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Holocephalans in the Staatliches Museum für Naturkunde in Stuttgart
2. A myriacanthid tooth plate from the Hettangian (Lower Lias) of northern Bavaria

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With 1 figure in the text, 1 plate

Abstract

Alethodontus bavariensis n.g., n.sp. is a myriacanthid holocephalan described from an external mould recovered from the Lower Hettangian of Krappenroth, northern Bavaria. The specimen is a left lower tooth plate with a strong ridge at the symphyseal margin, and sharp diagonal and labial ridges arising from a common origin on the labial margin. The specimen is probably a juvenile, and shows scratch marks due to functional antemortem abrasion on the shearing part of the tooth plate. The tooth plate is distinct from those of all other myriacanthid genera in the details of the occlusal surface.

Zusammenfassung

Alethodontus bavariensis n.g., n.sp., ein Holocephale aus der Familie der Myriacanthidae, wird anhand eines Positiv-Abdruckes der Zahnhohlform beschrieben. Diese stammt aus dem unteren Hettangium von Krappenroth in Nordbayern. Das Exemplar ist eine linke Unterkieferzahnplatte. Sie ist durch eine starke Kante am Symphysealrand und scharfe, vom labialen Rand ausgehende Diagonal- und Labialleisten charakterisiert. Der Zahn ist wahrscheinlich einem Jugendexemplar zuzuordnen. Auf den scherend wirkenden Zahnkämmen sind antemortem entstandene Abnützungsspuren festzustellen. Die Zahnplatte unterscheidet sich von den Zähnen aller anderen Gattungen der Familie Myriacanthidae durch ihre eigenartige Okklusionsfläche.

1. Introduction

Myriacanthid holocephalans are known to range from sediments of Rhaetian (Upper Triassic: Duffin & Furrer 1981) to Tithonian (Upper Jurassic: Zittel 1887) age in north-west Europe. Parts of the dentition are known in *Agkistracanthus mitgelensis* Duffin & Furrer from the Rhaetian and Hettangian of Kanton Graubünden, eastern Switzerland, *Myriacanthus paradoxus* Agassiz and *Metopacanthus granulatus* Agassiz

from the "Lower Lias" (Sinemurian) of Lyme Regis in England (Patterson 1965), *Chimaeropsis foussi* Casier from the Sinemurian of Belgium (Casier 1959), *Acanthorhina jaekeli* Fraas from the Toarcian of Holzmaden (Duffin 1983) and *Chimaeropsis paradoxa* Zittel from the Lower Tithonian of Solnhofen in Bavaria (Zittel 1887).

The myriacanthid dentition typically comprises a symphyseal tooth plate and a pair of posterior tooth plates in the lower jaw, and three pairs of tooth plates in the upper jaw. The occlusal surfaces of the tooth plates lack the tritoral areas of pleromic hard tissue occurring in the chimaerids, except in upper anterior tooth plates. Diagonal ridges cross the occlusal surfaces of the posterior tooth plates.

This paper is the second in a proposed series in which it is intended to describe the holocephalan remains held in the Staatliches Museum für Naturkunde in Stuttgart. The first publication in the series (Duffin 1983) dealt with the myriacanthid material, a further specimen being presented to the Museum after completion of the paper. This new specimen is described below.

2. Systematic palaeontology

Class Chondrichthyes Huxley, 1880
Subclass Holocephali Bonaparte, 1832
Order Chimaeriformes Patterson, 1965
Suborder Myriacanthoidei Patterson, 1965
Family Myriacanthidae Smith Woodward, 1889

Genus *Alethodontus* n.g.

Type species by monotypy: *Alethodontus bavariensis.*
Derivation of name: aletho (Greek, ἀλήθω) = to grind at the mill; odous (Greek, ὀδούς)

Diagnosis: Myriacanthid holocephalan known on the basis of a single natural mould of a left posterior tooth plate from the lower jaw. The tooth plate is elongate and possesses a straight symphyseal margin surmounted by a strong ridge. Further ridges are present, one along the labial tooth plate margin, the other diagonally across the occlusal surface. These latter ridges have a common origin on the labial margin of the tooth plate, distal to the antero-symphyseal corner.

Alethodontus bavariensis n.sp.

