions, is scarce.

## 1. DIODONTIDS

### DIODONTIDS DENTAL MORPHOLOGY

The family diagnose of Diodontidae, based on their dental morphology was well established by Tyler (1980):

“Teeth incorporated in to the matrix of the biting edge of the jaws as small and more or less rounded units; premaxillaries and dentaries fully fused to their opposite members in the midline; lateral surface of the maxillary with a deeply indented or laterally flanged surface, the thickened ridges increasing its strength; the jaws massive, a large trituration plate always present in the upper and lower jaw, first and second pharyngobranchial with minute teeth or toothless, and sometime absent”.



*Fig. 1. Cranial morphology in diodontids (after Tyler, 1980)*

The internal trituration teeth from the biting edge always form a large plate divided in two sides, each one formed by a series of large overlapped dental plates, with middle edges straight or rounded. The trituration plates are formed at the base of the pulp cavity and have a slightly concave smooth upper surface and a convex papillate surface. Each plate migrates to the external trituration surface, becoming more flattened and more cemented together. The number of the plates increases according to the specimen size. The trituration surface is oblique on the dental plates plane. In most diodontids a pair of apertures could be observed on the dorsal part of the premaxillary.

The nasal apparatus and the spines (erectiles and nonerectiles) are the principal differentiation criterion between the actual diodontids.

Based on the nasal apparatus and spines structure, Fraser Bruner (1943) and Le Danois (1959), recognized 3 genera: *Chilomycterus* BRISOUT DE BARNEVILLE (ex BIBRON), 1846, *Diodon* LINNAEUS, 1758, *Dicotylichthys* KAUP, 1855.

The 5<sup>th</sup> ceratobranchial is toothless in many diodontids, like in some gymnodonts. In the actual *Chilomycterus affinis* GUNTHER, 1870, *Chilomycterus orbicularis* (BLOCH 1785) and *Chilomycterus reticulatus* (LINNAEUS, 1758) (personally, I examined in the Natural History Museum in Vienna few specimens of *Chilomycterus orbicularis*), the 5<sup>th</sup> ceratobranchial presents a small patch of minute teeth.

The same patch could be better recognized on the 5<sup>th</sup> ceratobranchial in *Dicotylichthys*.

Tyler (1980) considers that these teeth could represent archaic features of the primitive diodontids.

The pharyngobranchial dentition is slightly variable in diodontids.

The pharyngobranchial of the first and second arches always presents small teeth, the pharyngobranchial of the third arch, when present, is always smaller and almost always toothless.

In actual *Chilomycterus* and *Dicotylichthys* the 3<sup>rd</sup> arch is usually small and toothless, and very rarely small teeth could be observed (sometimes in *Chilomycterus shephi* WALBAUM, 1792). In *Diodon* it is toothless and variable in size.

#### **GENERAL SYSTEMATIC STATUS OF THE FOSSIL DIODONTIDS**

The dental plates morphology of the actual diodontids is very similar with the fossil representatives of the group, which begun their evolution since the Eocene. Only small changes occurred, in their increased size and the rearrangement of the dentition.

The fossil diodontids are usually documented by jaws remains, and only exceptionally by complete skeletons. Skeletons, more or less complete, were found only at the famous Eocene Monte Bolca site, in Italy. Two species were identified there: *Diodon erinaceus* AGASSIZ, 1844 and *Diodon tenuisinus* AGASSIZ, 1844.

In the Eocene deposits, the Diodontids jaws are frequent. Tavani (1955) described some new genera based on the jaws structure. He erected a new genus *Eodiodon*, different from the other diodontids by its jaws devoid of biting teeth and with a large trituration surface. He includes this genus in a new family named Eodiodontidae. Tavani recognized also other 4 genera: *Progymnodon* from middle and upper Eocene of Europe, *Kyrtogymnodon* from the Pliocene of Europe, *Oligodiodon* in Oligocene and Miocene from Europe and North America, and finally *Diodon* in the European Miocene, a genus that is also actually present.

Tyler (1980) considers that the difference between *Progymnodon* and *Oligodiodon* represents an evolutionary turnover in the jaws structure. In *Oligodiodon* (like in recent forms) the biting edge and the triturating region are separate by a large bone layer, a process better observed in the juveniles.

In the same contributor's opinion (Tyler 1980), the *Eodiodon* genus based on the missing teeth in the biting edge could be wrong diagnosed. He explains the apparently missing teeth on the biting edge and the undistinguished triturating plates, as a result of the precarious jaws preservation and possible, due of wear stage. I agree this opinion because I noticed the same precarious preservation of the few *Eodiodon* specimens studied in the Natural History Museum in Vienna (abbreviated NHMV). For Tyler, another subfamily erected by Tavani (1955) (*Progymnodontidae*) should be reconsidered, because the dental morphology is too similar to the others diodontids for allowing the separation of a distinct subfamily.

