STUDIA UNIVERSITATIS BABEȘ-BOLYAI, GEOLOGIA, XLVII, 2, 2002, 37-46

A REVIEW OF THE EOCENE DIODONTIDS AND LABRIDS FROM TRANSYLVANIA

EMANUEL PAUL DICA[1]

ABSTRACT. This paper reviews two diodontids and labrids species: *Chylomicterus hilgendorfi* and *Lachnolaimus multidens*. 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 Nișului Valley Formation (Turnu Roșu) 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 (Șuraru & Șuraru, 1966), from the outcrops: Pleșca Valley and Baciu quarries (Cluj Napoca area): *Scaroides gatunensis* TOULA, 1908; Șuraru et al. (1980), Someș dam outcrop (western side of Cluj Napoca): *Progymnodus hilgendorfi* (DAMES), 1883, *Nummopalatus* cf. *multidens* (MUNSTER), 1846, *Scaroides gatunensis*; Șuraru & Șuraru (1987), from Văratec Valley (Turbuța, Sălaj district) and Baciu quarry (near Cluj-Napoca) outcrops: *Progymnodus* cf. *hilgendorfi*, *Scaroides gatunensis.*

b) Nișului Valley Formation from Satului Valley, Turnu Roșu (= Porcesti, Sibiu district; Șuraru & Șuraru, 1966): *Scaroides gatunensis*.

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

The identified fishes (*Chylomicterus hilgendorfi, Lachnolaimus multidens)* 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 XIXth century. The fossil assemblages are very diverse, including invertebrates (mollusks, crustaceans, corals, foraminifers

[1] *"Babeş-Bolyai" University, Department of Geology-Paleontology. Str. Kogălniceanu 1, RO-3400 Cluj-Napoca, Romania. E-mail: pdica@bioge.ubbcluj.ro*

etc) and vertebrates (fishes, turtles, crocodilians 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; premaxyllaries 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".

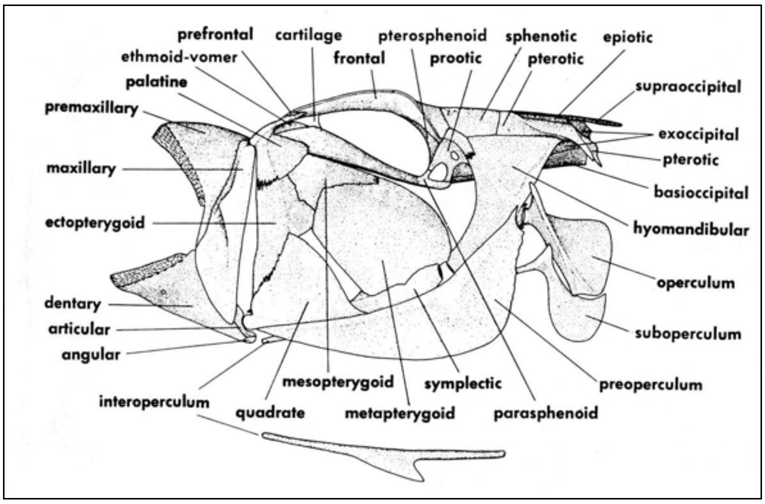

Fig. 1. Cranial morphology in diodontids (after Tyler, 1980)

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 straights 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 5th 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 5th ceratobranchial presents a small patch of minute teeth.

The same patch could be better recognized on the 5th 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 pharynghobranchial of the first and second arches always presents small teeth, the pharynghobranchial of the third arch, when present, is always smaller and almost always toothless.

In actual *Chylomycterus* and *Dicothylichthys* the 3rd arch is usually small and toothless, and very rarely small teeth could be observed (sometimes in *Chilomycterus sheophi* 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 ore less completes, 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 frequents. 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, Baciu 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 angulary and the articulary.

Weiller (1929) assigned such lower and upper jaws to *Diodon* (?*Chilomycterus*) *hilgendorfi*. Later, Șuraru & Șuraru (1966, 1987) and Șuraru 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^{th} 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 multidens (MUNSTER)

(Pl. I fig. 3, 4)

1846 *Phyllodus multidens* MUNSTER, in Munster, p. 7, pl. I, fig. 5
1875 *Nummopalatus multidens* (MUNSTER), in Sauvage, p. 629, pl. 23, fig 9
1980 *Nummopalatus cf. multidens* (MUNSTER), in Șuraru 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. Nișului Valley Formation: Turnu Roșu (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 Roșu 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: Cheilinini, 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 streches of sand into which they dive with the approach of danger. For the most part of labrids, feed consists mainly from hard–shelled mollusks, seaurchins 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 multidens* should be replaced by *Lachnolaimus multidens* (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 Nișului Formation indicate a diet represented by hard-shelled invertebrates for *Chilomycterus* and a more diverse nutrition for *Lachnolaimus*, with hard–shelled mollusks, seaurchins and crustaceans, which they crushed with their pharyngeal teeth.

