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A NEW *AULOSTEGES* FROM THE LOWER PERMIAN OF QUEENSLAND.

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(Plate xxiii.)

Introduction.

In this paper a new species of *Aulosteges* from the Dilly Stage of the Queensland Permian is described as *Aulosteges acanthophorus*. It is the first time the genus has been recorded from the Permian rocks of Eastern Australia, although it is not uncommon in rocks of similar age in Western Australia.

Some time ago a comprehensive collection of fossils was made by Mr. J. H. Reid, Geological Survey of Queensland, from the Permian beds of the Springsure district. The collection was later presented by him to the University of Queensland, Brisbane. Included in this collection are two well preserved specimens of *Aulosteges*, now known as *A. acanthophorus*, and consisting of a complete shell (No. 153) and an internal cast of a brachial valve (No. 152). They were collected from "Little Gorge Creek, Springsure Anticline, Queensland". This species has since been collected from the head of Little Gorge Creek and from the Burnett River, half a mile south of Yarrol, Queensland.

I am indebted to Mr. J. H. Reid for the opportunity of describing this new and interesting species of *Aulosteges*, and to the Shell (Queensland) Development Proprietary Ltd., for information regarding the additional localities.

The Occurrence of *Aulosteges* in Australian Rocks.

The genus *Aulosteges* is restricted to rocks of Permian age and has practically a world-wide distribution. It was first recorded in Australia when Etheridge (1903, p. 22) described *A. baracoodensis* from Baracooda Pool, Arthur River, North-West Division, Western Australia (Callytharra Stage). The same author ((1906, p. 5) later described *A. baracoodensis* var. *septentrionalis*, from a locality six miles north-east of Cape Dombey, Hyland Bay, Northern Territory.

Etheridge (1914, pp. 33-34) described and figured two additional specimens of *A. baracoodensis* from twenty miles north of Barrabiddie, Minilya River district, but Whitehouse (1926, pp. 282-283) considered these particular specimens should be referred to *Taeniothaerus*. This genus was proposed by him for shells previously known as *Productus subquadratus* of Morris. Miss Hosking (1933, p. 36) is of the opinion that the specimen figured by Etheridge (1914, pl. iv, figs. 11, 13) should be referred to *Taeniothaerus subquadratus*, but the second specimen (pl. iv, fig. 12), which actually came from Mt. Marmion, must be retained in the genus *Aulosteges*. Miss Prendergast (1943, p. 27) placed both specimens as synonyms of *Taeniothaerus subquadratus*.

Miss Hosking (1931, p. 15) described and figured *A. ingens*, a large inflated species, from the Wooramel River, two miles east of Survey Station R.20 and from a locality three miles above Survey Station R.20 (Byro Stage). A series of well preserved specimens of this species, in the Australian Museum Collection (F.36213-7), were collected by Dr. H. Raggatt from a locality thirty chains below Coolkilya Pool, Minilya River (Wandagee Stage). Additional specimens were collected by Mr. H. Coley of Wandagee Station. This locality is approximately 150 miles north from the Wooramel River. A smaller species with shallow valves, *A. spinosus*, was described and figured (Hosking, 1931, p. 17) from the south bank of the Wooramel River, below Callytharra Springs (Callytharra Stage). Later, the same authority (1933, pp. 33-37) revised the

known species of *Aulosteges* from Western Australia with some additional notes on *A. baracoodensis*. Little known records of the genus and specimens that cannot be traced were also listed. A specimen, *A. cf. spinosus*, from the Irwin River (Fossil Cliff limestone) was recorded. The brachial valve of *Aulosteges*, F.16779 in the Australian Museum Collection, from the Lower horizon of Mount Marmion (1933, p. 36) can certainly not be referred to *A. baracoodensis*. It must, however, be retained in the genus *Aulosteges*.

Miss Hosking (1933, p. 37) also described a specimen from Luluigui Station, Kimberley Division, as *Aulosteges* sp. (Upper Ferruginous or Liveringa Series). An additional specimen, with the umbo curved over and concealing the pseudo-deltidium was also mentioned from the same locality.

The morphology of the genus *Aulosteges* was dealt with by Miss Prendergast (1943, pp. 32-37) and comparisons were made with closely allied genera. Two specimens of *A. spinosus* were also described from Wandagee Station, Minilya River, which extended the range of this species into the Wandagee Stage.

The present known species of the genus *Aulosteges* occurring in the Permian rocks of Australia are as follows:

- Aulosteges baracoodensis* Etheridge.
- „ *baracoodensis* var. *septentrionalis* Etheridge.
- „ *ingens* Hosking.
- „ *spinosus* Hosking.
- „ sp.
- „ *acanthophorus*, sp. nov.

Description of the Species.

Genus *Aulosteges* Helmersen.

1847.—Helmersen. Leonhard and Bronn's Jahrbuch für Mineralogie, p. 331, text-figure.

Aulosteges acanthophorus, sp. nov.

