A NEW HYBODONT SHARK (HYBODUS DAWNI) FROM THE OXFORD CLAY OF PETERBOROUGH, CAMBRIDGESHIRE

by

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Summary

A dorsal fin spine from the Lower Oxford Clay of Peterborough is distinct from the common Lower Oxford Clay hybodont sharks *Hybodus obtusus* and *Asteracanthus ornatissimus*. The new spine has distinct vertical ribbing laterally and a simple ornament/root margin. It is considered to belong to *Hybodus*, but cannot satisfactorily be placed in any of the currently recognised species. It is proposed to erect a new species of *Hybodus* for the reception of the new specimen, *Hybodus dawni* sp. nov.

Introduction

A fin spine of a hybodont shark, most likely from the Lower Oxford Clay, in the collection of the City Museum, Peterborough, is distinct from previously described Lower Oxford Clay hybodont sharks. The specimen is incomplete, but sufficient is preserved for an adequate description of the entire spine to be made.

The Lower Oxford clay (Callovian, Middle Jurassic) of the Peterborough district is well known for its vertebrate fossils (Andrews 1913, Martill 1985) and has yielded large numbers of skeletons of marine reptiles, fish and, rarely, dinosaurs. Vertebrates are found throughout the sequence, but appear to be more common in the organic-rich parts of the succession, especially the *K. jason* Zone.

Chondrichthyan fishes form an important part of the fish biota, and include *Pachymylus, Ischyodus, Brachymylus* and *Leptacanthus* (Chimeariformes); *Hybodus* and *Asteracanthus* (Hybodontiformes); *Notidanus* (Hexanchiformes); *Protospinax* (Squaliformes); *Paracestracion*, and *Heterodontus* (Heterodontiformes); *Palaeobrachaelurus, Orectoloboides, and Sphenodus* (Orectolobiformes), and *Spathobatis* (Rajiformes). Although this appears at first glance an impressive list of genera, most of the genera are based on incomplete or inadequate material. Thus *Paracestracion* is based on a single fin spine, while *Heterodontus* is known only from isolated teeth. Probably the teeth and the spine are from the same genus, but until a complete specimen is discovered this cannot be confirmed. The hybodont sharks *Hybodus* and *Asteracanthus*, however, are represented by a variety of skeletal elements including teeth, jaws, fin spines, cephalic spines and shagreen (Woodward 1889). Some of the material has been found in association and it has been possible for teeth and spines to be matched together.

Chondrichthyan fish have been reported from much of the outcrop of the Oxford Clay from Scarborough (Pyrah 1979) to Weymouth (Damon 1860).

Material

The specimen herein described is an almost complete dorsal fin spine from the phalacanthous shark *Hybodus*. Part of the distal tip is missing, as is the basal portion of the spine root. The posterior groove of the root has been distorted due to compaction. A small piece of calcified cartilage is present within the posterior groove of the root. The specimen is in the Peterborough City Museum collection, accession number PCM F92. The specimen is described as *Hybodus obtusus* in the Peterborough Museum Catalogue (Cross 1975). It was presented to Peterborough City Museum in 1886, and the locality given as Peterborough. In all probability the

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specimen was obtained from one of the many small brick yards operating in the district at that time, and came from the Lower Oxford Clay. Pits currently operating in the area expose both Middle and Lower Oxford Clay, but at the time of the discovery of the specimen most of the pits displayed only Lower Oxford Clay.

Systematic Description

Class SELACHII
Order HYBODONTIFORMES
Family HYBODONTIDAE Owen 1846
Genus HYBODUS Agassiz 1837

Diagnosis. See Woodward (1916: 3) and Patterson (1966: 287). Dorsal fin spines elongate, gently recurved. Posterior margin with two rows of denticles, lateral margins costate.

Hybodus dawni sp. nov.

