PERMIAN HYOLITHIDA FROM AUSTRALIA: THE LAST OF THE HYOLITHS?

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INTRODUCTION

CLASS HYOLITHA Marek, 1963 encompassing the Order Hyolithida Sysoev, 1957 (Early Cambrian to Upper Permian) and Order Orthothecida Marek, 1966 (Early Cambrian to Early Devonian) consists of a group of conical, calcareous-shelled invertebrates of controversial affinity. One opponent view holds that hyoliths may be reasonably accommodated under the Phylum Mollusca (Malinky and Yochelson, 2007 and references therein), whereas another supports separate phylum status under the name Hyolitha (Pojeta, 1987 and references therein). Hyolith abundance and diversity attain a maximum in the Cambrian, followed by a progressive decline up to their Permian extinction (Fisher, 1962; Wills, 1993). Their demise was part of the extinction event of the Late Permian/Early Triassic. The cause(s) of this event remains controversial (Erwin et al., 2002), and no imprint remains in the geologic record of the specific circumstances surrounding the disappearance of the hyoliths, though it is highly probable that reduced population size was a contributing factor. Given the overall rarity of Late Paleozoic hyoliths, every occurrence is worthy of note to better understand patterns of hyolith diversity and abundance in the Late Paleozoic, the geographic and stratigraphic distribution of hyolith taxa and circumstances related to their extinction. The specimens from the Upper Permian described herein is among the youngest, if not the youngest, members of class Hyolitha. All specimens are housed at the Natural History Museum (USNM), Smithsonian Institution, Washington, D.C.

HYOLITHA IN THE PERMIAN

Hyoliths in the Late Paleozoic appear to have been rare components of normal marine, benthic invertebrate assemblages, and only nine species have been reported from the Permian (Morris in Strzelecki, 1845; Geinitz, 1861; Sinclair, 1946; Fisher, 1962; Gonzalez and Sabattini, 1972; Pagani et al., 2002). The species to which all specimens described herein were initially assigned, Theca lanceolatus Morris (in Strzelecki, 1845) was the third hyolith species named and the first recorded from the Permian. The next Permian hyolith named was Theca kirkbyi Howse, 1857 from England, a rather unusual individual that appears to possess projections or ‘wings’ along the lateral edges. That specimen remains to be examined, but its morphology suggests encrustation of a hyolith conch by an epibiont, resembling several morphologically identical to specimens of ‘orthothecids’. The curvature of the conch between that genus and unequivocal hyoliths such as Orthotheca barrandei Novák, 1891 from the Lower Devonian of the Barrandian region, Czech Republic. The Miocene specimen remains to be located to confirm its identity. An unusual group of very large (up to one meter long) invertebrates, referred to varying as Toxemorphism Shimanskii, 1963 or Conicingchia Sysoev, 1957 may be hyoliths, but these organisms bear little resemblance to unequivocal hyoliths. They range in age from Mississippian to Permian, with occurrences known thus far only in Siberia, the Himalayan region and Greenland (Peel and Yochelson, 1983). Further discussion of this group is beyond the scope of this study.

“HYOLITHES” LANCEOLATUS

The specimens of “Hyolithes lanceolatus” discussed herein were collected by the expedition of Captain Charles Wilkes to Australia in the late 1830s/early 1840s, and they may reasonably be regarded as toptotypic material of “H.” lanceolatus (Morris in Strzelecki, 1845). The location of the type material remains unknown, although based upon descriptions and an illustration provided by Dana (1849), the individuals described herein belong to the same species as the types. Mention of this species in the literature has been rare. Dana (1847) did not include them in his list of Permian species from New South Wales but did provide a generalized description though without illustrations shortly afterward (Dana, 1849). De Konink (1876–1877) in his monograph on the Paleozoic fossils of New South Wales failed to list any species of Hyolithes, although Etheridge (1889) recorded two specimens of this species from the Maitland region of New South Wales. Süssmilch (1922) listed an occurrence of Hyolithes from the “Pero-Carboniferous” of New South Wales, and specifically mentioned Hyolithes lanceolata (sic) from the “Upper Marine Series” of Gerringong. Branson (1969) listed it in his compilation of Permian invertebrates, and Pojeta (1987) illustrated one of the specimens recorded below. This species seems to be endemic to Australia and unique to the Permian; neither Cambrian (Kruse, 1990, 2002) nor Carboniferous (Yoo, 1988) hyoliths from Australia bear any resemblance to either Australotheca lanceolata (Morris, 1845) or Illawarrottheca wilkensi n. gen. and sp.

Information regarding the locality or localities that produced the specimens described herein is sparse, and neither the labels associated with them nor the description given by Morris (1845) sheds much light on the matter. The only details given on the labels are ‘Illawarra. Permian, New South Wales’, and whether