(Plate xxiii, figures 1-3.)

Shell of medium size, sub-quadrangular in outline, slightly longer than wide. Moderately convex pedicle valve and flattened brachial valve with strongly vaulted margins. Hinge-line straight, exceeding two-thirds the greatest width of the valve. Surface of the valves uniformly marked with rather sparse, stout spines varying little in size and strength.

The pedicle valve is convex, not strongly inflated with a shallow sinus originating at about the middle of the shell, in the central line, and increasing in width towards the slightly indented inferior margin. Longitudinally the valve appears somewhat flattened but bends suddenly in a well-rounded curve to form abruptly sloped, straight, lateral and inferior margins. The slope at the junction of the lateral and cardinal margins is not so strongly marked, almost flattened, forming distinct auricles.

The umbo is prominent, produced, pointed, overturned and slightly twisted, overhanging the area. A distinct scar on the umbo may represent the point of attachment to some foreign body but on the other hand could have been caused during preservation of the shell. The area is widely triangular, not high, and appears to be unequally developed on the two sides of the pseudo-deltidium. The area is slightly concave and is marked with vertical striations. A narrow pseudo-deltidium is present immediately below the umbo, but for the most part is hidden by the overhanging umbo and the central point produced on the cardinal margin of the brachial valve.

The surface of the pedicle valve is ornamented by not very numerous but regularly arranged and evenly spaced stout, erect and rounded spine bases. These bases continue longitudinally for some distance in the test before emerging at the surface. They give the valve a false ribbed appearance. The remains of several spines prove them to have attained considerable length. They are slightly finer on the umbonal slope but become thick and heavy on the lateral margins, and particularly the inferior margin. The

surface of the valve, between the spine-bases, is crowded with minute perforations. Concentric lines of growth are numerous, more pronounced at the inferior margin.

The brachial valve is more or less flat in the visceral region and along the cardinal margin, otherwise concave with strongly geniculated margins. The cardinal margin is almost as wide as the valve and is produced laterally to form auricular or triangular expansions.

The cardinal process is missing from the internal cast of the brachial valve. The appearance of the base suggests it was fairly strongly developed, not of great length, and the angle of inclination to the cardinal margin was wide.

A distinct median septum originates at the base of the cardinal process and extends for about two-thirds the length of the valve. On each side of this septum two roughly oval adductor muscle scars are found, with dendritic markings. Brachial impressions are not preserved.

The external surface of the brachial valve possesses fine spine-bases, compared with the pedicle valve, and these are not numerous. The entire surface, with the exception of the visceral area, is covered with minute perforations or possibly spine-bases for hair-like spines. These are particularly abundant on the vaulted margins. The internal surface is smooth except where the shell substance has been partly removed and reveals the bases of the spine sockets.

The dimensions of the specimens are as follows:

	Fig. 1.	Fig. 2.
Length	68 mm.	62 mm.
Width	66 mm.	62 mm.
Hinge-line	48 mm.	42 mm.

Observations.—The species of *Aulosteges* known from Western Australia fall into two types. One of these with strongly inflated pedicle valves and steep sides is represented by species such as *A. ingens* and *A. sp.*, while *A. baracoodensis* is representative of a type characterized by pedicle valves with a low degree of convexity and more or less sloping sides. The Queensland shell, *A. acanthophorus*, has a low degree of convexity with steep sides. It differs from *A. baracoodensis* in being far more quadrate in outline, having a low area, and in possessing sparsely arranged, thick spine-bases on the pedicle valve. The present species appears to be somewhat related to *A. baracoodensis* var. *septentrionalis* as they both possess regularly arranged coarse spines. They differ widely, however, in other respects. The general outline in *A. acanthophorus* is more quadrate and the cardinal process is of the *A. baracoodensis* type with an elongated extension into the umbo.

Miss Hosking (1931, p. 16) states that the area in *A. ingens* is "unequally developed on the two sides of the pseudo-deltidium". This is actually the case in *A. acanthophorus*, but I feel sure this feature has been developed by pressure on the brachial valve during preservation of the shell.

Localities.—Little Gorge Creek, Springsure district; Burnett River, half a mile south of Yarrol, Queensland.

Horizon.—Lower Permian. (Dilly Stage.)

Collection. University of Queensland, Brisbane. No. 153, Holotype; No. 152, Paratype.

Stratigraphical Conclusions.

The occurrence of *A. acanthophorus* in the Permian rocks of Queensland considerably extends the distribution of the genus in Australia as previously it was thought to be restricted to Western Australia. It is possible that as further research is carried out on the Permian faunas of Eastern and Western Australia many additional forms may be found which will suggest that the relationship between these beds is closer than is usually considered. It is useless to depend on the published lists of fossils made many years ago, but as new collections are made and described I feel sure that the dissimilarity between the two faunas will prove to be not so nearly marked as was originally thought.