Fig. 1 a—c; pl. 1 fig. 1

Holotype: Catalogue number 51956 SMNS (Staatliches Museum für Naturkunde in Stuttgart). The natural external mould of a left posterior lower tooth plate. The specimen was collected by Dr. G. Bloos, Ludwigsburg, in 1982.

Locus typicus: Brook ca. 600 m south-east of Krappenroth, Kreis Lichtenfels in Oberfranken, northern Bavaria; Blatt 5832 Lichtenfels, R37300/H57300.

Stratum typicum: Decalcified micaceous sandstone with carstone developments, directly above the "Sohlbank" (cf. Bloos 1981: 18), Lower Hettangian, *Psiloceras planorbis* Zone (Lower Jurassic).

Diagnosis: See diagnosis of the genus.

Description: The specimen (figure 1 a—c, plate 1 figures 1, 2) is very well preserved as an external mould on the surface of a sandstone block. The following descrip-

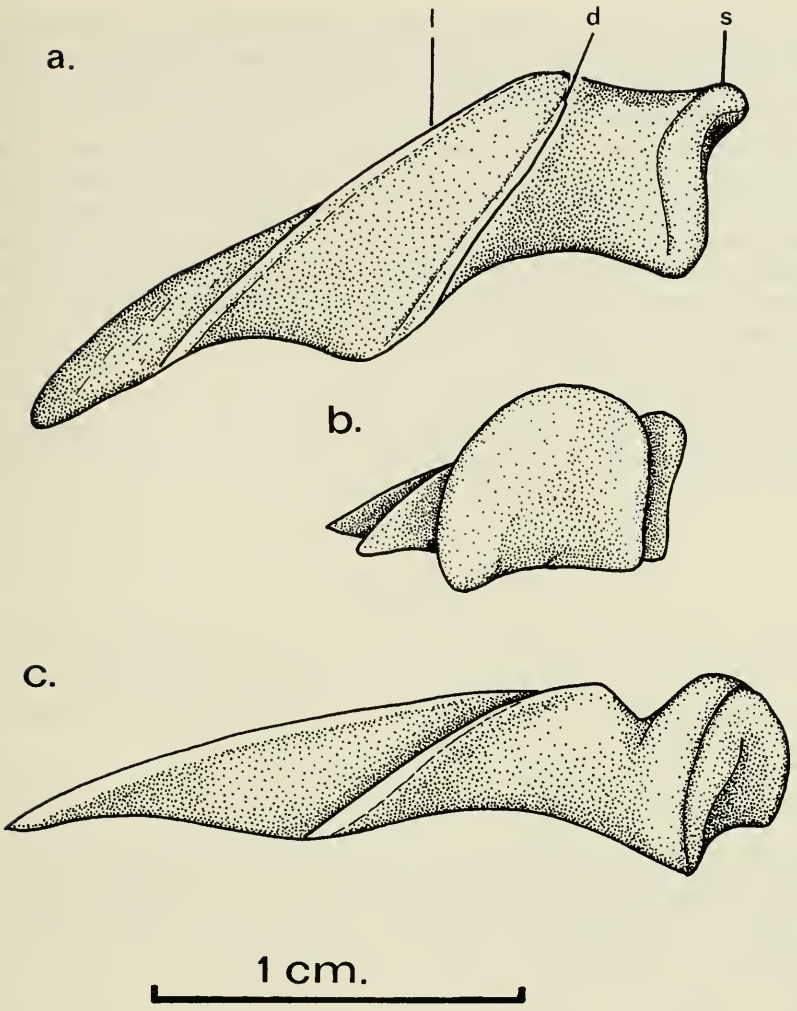

Fig. 1. Holotype of *Alethodontus bavariensis* n.sp. (SMNS 51956), a left lower posterior tooth plate from the Lower Hettangian of Krappenroth, northern Bavaria in a. occlusal view; b. symphyseal view; c. oblique lingual view. Abbreviations: s, symphyseal ridge; d, diagonal ridge; l, labial ridge: The drawings were made from a resin cast on a Wild Stereomicroscope fitted with a camera lucida.

tion and diagrams (figures 1 a—c; plate 1, figure 2)) are based on an epoxy resin cast taken from the specimen.

