

The Sinolepidae, a Family of Antiarchs (Placoderm Fishes) from the Devonian of South China and Eastern Australia

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ABSTRACT. Two new antiarchs are described, from the Late Devonian Hunter Siltstone near Grenfell in south-eastern Australia (*Grenfellaspis branagani* n.gen., n.sp.), and from the Early - Middle Devonian Dayaoshan Group in Guangxi, south-eastern China (*Dayaoshania youngi* n.gen., n.sp.). New material is described of *Xichonolepis qujingensis* P'an & Wang, 1978 from the Middle Devonian of Yunnan, and new interpretations are presented for *Sinolepis* Liu & P'an, 1958 from the Late Devonian of Jiangsu. All four genera are placed in the family Sinolepidae Liu & P'an, of which the most obvious defining character is the much reduced ventral laminae of the anterior and posterior ventrolateral plates of the trunk armour, and the presumed absence of a median ventral plate. Emended diagnoses are presented for the family Sinolepidae and the genera *Xichonolepis* and *Sinolepis*. It is suggested that *Grenfellaspis* and *Sinolepis* are immediately related, and the biostratigraphic, biogeographic, and palaeogeographic implications of this relationship are discussed. The vertebrate fauna from the Hunter Siltstone is regarded as the youngest nonmarine vertebrate horizon known from the Devonian of south-eastern Australia. A close palaeogeographic connection between south-eastern Australia and South and North China is indicated for the latest Devonian and earliest Carboniferous (late Famennian-early Tournaisian), which contrasts with the distinctive Devonian vertebrate faunas from the two regions in earlier strata. Other Devonian fossil groups showing a similar biogeographic pattern are considered in the context of competing hypotheses concerning the palaeogeographic relationships of Gondwana and Asia during the Middle Palaeozoic.

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The group of primitive fishes dealt with here first became known when Liu & P'an (1958) described some unusual antiarch remains from the Late Devonian Wutung Series near Nanjing (Fig.1, loc.2) as two new species in a new genus, *Sinolepis* Liu & P'an, which they referred to its own family, the Sinolepidae. This important paper provided the first indication of the highly endemic character of the early vertebrate fauna from the Devonian of China. Preliminary descriptions of other endemic groups soon followed (Early Devonian antiarchs, and galeaspid agnathans by Liu, 1963, 1965), and since then many publications have established the Devonian vertebrate fauna from South China as of central importance in understanding the early evolution of most of the major groups of Devonian agnathan and gnathostome fishes (for a recent review of the Devonian vertebrates of China see Pan & Dineley, 1988).

Gross (1965) was the first western scientist to attempt to incorporate *Sinolepis* into a general classification of the antiarchs. Gross divided the antiarchs into two major subgroups of ordinal rank, the Asterolepiformes and the Bothriolepiformes. He noted that the broad lateral plate of the skull in *Sinolepis* suggested bothriolepid affinity, and that the rectangular shape of the anterior median dorsal plate was reminiscent of the bothriolepid *Grossilepis*, but that the anterior median dorsal overlap relations, and the shape of the premedian, postmarginal, and opercular plates in the skull, were more similar to those of asterolepid antiarchs. Accordingly he placed the family Sinolepididae within his order Asterolepiformes. Miles (1968) followed this opinion, but Hemmings (1978) removed *Sinolepis* to the bothriolepidoids

because of apparent similarities in pectoral fin structure. The distinctiveness of *Sinolepis* was recognised in the classification of Denison (1978), who divided the antiarchs into three major groups of equal rank, the Bothriolepidae, the Asterolepidae, and the Sinolepidae.

In Australia the discovery of sinolepid remains resulted from an investigation by AR in 1972 of a new fish locality in the Upper Devonian Hunter Siltstone near Grenfell in east central New South Wales (Fig.2A). The arthrodire *Groenlandaspis* from this locality was reported by Ritchie (1975), but a diverse associated fauna was also recovered, including remains of other placoderms, dipnoans, crossopterygians, and acanthodians. The placoderm material included bones belonging to the antiarchs *Bothriolepis* and *Remigolepis* (Ritchie, 1975), as well as other isolated plates with a distinctive tubercular ornament, which could be identified by their internal structure to be median dorsal plates from the trunk armour of an unknown antiarch. They resembled both *Sinolepis* and *Grossilepis* in the somewhat rectangular shape of the anterior and posterior median dorsal plates. But the most unusual bones were the ventral plates of the trunk armour, which in other antiarchs always have an extensive ventral lamina forming a complete ventral wall to the trunk armour. In this new antiarch the ventral lamina on both the anterior and posterior ventrolateral plates was reduced to two narrow strips running transversely and longitudinally along the ventral wall.

Photographs of these very distinctive bones were taken by GY to China in 1981. During discussions with Chinese colleagues Pan Jiang and Zhang Guorui in