The specimens of *A. acanthophorus* from Little Gorge Creek and from the Burnett River, near Yarrol, are so similar that I venture to suggest the beds may be correlated as being horizontally equivalent. The associated fauna at Yarrol can also be compared favourably with species found at Little Gorge Creek which Reid has placed as belonging to the Dilly Stage. The fossil horizon at Yarrol has been correlated with the Gympie formation, a formation whose stratigraphical position is rather vague. Previously suggested as Upper Carboniferous age by a number of authors, the Gympie Series was finally considered to be Permian in age by Raggatt and the author (1937, p. 159). Recent field-work has proved the Dilly Stage of the Lower Bowen Series to be at the base of the Series so that a correlation of these beds, through *A. acanthophorus*, with the Yarrol fossil horizon is convincing.

In Western Australia the genus has a long vertical range extending from the Callytharra to the Wandagee Stage in the North-West Division and their equivalents in other areas. The species are also found to range through several horizons so that an attempt to correlate *A. acanthophorus* with allied forms in Western Australia is unsatisfactory.

The larger, inflated forms such as *A. ingens* from the Byro and Wandagee Stages, and *A. sp.* from the Upper Ferruginous or Liveringa Series appear to be restricted to horizons fairly high in the Permian sequence. The other more shallow-valved species such as *A. baracoodensis* and *A. spinosus*, with which the Queensland shell is more comparable, first appear in the Callytharra Stage and the Fossil Cliff limestone but are also found in higher horizons. The detailed stratigraphy of the Permian beds between the Victoria and Daly Rivers in the Northern Territory is unknown, so that the stratigraphical position of *A. baracoodensis* var. *septentrionalis* must remain in doubt until further field-work is carried out in this area.

Miss Prendergast (1943, p. 4) points out that in *Aulosteges* "the area is linear in the earlier species, but rapidly develops among the later species to a high plane triangle produced ventrally and thus carrying the umbo of the pedicle valve away from the brachial valve". In *A. acanthophorus* the area is narrowly linear and the umbo of the pedicle valve almost overhangs the pointed cardinal process of the brachial valve. If this feature may be taken as an indication of a primitive shell, then the Queensland species must be younger than *A. baracoodensis* and *A. spinosus*, as both these species, have the area developed ventrally, to a far greater extent than in *A. acanthophorus*.

Any attempted correlation between *A. acanthophorus* and Western Australian species of *Aulosteges* is inconclusive and tentative. It may be that the Queensland shell is a more primitive type than any found in Western Australia. If this is the case the Dilly Stage of Queensland would be pre-Callytharra or pre-Fossil Cliff and a correlation could be looked for in the top-beds of the Lyons Series.

EXPLANATION OF PLATE XXIII.

Aulosteges acanthophorus sp. nov.

Fig. 1.—Pedicel valve. Holotype, No. 153.

Fig. 2.—Dorsal view of Fig. 1, showing brachial valve and area of pedicle valve.

Fig. 3.—Interior of brachial valve; cardinal process not preserved. Paratype, No. 152.

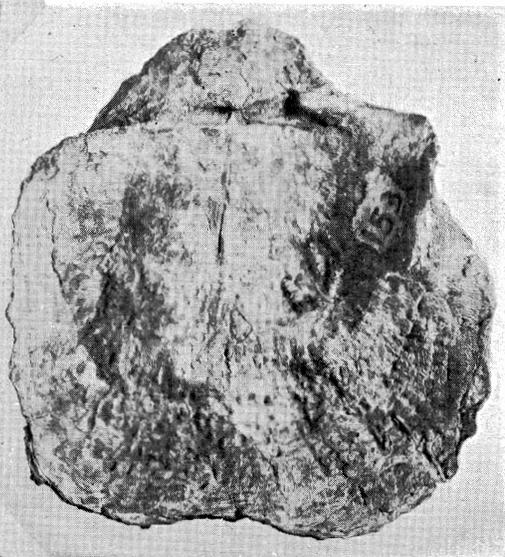
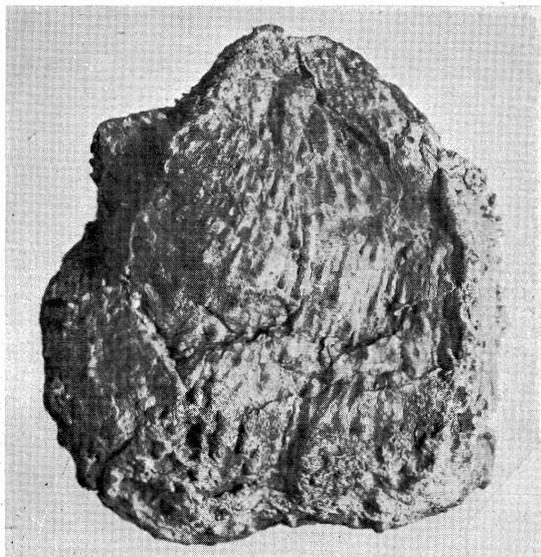
Natural size.

G. C. Clutton, photo.

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