The specimen, exposed in occlusal view (figure 1 a), measures 20 mm mesiodistally and 5 mm labiolingually at its widest point. The symphyseal margin is preserved and is 5 mm deep, with a "D" shaped outline in mesial view (figure 1 b). There is a shallow depression in the centre of the symphyseal face. The symphyseal margin is expressed as a pronounced ridge in occlusal view. The occlusal surface of the tooth possesses three ridges. As mentioned above, one of these (s., figure 1 a) marks the symphyseal margin, and is medial. Two ridges subdivide the occlusal surface into two main areas. The

longer (l., figure 1 a; 8 mm preserved length) is situated along the posterolabial margin of the tooth plate; the shorter (d., figure 1 a; 11 mm preserved length) runs diagonally across the occlusal surface labiolingually. The two ridges have a common origin 5 mm posterior to the junction of the labial and symphyseal margins of the tooth plate, along the labial margin (figure 1 a). Each of these two ridges is high (at least 1.5 mm) and sharp. They diverge lingually at an angle of approximately 30°. Examination of the resin cast under the light microscope reveals that individual dentine pillars, forming the surface pleromic hard tissue, were evenly spaced on the crest of the ridges, and over the triangular tritoral depression between them. The impression is gained from the resin cast that further pleromic hard tissue development was present on the ridge forming the symphyseal margin, especially lingually, and for a small area stretching some 3 mm distal to the symphyseal margin.

The mesial face of the diagonal ridge is sharply defined and steep. The resin cast displays some thirty scratch marks which are oriented mesially and labiolingually. The scratches are fairly deep, up to 1 mm long, and are concentrated toward the lingual margin. The crest of the diagonal ridge itself shows some antemortem wear lingually; it becomes worn to produce a double crest midway along its length (figure 1 c).

3. Discussion

The tooth plate described above is clearly that of a myriacanthid holocephalan. This is demonstrated by the fact that the pleromic hard tissue is widely distributed over the occlusal surface, rather than being organised into tritoral areas as in chimaerid tooth plates, and the presence of a diagonal ridge on the occlusal surface.

In the myriacanthid dentition a straight symphyseal margin is known only in the paired lower tooth plates. This feature is well developed in *Acanthorhina jaekeli* Fraas (Duffin 1983, figures 1, 5 a, plates 1, 2), although it is not so pronounced as in *Alethodontus*. *Agkistracanthus* the symphyseal margin of the tooth plate is long and not accentuated by ridge development. In *Myriacanthus paradoxus*, the symphyseal margin is not as straight as in *Alethodontus*. In *Metopacanthus granulatus* the ridge is straight and pronounced (Smith Woodward 1891, plate 3 figure 3, plate 1 figure 2), but is somewhat longer. The dentition of *Chimaeropsis* is currently insufficiently known for adequate comparisons to be made, although I am currently studying available material. Thus, in the straight symphyseal ridge, *Alethodontus bavariensis* is most closely comparable to *Acanthorhina* and *Metopacanthus*.

The form of the occlusal surface of the tooth plate is unique in *Alethodontus*, the long ridge along the labial margin diverging from its common origin with the diagonal ridge. The paired lower tooth plates of *Agkistracanthus* are trapezoid in occlusal view, with a single low diagonal ridge crossing the occlusal surface. The pleromic hard tissue is somewhat higher along the labial border of the tooth plate than it is in adjacent areas (Duffin & Furrer 1981, plate 2 figure 1 a) but does not constitute a marked ridge. Two diagonal ridges are developed in both *Myriacanthus* (Dean 1906, figure 119; Patterson 1965, figure 16) and *Metopacanthus* (Smith Woodward 1891, plate 3 figure 3; plate 1 figure 3). In each case, these ridges have separate points of origin on the labial border of the tooth plate. *Acanthorhina* bears three ridges in addition to the symphyseal ridge on the lower posterior tooth plate. The diagonal ridge bifurcates lingually; the third ridge defines the posterolabial border of the tooth plate, but has a separate origin to the diagonal ridges (Duffin 1983, figures 1, 5, plates 1, 2).