Diagnosis. Hybodont shark in which dorsal fin spine with between 8 and 10 coarse costae laterally. A single anterior costa forms keel on anterior border. Anterior costae slightly tuberculate basally. Costae extend basally well beyond limit of posterior denticles. Mantle/stock boundary gently curved, at high angle to spine axis.

Etymology. After Mr Alan Dawn, a most enthusiastic collector of Lower Oxford Clay fossils.

Age ?Lower (possibly Middle) Oxford Clay. Callovian, Middle Jurassic.

Locality. Woodston, Peterborough, Cambridgeshire.

Holotype. Single dorsal fin spine. PCM F92.

Description. Dorsal fin spine elongate, gently recurved posteriorly, ornamented apically for approximately seven eighths of its height, estimated at two thirds of its height when complete. Root broad with deep posterior groove, fibrous texture, not known basally. Ornamented portion with coarse, widely spaced vertical ribs, continuous from root/crown margin to apex. Some ribs with slight expansions, almost becoming tuberculate. Anterior margin of spine with single rib producing sharp keel. Posterior margin broad, flat, smooth, with two rows of alternating denticles. Denticles enameloid, recurved basally.

Dimensions. The spine is incomplete, dimensions of the specimen are:-

height of spine	160 mm
height of ornamented portion anteriorly	145 mm
height of denticulate posterior border	68 mm
maximum length	24 mm

Estimated dimensions of the complete specimen:-

height	230 mm
height of ornamented portion anteriorly	155 mm
height of denticulate posterior border	73 mm

Discussion

Dorsal fin spines of hybodont sharks are often highly ornamented, and the ornament may be of taxonomic significance (Maisey 1978). Ornamentation patterns can be highly variable (plate 1, fig. a), but the gross morphology is usually sufficient for identification purposes. An examination of several specimens of Lower Oxford Clay hybodont shark fin spines in the BM(NH), Leicester and Peterborough Museums, indicates that ribbing morphology is relatively constant, although the density of ribs per centimetre may vary slightly. All of the specimens examined were recognisable as either *H. obtusus* or *A. ornatissimus*. Variation in ornament morphology of *A. ornatissimus* is greater than in *H. obtusus*. Both ribs and stellate lateral denticles may appear on the same spine, and the arrangement of lateral denticles may vary from vertical rows to random patches (Maisey 1978). Ornamentation may vary on different sides of the specimen. No specimen of either *H. obtusus* or *A. ornatissimus* showed ornamentation approaching that of *H. dawni*.

Figure 1. *Hybodus dawni* sp. nov. X 1. Lower Oxford Clay, Peterborough. Based on specimen PCM F92. Estimation of missing root and apex based on various specimens of *H. obtusus* Ag.

Woodward (1890) records three species of *Hybodus* from the Stonesfield Slate (Bathonian) of Oxfordshire; *H. apicalis, H. dorsalis*, and *H. marginalis*. The new specimen appears distinct from these forms (which may all be conspecific) in the coarseness of the costae, but there are similarities in the shape of the ornament/root margin, and the lack of a smooth posterior border.

The assignation to the genus *Hybodus* is provisional, as Maisey (1978) points out that it is not possible to distinguish *Hybodus* from *Acrodus* on the basis of fin spines alone. However, no teeth of *Acrodus* have been reported from the Lower Oxford Clay, and until they are, *Acrodus* cannot be considered a part of the Oxford Clay Ichthyofauna. The dorsal spines of *Lonchidion* (Estes 1964) are similar, but have only a single row of denticles on the posterior border. The dorsal spines of *Asteracanthus* are always strongly tuberculate.