## PALEONTOLOGY

Order ***Tetraodontiformes*** REGAN, 1929

Suborder ***Tetraodontoidei*** BERG, 1937

Family ***Diodontidae*** BIBRON, 1855

Genus ***Chilomycterus*** BRISOUT DE BARNEVILLE (EX BIBRON) 1846

### ***Chilomycterus hilgendorfi* (DAMES)**

(Pl. I, Figs. 1, 2)

1883 *Progymnodon hilgendorfi* DAMES, in Dames, p. 148, pl. 3, fig. 13

1929 *Diodon* (? *Chilomycterus*) *hilgendorfi* (DAMES) in Weiller, p. 29, pl. 6, figs. 7,9,13,14

1966 *Scaroides gatunensis* TOULA in Şuraru & Şuraru, p. 72, figs. 12-14

1980 *Scaroides gatunensis* TOULA in Şuraru M. et al., p. 179, figs. 4-11

1980 *Progymnodus cf. hilgendorfi* (DAMES) in Şuraru M. et al., p. 177, fig. 1

1987 *Progymnodus cf. hilgendorfi* (DAMES) in Şuraru & Şuraru p. 128, fig. 1

1987 *Scaroides gatunensis* TOULA in Şuraru & Şuraru, p. 129, fig. 2

**Material:** 30 upper and lower jaws recently collected and 10 from the older collections curated at the Geological-Paleontological Museum of the Department of Geology-Paleontology from "Babeş Bolyai University" of Cluj-Napoca (abbreviated: GPMDGPBBU).

**Sites:**

1. Cluj Limestone: Someş Dam, Pleşca Valley, Baciú quarry (Cluj Napoca area) Văratecului Valley, Turbuţa (Sălaj district);
2. Nişului Valley Formation: Turnu Roşu (Sibiu district).

### **Description and discussion**

In the studied material, the upper jaws preserve satisfactory the triturating plates, the dentaries and the biting edges. The considerable distance between the minute teeth from the biting edge and the triturating plates represents a diagnostic character for *Chilomycterus*. Another diagnostic elements are the large and thin triturating plates, different from *Diodon*, less expanded, thicker and more numerous. The jaws dimensions are comprised between 1 and 5 cm, depending on the individuals' size. The most complete lower jaw preserves the dentary, the biting edge with few series of minute teeth, the angular and the articular.

Weiller (1929) assigned such lower and upper jaws to *Diodon* (?*Chilomycterus*) *hilgendorfi*. Later, Şuraru & Şuraru (1966, 1987) and Şuraru et al. (1980) wrongly assigned the lower jaw at *Scaroides gatunensis* based on Toula's (1908) viewpoint (in fact, the *Scaroides* described by Toula represents a *Diodon*), and the upper jaw to *Progymnodus cf. hilgendorfi*.

The holotype of this species is curated at the Natural History Museum in Muenchen (abbreviated NHMM), represented by an upper jaw. The dental morphology of the jaw holotype is identical with the upper jaws discovered in the Eocene formations from Transylvania.

### **Ecology of actual diodontids**

The diodontids are popularly named "porcupine fishes", "spiny puffers", "burrfishes" or "ballonfishes".

The body is globular and inflatable. The scales are modified into massive spines with large subdermal bases. The teeth are fused into a single beak-like plate on each jaw, without a median structure. They are usually medium-sized fishes (however, some specimens reach 1m) occurring worldwide, in temperate and tropical waters. The juveniles are usually pelagic and the adults are benthic, dwelling with reef or shelf waters not exceeding 100 m deep. Their diet consists on hard-shelled invertebrates.

## **2. LABRIDS**

### **LABRIDS DENTAL MORPHOLOGY**

The jaw mechanism in Labridae is composed by upper jaw with maxillary and premaxillary, lower jaw formed of dentary, articular, angular and sesamoid articular and lower and upper pharyngeal bones. The material available for study is composed only from pharyngeal teeth.

One of the diagnostic characters of the family is the presence of a single pharyngeal lower undivided plate, a result of the pharyngeal fusion of the 5<sup>th</sup> ceratobranchial. The large variety of these pharyngeal bones could help the specialists to establish an evolutionary lineage inside this family.

Conical or blunt teeth disposed in different arrangements cover the pharyngeal bones. In *Lachnolaimus* only blunt teeth appears on the lower pharyngeal bone, considered by Gomon (1997) as a primitive condition. On the lower pharyngeal bone there is a small peduncle with small conical, blunt, or large teeth.

