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A NEW SPECIES OF MOBULID RAY (ELASMOBRANCHII, MOBULIDAE) FROM THE OLIGOCENE OF BELGIUM

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A new mobulid species, *Plinthicus kruibekensis*, from the Oligocene (Rupelian) Boom Clay Formation of Belgium is described.

Key words — Chondrichthyes, Mobulidae, Oligocene, Rupelian, Belgium.

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INTRODUCTION

The family Mobulidae (devil rays) includes the largest representatives of living batoid fishes. Some species, *e.g. Manta birostris* (Donndorff, 1798), may attain a disc width of at least 6.7 m and a weight in excess of 1,400 kg (Bigelow & Schroeder, 1953). Nowadays, devil rays occur worldwide in tropical and subtropical seas quite commonly, more rarely in warm-temperate waters; over continental shelves as well as around larger distant islands. Their mode of life is pelagic and they are highly migratory, swimming often in small schools close to the surface. Unlike all other rays, mobulids filter-feed on zooplankton (fish fry, crustacean larvae and small squids) by means of a specialised branchial sieve apparatus. In living mobulids, the small and numerous teeth display a wide range of variation with regard to their morphology, which is brought about by a process of regression of their dentition which is no longer in use.

Fossil mobulid teeth have been described from the Tertiary of Europe, North America, Africa and Asia. The family includes the genera *Archaeomanta* (Late Palaeocene - Middle Eocene), *Burnhamia* (Late Palaeocene - Middle Eocene), *Eomobula* (Late Eocene - Middle Eocene), *Manta* (Early Miocene - Recent), *Mobula* (Late Eocene - Recent) and *Plinthicus* (Early Miocene - Middle Miocene). However, mobulid teeth have not yet been described from the Oligocene. Pfeil (1981) described two mobulid species from the Latdorfian Schönecker Fischschiefer of southern Germany, but the Latdorfian is now incorporated into the Eocene while the Oligocene comprises only the Rupelian and Chattian (Cowie & Bassett, 1989).

In 1984, a tooth of an undescribed *Plinthicus* species was collected by the author from the sieve residue of a sediment sample from the Boom Clay Formation (Oligocene, Rupelian) of Kruibeke near Antwerp, Belgium. It is the earliest known occurrence of this genus and first evidence of its presence in the North Sea Basin. The elasmobranch fauna from the Boom Clay Formation in Belgium is well known and has been the subject of several papers, *e.g.* Leriche (1910), Steurbaut & Herman (1978) and Nolf (1986). It is dominated by small teeth of *Squalus* (72%) and *Raja* (24%); larger teeth of *e.g. Carcharias* are extremely rare and represent no more than 4% of the total number of elasmobranch teeth. The extreme rarity of mobulid teeth may be due to the considerable fall in temperature at the Latdorfian-Rupelian boundary.

SYSTEMATIC PART

Class	Chondrichthyes
Subclass	Elasmobranchii
Superorder	Batomorphii
Order	Myliobatiformes
Family	Mobulidae
Genus	*Plinthicus* Cope, 1869

Type species — *Plinthicus stenodon* Cope, 1869.
Generic diagnosis — Extinct mobulid ray known only from isolated teeth. The dentition is similar to that of *Rhinoptera* with hexagonal teeth which regularly decrease in width from the symphysial towards the lateral rows. The teeth may be quite large, up to 25 mm wide. The crown is high, compressed in outer-inner direction, expanded mesio-distally, higher on the mesial than on the distal part, strongly sloping inwards, placing the occlusal surface backwards with respect to the basal crown face, and shows pronounced enameloid laminae on the inner and outer faces. The polyaulacorhizid root is low and poorly developed.
Discussion — The genus *Plinthicus* is poorly known. The only species described hitherto is the type species, *P. stenodon* Cope, 1869. It is common in the Miocene of Maryland and North Carolina, U.S.A., and rare in the Miocene of southern France (Cappetta, 1970, 1987).

Plinthicus is included in the family Mobulidae, since the general tooth morphology (especially the high, compressed crown and polyaulacorhizid root) resembles that of certain extant *Mobula* species. In addition, the degree of wear of the teeth is negligible, which would suggest a diet of soft prey, and thus a pelagic way of life (Cappetta, 1970, 1987).