Acknowledgements. Author is grateful to *Prof. Dr. Vlad Codrea* for reviewing this paper and to *Assist. Matei Vremir* for his collegial help in collecting several fossils. This paper is a contribution of *CNCSIS Td. Grant (2002): "Palaeoenvironmental studies in the Paleogene formations from the NW Transylvanian Depression based on ichthyologic assemblages".*

REFERENCES

Dames, W., 1883*, Uber eine tertiare Wirbeltierfauna von der westllichen Insel des Birket el Qurun im Fajum (Aegyptem).* – Sitzunggsberichte der koniglich – preussischen Akademie der Wisseeenchaften zu Berlin, 129-153; Berlin.

Frasser-Brunner, A., 1943 – *Notes on the plectognath fishes. VIII. The clasification of the Tetraodontoidea, with a synopsis of the genera* – Ann. Mag. Natural History, ser. 11, 10:1-18, Washington.

Gomon, M., 1997, *Relationships of fishes of the Labrid tribe hypsengenyni* – Bulletin of marine science 60 (3): 789-871, Miami.

Le Danois, Y., 1959*, Étude ostéologique, myologique et systématique des poissons du sous-ordre des orbiculates* – Annales de l'Institut Océanographique du Monaco (N. S.) v. 36 (no. 1): 1-273, Monaco.

Le Danois, Y., 1962, *Catalogue des types de poissons orbiculates du muséum National d'Histoire naturelle. II. Familles des Tetraodontidae, Lagocephalidae, Colomesidae, Diodontidae et Triodontidae* – Bulletin du Muséum National d'Histoire Naturelle, (Ser. 2) v. 33 (no. 5): 462-478, Paris.

Leis, J.M.,1986, *Family No. 269: Diodontidae* - In: Smiths' Sea Fishes (Smith & Heemstra ed.), pag. 903-907, Washington.

Leis, J.M. & M.-L., BAUCHOT, 1984, *Catalogue critique des types de Poissons du Muséum national d'Histoire naturelle. (Suite) (Famille des Diodontidae)* - Bulletin du Muséum National d'Histoire Naturelle, Sect. A, v. 6 (no. 3): 83-101, Paris.

Munster, G.G, 1846, *Ueber die in der Tertiar – Formation des Wiener Beckens vorkommeden Fisch – Ueberreste, mit Beschreibung einiger neuen merkwurdigen Arten* – Beitrage zur Petrefacten – Kunde, in Verlag der Buchner'sschen Buchhlandlung ed., p. 1-66, Bayreuth.

Nelson, J., 1984, *Fishes of the World (2nd edition)* - John Wiley & Sons ed. 523 pag. New York.

Rognes, K., 1971, *Head skeleton and Jaw mechanism in Labrinae (Teleostei:Labridae) from Norwegian waters* - Acta Universitatis Bergensis, 4:1-170, Bergen.

Sauvage, E, 1875*, Note sur le genre Nummopalatus et sur les espèces de ce genre trouvées dans les terrains tertiaires de la France* - Bulletin de la Société Géologique de France, 3:613-630, Paris

Șuraru, M., Strusievici, R., Laszlo, K., 1980, *Resturile unor dinti de teleostei in Eocenul de la Cluj-Napoca* – Studii și Cercetări de Geologie, Geofizică, Geografie, 25:177-181, București.

Șuraru, N. & Șuraru, M., 1966, *Asupra unor resturi de pesti eocenici din bazinul Transilvaniei* - Studia Universitatis Babeș-Bolyai, seria Geologie- Geografie, 1: 69-77, Cluj-Napoca.

Șuraru, N. & Șuraru, M., 1987, Neue angaben uber eininge fischreste aus dem Eozan des Transylvanischen beckens – in: The Eocene from the Transylvanian Basin, speciall issue, pag. 127-134, Cluj-Napoca.

Tavani, G., 1955, *Observazioni su alcuni Plectognathi (Gymnodonti).* - Atti della Soc. Toscana Scienci. Nataturali, Mem., (A) 62:176-200, Pisa.

Toula, F., 1908, *Eine jungtertiare Fauna v. Gatun am Panama Kanal* – Jahrbuch. der Kaiserlich – Konglichen Geologischen Reichsantaldt, Bd. LVIII, Wien.

Tyler, J.C. 1980, *Osteology, Phylogeny and Higher Classification of the fishes of the Order Plectognathi (Tetraodontiformes).* - NOAA Tehnical Report NMFS Circular 434, 422 pp, Washington.

Weiller, W., 1929, *Die mitel und obereocaene Fishfauna Agypteus mit besonderer Beriicksichtigung der teleostomi* – Abhandlugen der Bayerischen Akademie der Wissenchaften Mathematisch - Naturwissenchaften, 57:15-35, Muenchen.

Westneat, M.W., 1993, *Phylogenetic relationships of the tribe Cheilinini (Labridae: Perciformes)* – Bulletin of marine science, 52(1): 351-394, Miami.

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 multidens*
Fig. 4 - upper pharyngeal bone of *Lachnolaimus multidens*
Scale bar 0.5 cm.

Plate I