## PALEONTOLOGY

Order *Perciformes* BLEEKER, 1859  
Suborder *Labroidei* BLEEKER, 1859  
Family *Labridae* CUVIER, 1817  
Genus *Lachnolaimus* Cuvier 1829

### *Lachnolaimus multidentis* (MUNSTER)

(Pl. I fig. 3, 4)

1846 *Phyllodus multidentis* MUNSTER, in Munster, p. 7, pl. I, fig. 5  
1875 *Nummopalatus multidentis* (MUNSTER), in Sauvage, p. 629, pl. 23, fig 9  
1980 *Nummopalatus cf. multidentis* (MUNSTER), in Şuraru M. et al., p. 178, figs. 2-3

**Material:** 1 lower pharyngeal bone curated at GPMDGPBBU collection and two upper pharyngeal recently collected.

**Sites:**

1. Cluj Limestone: Somes Dam, (Cluj Napoca area) for the lower pharyngeal bone
2. Nişului Valley Formation: Turnu Roşu (Sibiu district) for the upper pharyngeal bones

### Description and discussion

The preserved lower pharyngeal bone represents three quarters from the initial bone size. On its surface, there are several blunt teeth disposed in few rows, decreasing in width from the center toward the edges. The lateral epiphyses and the peduncle are not preserved. This morphological teeth pattern on the pharyngeal bone is diagnostic for *Lachnolaimus*.

The two upper pharyngeal remains from Turnu Roşu represent a half of the entire pharyngeal bone and are covered also by blunt teeth disposed in rows.

This species holotype curate at NHMM and the actual *Lachnolaimus maximus* WALBAUN, 1792 represents the comparative material. A lower pharyngeal bone originating from the Miocene of Vienna Basin represents the holotype. One of the lateral epiphyses and the peduncle are missing. Except the slightly smaller size, the spatial arrangement of the pharyngeal teeth and the general morphology is identical with the specimen from the Cluj Limestone.

The labrids include actually about 500-600 species inside 60 genera, and represent the most prominent and diverse coral reef fishes throughout the world.

Westenat (1993) considers that three tribes are existing into the Labridae: Cheilini, Hypsgenyini and Julidini. The *Lachnolaimus* genus, positioned in the Hypsgenyini tribe, seems to have the most primitive characters among labrids.

Even if the morphological diversity is wide, I could recognize only few fossil genera: *Labrus*, *Julis*, *Labrodon*, *Pharingodopilus*, and *Nummopalatus* (for some authors synonym with *Labrodon*). From these genera the only which have actual representatives are *Labrus* and *Julis*. I consider that the *Labrodon* genus is an artifact and includes the all unknown forms, which theoretically could belong to Labridae.

### Ecology of actual labrids

The actual labrids are very diverse in size, form and color. The body is slightly flattened laterally. Dimensions are running between 45 cm (*Minilabrus striatus*) to 2 m (*Cheilinus undulatus*).

Labrids are shallow-water fishes, most of them living on coral reef or rocky substratum environments, excepting *Xyrichtys* and *Cymolutes*, which are found over open stretches of sand into which they dive with the approach of danger. For the most part of labrids, feed consists mainly from hard-shelled mollusks, seurchins and crustaceans, which they crush with their pharyngeal teeth.

### CONCLUSION

This paper has reviewed two species from the Eocene deposits from Transylvania, previously considered extinct forms, without actual correspondents. I reconsider these taxa, as follow:

1 - *Labrodon multidentis* should be replaced by *Lachnolaimus multidentis* (in the same Labridae family)

2 - *Progymnodon hilgendorfi* should be replaced by *Chilomycterus hilgendorfi* (i.e. from Progymnodontidae in Diodontidae).

Their holotypes curates in NHMM were restudied and reconsidered in relation with the actual *Lachnolaimus* and *Chylomicterus*.

The environments of the actual *Chilomycterus* and *Lachnolaimus* probably are the same with the fossils ones. Now, they are living in shallow tropical water seas. The dentition (almost unchanged after 40 MY) and the faunal assemblages from the Cluj Limestone and Valea Nişului Formation indicate a diet represented by hard-shelled invertebrates for *Chilomycterus* and a more diverse nutrition for *Lachnolaimus*, with hard-shelled mollusks, seurchins and crustaceans, which they crushed with their pharyngeal teeth.

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#### Plate caption

#### PLATE I

- Fig. 1 - upper pharyngeal jaw of *Chilomycterus hilgendorfi*  
 Fig. 2 - lower pharyngeal jaw of *Chilomycterus hilgendorfi*  
 Fig. 3 - lower pharyngeal bone of *Lachnolaimus multidentis*  
 Fig. 4 - upper pharyngeal bone of *Lachnolaimus multidentis*  
 Scale bar 0.5 cm.

Plate I