Hybodont sharks are a relatively common element of the Lower Oxford Clay. The two common taxa occupy very distinct trophic niches. *Hybodus obtusus* is a large form with caniniform, multicuspidate dentition, and was presumably piscivorous, or perhaps an opportunistic carnivore. *Asteracanthus ornatissimus* was also large, but had a dentition modified for crushing shelled invertebrates. It was possibly a sluggish swimmer, living close to or on the sea floor. Some of the broken shell beds of the Lower Oxford Clay may have been produced by the activities of *A. ornatissimus* and the numerous chimaeras. It is difficult to assess the autecology of *Hybodus dawni* as it is only known from a single dorsal fin spine. The rarity of this taxon suggests that it was not suited for the Lower Oxford Clay environment, and the new specimen may represent a stray.

Martill (1984, & 1988) has suggested that a rare terrestrial vertebrate fauna in the Oxford Clay entered the sea from nearby rivers. It is possible that the isolated fin spine of *H. dawni* could be from a freshwater Hybodont. Freshwater Hybodonts have been reported from the Triassic of Texas (Murry 1981) and the Wealden of southern England (Patterson 1966).

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References

Andrews, C.W., 1910–13. *A descriptive catalogue of the marine reptiles of the Oxford Clay*. Vol. 1, 205pp., 10 pls. (1910). Vol. 2, 206pp., 13 pls. (1913). London: British Museum (Natural History).

Cross, T., 1975. *A catalogue of the fossil vertebrates in the City Museum, Peterborough. Part 1, Reptiles and fish*, 21pp. Peterborough.

Damon, R., 1860. *Handbook of the geology of Weymouth and the Isle of Portland*, 199pp. London.

Estes, R. Fossil vertebrates from the Late Cretaceous Lance Formation, Eastern Wyoming. *Bull. Dep. Geol. Univ. Calif.*, 49, 1–187.

Maisey, J.G., 1975. The interrelationships of phalacanthous selachians. *N. Jb. Geol. Palaont. Mh.*, 9, 553–567.

Maisey, J.G., 1978. Growth and form of finspines in hybodont sharks. *Palaeontology*, 21, 657–666.

Martill, D.M., 1984. The occurrence of a dinosaur phalanx in the Lower Oxford Clay of Peterborough, Cambridgeshire. *Mercian Geol.*, 9, 209–211.

Martill, D.M., 1985. The preservation of marine vertebrates in the Lower Oxford Clay (Jurassic) of central England. *Phil. Trans. R. Soc. Lond.*, B311, 155–165.

Martill, D.M., 1988. A review of the terrestrial vertebrate fossils of the Oxford Clay. (Callovian-Oxfordian) of England. *Mercian Geol.* 11, 171–190.

Murry, P.A., 1981. A new species of freshwater Hybodont from the Dockum Group (Triassic) of Texas. *Jour. Paleont.*, 55, 603–607.

Patterson, C., 1966. British Wealden sharks. *Brit. Mus. (Nat. Hist.) Bull. Geol.*, 11, 281–350.

Pyrah, B.J., 1979. Yorkshire Museum: type and figured fossils. *Proc. Yorks. Geol. Soc.*, 42, 415–437.

Thies, D., 1983. Jurazeitlice neoselachier aus Deutschland und S-England. *Cour. Forsch. Inst. Senckenberg*, 58, 1–116, Frankfurt/M.

Woodward, A.S., 1888. On some remains of the extinct selachian *Asteracanthus* from the Oxford Clay of Peterborough preserved in the collection of Alfred Leeds Esq., of Eyebury. *Ann. Mag. Nat. Hist.*, 2, 336–342.

Woodward, A.S., 1889. *Catalogue of fossil fishes in the British Museum (Natural History). Part 1. Elasmobranchii.* i–xlvii, 1–474, 17 pls. London.

Woodward, A.S., 1890. A synopsis of the fossil fishes of the English Middle oolites. *Proc. Geol. Assoc.* 11, 285–306.

