VARIATION WITHIN A LARGE SAMPLE OF AGELEODUS PECTINATUS TEETH (CHONDRICHTHYES) FROM THE LATE DEVONIAN OF PENNSYLVANIA, U.S.A.

JASON PHILIP DOWNS1,2 and EDWARD B. DAESCHLER1. 1Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, Pennsylvania 19103, U.S.A.; 2Department of Geology and Geophysics, Yale University, 210 Whitney Avenue, New Haven, Connecticut 06511, U.S.A.

The monospecific genus Ageleodus is a primitive chondrichthyan known exclusively from isolated Late Devonian and Carboniferous teeth. Due to part in the paucity of material, dental variation in Ageleodus has not been fully recognized. This paper reports on a large new sample of Ageleodus pectinatus teeth (382) from the Catskill Formation (Late Devonian, late Famennian) at the Red Hill site in Clinton County, Pennsylvania, U.S.A. It represents the earliest recorded occurrence of the genus, and the largest catalogued sample of A. pectinatus from a single site. This sample allows for a thorough description of morphological variation within A. pectinatus teeth and gives occasion to a review of the species’ nomenclatural history.

Nomenclatural History

Agassiz (1838) described three species of Ctenoptychius (C. apicals Agassiz, 1838; C. denticulatus Agassiz, 1838; and C. pectinatus Agassiz, 1838) from isolated teeth. The type material of C. apicals is from the Late Carboniferous (Westphalian) of Staffordshire, England. The type material of C. denticulatus and C. pectinatus is from the Burdie House Limestone (Early Carboniferous, Viséan) of Scotland. Agassiz’ original specimens are missing (Susan Turner, pers. comm.); the relevant illustrations from Agassiz’ (1838) plate are reproduced here in Figure 1. The original specimen of C. apicals (Fig. 1A) has a short root and a raised, medially-acuminate crown with imbricated basal ridges. Conical cusps divide the arching coronal margin. The prominent central cusp is bordered by three to four smaller cusps that decrease in size mesially and distally. (Note: because the arrangement of teeth within the mouth of Ageleodus is unknown, in the present paper, the terms mesial and distal [sensu Peyer, 1968] refer to direction along the long horizontal axis or length of the tooth; lingual and labial refer to direction along the short axis or width of the tooth.) Two of the three original specimens of C. pectinatus (Fig. 1B, C) exhibit a tall root punctured with nutritive foramina and a raised crown. The coronal margin is straight to slightly arched and is divided into nine or fewer cusps. The third specimen ascribed to C. pectinatus (Fig. 1D) has a very different morphology and, under present consideration, does not belong to either Ctenoptychius or Ageleodus. This tooth has a raised crown and short root. The tightly arched coronal margin is divided into bulbous cusps. Cusp size decreases with proximity to the mesial and distal edges of the tooth. The original C. denticulatus specimens (Fig. 1E–G) exhibit a tall root punctured with nutritive foramina and a raised crown. Fourteen or more slender cusps of equal dimensions divide the coronal margin.

Owen (1867) described Ageleodus diademata Owen, 1867 from coal horizons of the ‘Low Main Seam’ of Northumberland, England (Carboniferous). The original specimen was characterized by a denticall crown featuring at least twelve sub-equally sized, conical cusps and an “osteodental” root (Owen, 1867). Barkas (1874) synonymized A. diademata and Ctenoptychius pectinatus. Stock (1882) discussed continuous variation between the teeth of Ctenoptychius pectinatus and Ctenoptychius denticulatus. Traquair (1888) proposed new generic status for Ctenoptychius pectinatus, but without recognizing the availability of the genus name Ageleodus, he assigned the species to a new genus, Callopristodus. Woodward (1889) listed Callopristodus pectinatus (Agassiz, 1838) as the senior synonym of Ctenoptychius pectinatus Agassiz, 1838, Ctenoptychius denticulatus Agassiz, 1838, and Ageleodus dia- dema Owen, 1867. Zangerl (1981) recognized the priority of the genus name Ageleodus for the species Callopristodus pectinatus and, at present, Ctenoptychius pectinatus Agassiz, 1838 is regarded as the type and only species of Ageleodus. Ctenoptychius apicalis Agassiz, 1838 is the only legitimate species of Ctenoptychius and the only taxon in Agassiz’ (1838) description that is regarded as a petalodontiform chondrichthyan (Hansen, 1984).

Geological Setting

The entire sample of Ageleodus pectinatus teeth examined in this study was collected at the Red Hill site in Clinton County, Pennsylvania from the Duncannon Member, the uppermost subdivision of the Catskill Formation. The Catskill Formation is a sequence of clastic sediments that were shed into a foreland basin on the North American craton during the Acadian Orogeny (Faul, 1985). The sedimentology of the Duncannon Member at Red Hill indicates non-marine deposition within and between meandering stream channels on low-relief alluvial plains bordering the Catskill Sea (Woodrow et al., 1995).

The Red Hill site sample of Ageleodus teeth was found exclusively in well-sorted lenses within a one-meter-thick sequence of gently inclined sandy-siltstone layers. These lenses, which are generally several centimeters thick and up to several meters wide, are likely the result of periodic events that deposited thin layers of the coarse sand-sized sediment load in the point bar facies. This sedimentological setting suggests that all of the Ageleodus teeth examined in this study were deposited penecontemporaneously, a factor in the assignment of all specimens to a single taxon. The lenses also preserve other vertebrate material in abundance. Small groenlandaspidid placoderm elements and fragments of gryracanthid acanthodian fin spines are quite common. Small to moderate size sarcopterygian teeth, fragmentary sarcopterygian scales, and vertebrate microfossils of unknown affinities are also present in these layers.

SYSTEMATIC PALEONTOLOGY

Class CHONDRICHTHYES Huxley, 1880
Family Incertae Sedis
Genus AGELEODUS Owen, 1867
AGELEODUS PECTINATUS (Agassiz, 1838) (Fig. 2)
Ctenoptychius pectinatus Agassiz, 1838:100
Ctenoptychius denticulatus Agassiz, 1838:101
Ageleodus diademata Owen, 1867:234
Callopristodus pectinatus (Agassiz, 1838) Traquair, 1988:85

Referred Specimens—Three hundred and eighty-two specimens catalogued in the Vertebrate Paleontology Collection at the Academy of Natural Sciences of Philadelphia: ANSP 20271-20305, 20349-20451, 20981-21121, 21124-21128.

Locality and Horizon—U.S.A., Pennsylvania, Clinton County, Red Hill site, north side of Route 120, 2 km west of Hyner; N41°15.066'E, W77°40.809'. All specimens are from the Duncannon Member of the Catskill Formation. Palynomorph biostratigraphy indicates that the age of Red Hill is Late Devonian, late Famennian Stage (Grandispora cornutal/Rugispora flexuosa palynomorph zone) (Traverse, in press).