The tooth shape of *Alethodontus* like that of *Acanthorhina*, suggests both a shearing and crushing function. The presence of the high ridges allows shearing, while the flatter intervening areas crush food. Functional antemortem wear has been observed in the tooth plates of *Agkistracanthus* by Duffin & Furrer (1981). Here, wear facets were produced bearing randomly oriented scratch marks on predominantly crushing tooth plates. The position and orientation of the scratches on *Alethodontus* suggests production during a shearing action. The jaws of extant holocephalans are capable of vertical movement only (Ribbink 1971). The jaw suspension in myriacanthids is apparently identical to that in chimaerids, indicating similar jaw motion during biting. This might be expected to produce scratch marks down the sides of the diagonal ridge during occlusion while feeding. The labiolingual curvature of the tooth plate adds a further directional component to food particle movement. The scratches must have been made by resistant food particles. It has been suggested that some myriacanthids fed on belemnite remains (Riegraf 1980, Duffin 1983); extant chimaeroids feed on a variety of shelled invertebrates and worms. The tooth plate of *Alethodontus* was recovered from Hettangian sediments of littoral facies supporting a large bivalve fauna, but no belemnites. Bivalves may well have been prey to myriacanthids.

The specimen of *Alethodontus* described above is probably from a juvenile. Functional wear has begun to erode the crest of the diagonal ridge lingually, but other parts of the tooth plate appear to have sustained little ante- or postmortem abrasion. Indeed, the labial margin ridge is very sharp. There is a possibility that the labial and diagonal occlusal ridges separate at their origin with maturity; further specimens are needed before this can be discussed further.

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References

Bloos, G. (1981): Zur Stratigraphie und Ammonitenfauna des marinen Hettangiums (Unterer Lias) in Oberfranken (N-Bayern). — Stuttgarter Beitr. Naturk., B, **78**, 1—59, 3 tables, 16 figs., 3 pls.; Stuttgart.

Casier, E. (1959): Contributions à l'étude des Poissons Fossiles de la Belgique. XII. Sélaciens et Holocéphales sinémuriens de la province de Luxembourg. — Bull. Inst. Sci. nat. Belg., **35**/8, 1—35, pl. 1—3.; Brussels.

Dean, B. (1906): Chimaeroid fishes and their development. — Publ. Carneg. Instn. **32**, 194 pp., pls. 1—11; Washington.

Duffin, C. J. (1983): Holocephalans in the Staatliches Museum für Naturkunde. 1. Myriacanthoids and Squalorajoids. — Stuttgarter Beitr. Naturk. B, **97**; Stuttgart.

Duffin, C. J. & Furrer, H. (1981): Myriacanthid holocephalan remains from the Rhaetian (Upper Triassic) and Hettangian (Lower Jurassic) of Graubünden (Switzerland). — Eclogae geol. Helv., **74**/3, 803—829, 6 figs., 2 pls.; Basel.

Patterson, C. (1965): The Phylogeny of the Chimaeroids. — Phil. Trans. R. Soc., B, **249**, 213—482, 4 figs., pls. 22—28; London.

Riegraf, W. (1981): Revision der Belemniten des Schwäbischen Jura. Teil 8. — Palaeontographica, A, **173**, 64—139, figs. 188—254, pls. 5—9; Stuttgart.

Ribbink, A. J. (1971): Contributions to the functional morphology of fishes. Part IV. The jaw mechanism and feeding of the holocephalan *Callorhynchus capensis* Dumeril. — Zoologica Africana, 6/1, 45—73, 11 figs.; Cape Town.

Woodward, A. Smith (1891): Catalogue of the fossil fishes in the British Museum (Natural History). II, xliv + 474 pp., 17 pls.; London (Brit. Mus., nat. Hist.).

Zittel, K. A. von (1887): Handbuch der Palaeontologie. Band III, Leif I, xii + 256 pp., 266 figs.; München (Oldenbourg).

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Plate 1

Fig. 1. Holotype of *Alethodontus bavariensis* n.sp. (SMNS 51956); a natural mould of a left lower posterior plate from the Lower Hettangian of Krappenroth in northern Bavaria.

Fig. 2. Holotype of *Alethodontus bavariensis* n.sp. (SMNS 51956); a silicone rubber cast of the natural mould.

Fig. 3. Left lower posterior tooth plate of *Metopacanthus granulatus* (Agassiz) from the Sinemurian of Lyme Regis, Dorset, England, photographed in occlusial view (BMNH P.3099). Bar scale = 10 mm.