Woodward, A.S., 1916. Fossil fishes of the English Wealden and Purbeck. *Palaeont. Soc. Monog.*

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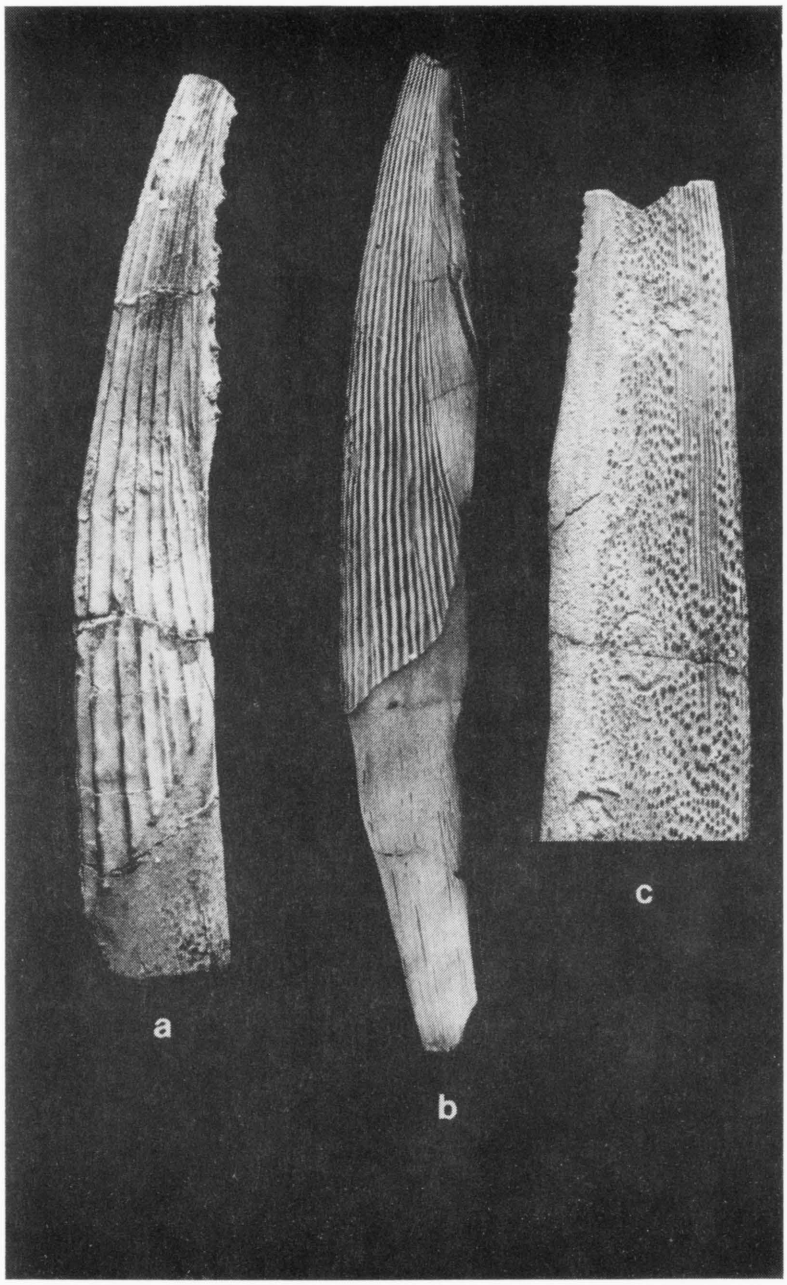

Plate 1. a. *Hybodus dawni* sp. nov. PCM F92. ?Lower Oxford Clay, Woodston, Peterborough, Cambridgeshire. Left lateral view. X 1.25. b. *Hybodus obtusus* Agassiz, LEICS G.418.1956.18.1. Lower Oxford Clay, Peterborough, Cambridgeshire. Almost complete dorsal fin spine with fine vertical ribbing and well preserved root. Left lateral view. X 0.8. c. *Asteracanthus ornatissimus* Agassiz, Lower Oxford Clay, Peterborough, PCM F57, right lateral view showing high degree of ornamental variation. X 0.7.