Plinthicus kruibekensis nov. sp.
Pl. 1, Figs 1-5.

Derivation of name — This species is named after the type locality Kruibeke in northern Belgium.
Material — A single tooth, the holotype, collected by the author in 1984. It is deposited in the collections of the Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Geologie en Mineralogie), Leiden, The Netherlands. Registration number RGM 177 500.
Type locality — "Gralex" clay pit at Kruibeke, situated SW of the city of Antwerp, Belgium. Coordinates: x = 146.5, y = 208.5. For a description of the section exposed the reader is referred to Vandenberghe (1978) and van den Bosch & Janssen (in press).
Type horizon — Upper part of the Boom Clay Formation, Putte Member. Sediment sample from bed number 56, which coincides with septaria level S60, formerly referred to as S6 (Vandenberghe, 1978; Vandenberghe & Laga, 1986). Age: Oligocene, Rupelian.
Description — The tooth is very fragile, but of perfect preservation, showing no signs of abrasion due to functional usage or 'post-mortem' transport whatsoever. The tooth is 3.0 mm high, 5.4 mm wide and 1.6 mm long.

The crown is very high, compressed in outer-inner direction and expanded mesio-distally. In inner and outer view the crown has a subrectangular outline; the basal side being rectilinear, the occlusal side slightly concave, the mesial and distal sides semi-elliptical. The crown is somewhat asymmetrical, being slightly higher on the mesial than on the distal part. The elliptical mesial and distal crown extensions are about half as thick as the middle part of the crown between the occlusal and basal faces. In lateral view, the crown first slopes outwards and then curves strongly towards the inner side, thus placing the occlusal face backwards with respect to the basal crown face. The occlusal surface has a clearly hexagonal outline with sigmoidal inner and outer sides, the inner edge being sharp, the outer edge rounded and slightly overhanging the outer crown face. The flat and smooth occlusal face is 2.6 times as wide as deep. It shows a number of low, broad and irregular folds that run in an outer-inner direction. The inner crown face shows an anastomosing pattern of very pronounced vertical ridges with intermediate grooves of varying depth. On the outer crown face a similar pattern of anastomosing ridges is present, in contrast to the inner crown face which is covered with large and blunt spine-like outgrowths of varying size and shape. The inner crown rim is smooth, extended and overhangs the root. The outer crown rim is smooth and slightly convex. The basal face of the crown has a hexagonal outline with subrectilinear inner and outer sides. The crown/root junction lies in a depression in the basal surface of the crown.

The polyaulacorhizid root is low and poorly developed. The irregularly shaped root lobes are separated by rather broad and deep parallel intermedian grooves, U-shaped in section and of varying width and depth. The mesialmost and distal-

most root lobes are partly fused. The foramina, being variable in size and shape, are randomly scattered over the root; the larger foramina occur in the intermedian grooves.

Differential diagnosis — The genus *Plinthicus* was monotypic until now. The type species, *P. stenodon*, was described by Cope (1869: 116-117), and figured for the first time by Hussakof (1908: 33, fig. 10); a good description and figure were given also by Cappetta (1987: 177-178, fig. 148G-I). The tooth of *P. kruibekensis* described here resembles those of *P. stenodon* in general morphology, but differs in the following respects:

Plinthicus kruibekensis	*Plinthicus stenodon*
- crown first slopes in outward direction and then curves inwards	- crown slopes inwards and finally curves upwards
- occlusal face flat	- occlusal face hollow
- anastomosing enameloid laminae on crown faces of varying height.	- parallel enameloid laminae on crown faces of equal height.

There are no literature data as to the presence or absence of dignathic heterodonty in *Plinthicus*. The possibility that the differences mentioned above are partly an expression of different tooth morphology in the upper and lower jaws cannot be ruled out.

Discussion — The shape of the tooth and the very pronounced enameloid laminae on the inner and outer faces of the thicker middle part of the crown indicate that in *P. kruibekensis* the individual teeth in a row were interlocked. The hexagonal outline of the occlusal face and the elliptical mesial and distal crown extensions show that the tooth rows were also interlocked, forming a dental plate similar to that of *Rhinoptera*. This lends support to the hypothesis that the genus *Plinthicus*, and possibly all mobulids, evolved from the rhinopterids.

Remarks — Naturally, the erection of a new species of ray on the basis of a single tooth is open to criticism. However, I consider it justified in this case for several reasons:

1. The tooth is very well preserved, quite typical of the genus and unlikely to be pathological.
2. It is different from all mobulid teeth hitherto described in the literature.
3. The Rupelian elasmobranch faunas from Belgium and The Netherlands are very well known and the chances of further specimens being discovered in the near future are slight.
4. The specimen is of importance in representing the stratigraphically oldest species of *Plinthicus* and only Oligocene mobulid yet described.

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References

Bigelow, H.B., & W.C. Schroeder, 1953. Fishes of the western North Atlantic. Sawfishes, guitarfishes, skates and rays. — Mem. Sears Found. Mar. Res., 1(2): 1-514, 117 figs.

Bosch, M. van den, & A.W. Janssen, in press. Presence of a sedimentary hiatus in the Boom Clay Formation at Kruibeke (Belgium): an example for the application of planktonic gastropods ('pteropods') in biostratigraphy and interregional correlation of Rupelian deposits in the North Sea Basin. — Submitted to Mitt. Überseemus. Bremen.

Cappetta, H., 1970. Les sélaciens du Miocène de la région de Montpellier. — Palaeovertebrata (1970), mém. ext.: 1-139, 22 figs, 6 tabs, 27 pls.

Cappetta, H., 1987. Chondrichthyes, 2 (Mesozoic and Cenozoic Elasmobranchii). *In*: H.-P. Schultze (ed.). Handbook of paleoichthyology, 3B. Stuttgart & New York (G. Fischer Verlag): 193 pp., 148 figs.

Cope, E.D., 1869. Descriptions of some extinct fishes previously unknown. — Proc. Boston Soc. Nat. Hist., 12: 310-317.

Cowie, J.W., & M.G. Bassett, 1989. IUGS 1989 global stratigraphic chart. — Episodes, 12(2): 1 pp. (supplement).

Hussakof, L., 1908. Catalogue of the type and figured specimens of fossil vertebrates in the American Museum of Natural History, 1. Fishes. — Bull. Am. Mus. Nat. Hist., 25: 1-103, 49 figs, pls 1-6.

Leriche, M., 1910. Les poissons oligocènes de la Belgique. — Mém. Mus. r. Hist. nat. Belgique, 5(20): 229-363, figs 65-156, pls 13-27.

Nolf, D., 1986. Fossielen van België. Haaie- en roggetanden uit het Tertiair van België. Brussel (Koninkl. Belg. Inst. Natuurwetensch.): 171 pp., 17 figs, 59 pls.

Pfeil, F.H., 1981. Eine nektonische Fischfauna aus dem unteroligozänen Schönecker Fischschiefer des Galon-Grabens in Oberbayern. — Geologica Bavarica, 82: 357-388, 1 tab., 3 pls.

Steurbaut, E., & J. Herman, 1978. Biostratigraphie et poissons fossiles de la Formation de l'Argile de Boom (Oligocène Moyen du Bassin Belge). — Géobios, 11(3): 297-325, 3 figs, 6 tabs, 3 pls.

Vandenberghe, N., 1978. Sedimentology of the Boom Clay (Rupelian) in Belgium. — Verhand. Koninkl. Acad. Wetensch., Lett., Sch. Kunsten België, Kl. Wetensch., 40(147): 1-137.

Vandenberghe, N., & P. Laga, 1986. The septaria of the Boom Clay (Rupelian) in its type area in Belgium. — Aardk. Meded., 1986(3): 229-238, 4 figs.

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PLATE 1

Figs 1-5. *Plinthicus kruibekensis* nov. sp.
"Gralex" clay pit at Kruibeke, Belgium. Oligocene, Rupelian, Boom Clay Formation, Putte Member, bed number S60-56. Holotype, leg. T.J. Bor, coll. RGM 177 500, approx. × 19. 1: outer view, 2: inner view, 3 distal view, 4: occlusal view, 5: basal view.

PLATE 1