

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Riek, E. F., 1964. Merostomoidea (Arthropoda, Trilobitomorpha) from the Australian Middle Triassic. *Records of the Australian Museum* 26(13): 327–332, plate 35. [6 January 1965].

doi:10.3853/j.0067-1975.26.1964.681

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

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MEROSTOMOIDEA (ARTHROPODA, TRILOBITOMORPHA) FROM THE AUSTRALIAN MIDDLE TRIASSIC

By E. F. RIEK

Division of Entomology, C.S.I.R.O., Canberra.

Plate 35. Figs. 1 and 2.

Manuscript received August 28, 1963

SUMMARY

A monotypic genus of a new family of Merostomoidea is described from the Middle Triassic of Brookvale, New South Wales, Australia. The known range of the subclass, previously recorded from the Middle Cambrian, is extended considerably by this record.

Three well preserved non-insect arthropod specimens, apart from the xiphosuron, *Austrolimulus fletcheri* Riek, (1955), have been collected from the Middle Triassic freshwater sediments at Brookvale, New South Wales. These sediments also contain abundant insects and fish. These three specimens bear a considerable resemblance in body shape to both the Synziphosurina (Merostomata) and the Merostomoidea (Trilobitomorpha). The post-cephalic portion of the body is divided into two distinct regions and ends in a long caudal style. Although appendages are not clearly preserved, their general structure can be distinguished below the crumpled pleural regions in one of the specimens and their bases distinguished in another. These numerous pairs of similar appendages are of trilobitomorph form.

Trilobitomorpha, which are first recorded from the Lower Cambrian, are not known from strata younger than the Middle Permian and almost all the species occurring since the Cambrian are referred to the well-known trilobites (Class Trilobita). The Class Trilobitoidea is, however, recorded from the Devonian as well as from the Cambrian. If these Middle Triassic specimens do belong to the Trilobitoidea they extend the known range of the class very considerably. There seems little doubt from a study of the insect remains that the sediments in which these specimens occur are of Triassic, very probably Middle Triassic, age.

Trilobitoidea have not previously been recorded from Australia though the Trilobita are well represented. The only Synziphosurina (Merostomata) known from Australia is *Hemiaspis tunnecliffei* Chapman (1932) from the Silurian at Studley Park, Victoria. This specimen is so poorly preserved that its affinities are obscure.

Because of the considerable time interval between the Middle Triassic and the previous records of Trilobitoidea (Moore, 1959) doubts were originally entertained that these specimens could be representatives of this class of Trilobitomorpha. The specimens were therefore compared with other arthropod groups. There is a superficial resemblance between one specimen and the aquatic larvae of some Coleoptera (Insecta). This resemblance is due mainly to distortion of the fossil which was apparently brought about during the death struggles of the specimen. It would appear that the specimen was trapped in drying mud and that as it tried to move

forward the thin pleural regions became wrinkled and partly swept back along the sides of the body. This gives the specimen the appearance of possessing abundant lateral abdominal gills whereas one is actually seeing a rough outline of the serially arranged trilobitomorph legs through the wrinkled pleural lobes. The stylate telson can be compared with the apically produced abdomen of some water-beetle larvae (Coleoptera, Dytiscidae). In other specimens which are not distorted, the subdivision of the body into two very different regions gives it an appearance more like that of certain branchiopod Crustacea.

The most distinctive feature of the species is the development of a partly fused dorsal shield covering most of the trunk segments. The sessile eyes are well developed and the antenna was apparently formed of a number of large flattened segments.

Subphylum **TRILOBITOMORPHA**

Class **Trilobitoidea**

Subclass **Merostomoidea**

Family **Synaustridae** fam. nov.

Trilobitomorpha with elongate, trilobed body, styliform telson and all appendages, apart from the antenna, apparently of a simple trilobitic type. The post-cephalic portion of the body is differentiated into a broad anterior region with well developed pleura and a narrow posterior region without obvious pleura and without appendages. A partly fused dorsal shield is developed on the anterior trunk segments.

The family is recorded from the Middle Triassic of Australia.

Synaustrus gen. nov.

Type species **Synaustrus brookvalensis** sp. nov.

Cephalon rounded anteriorly and with the genal spine not strongly produced. Glabella large and with the suggestion of transverse segmentation which may, however, be due to segmentation on the ventral surface. Eye large, situated at the lateral margin. Trunk appearing to consist of nine segments but the first five segments each of a composite nature, consisting of 1,2,3,3,2 segments respectively, with the possibility of the first portion consisting of two segments. This dorsal shield may be ankylosed but the well developed junctions would seem to indicate some freedom of movement. The posterior four trunk segments free, without obvious pleura. Body ending in a long caudal style. Trunk appendages (absent from the posterior four segments) not extending beyond the pleural margins of the anterior segments.

This genus can be compared with *Molaria* Walcott from the Middle Cambrian, from which it differs in the development of a partly fused dorsal shield from the anterior trunk segments and apparently in possessing a larger number of trunk segments.

Synaustrus brookvalensis sp. nov.

Holotype specimen, F.30953, entire except for apex of telson but with the pleural regions of the trunk distorted. Length, excluding terminal style, 40 mm. Cephalon with genal spine produced to only a small blunt spine, grooved above. "Free cheek" narrowing only slightly anteriorly. Glabella, though ill-defined, somewhat longer

than wide, with a small elongate tubercle at meson caudally; with the suggestion of transverse grooves though this may be due to structures on the ventral side. Eye well developed, situated at lateral margin, at junction of anterior and middle thirds of cephalon; apparently slightly elongate.

Anterior portion of trunk appearing to consist of five segments each with well developed pleura, but in fact consisting of 11 or 12 segments between which there is part fusion dorsally. Ventrally each segment has a distinct sternite and a pair of lateral appendages. Each of these five apparent segments has a median elongated tubercle towards its posterior margin. Laterally, but just within the margin of the body (at junction of pleura with the body), the insertions of the appendages appear as a row of distinct pits. One pit appears at the caudal margin of the cephalon. A varying number occur on each of the following apparent trunk segments. One pit is present on the first segment and then 2,3,3,2. Appendages, seen through the crumpled pleura, consisting of a series of small segments, apparently up to 10 in number. Running obliquely back and towards the meson there is a deep groove from the insertion of each appendage. These grooves are considered to be artifacts produced by the flattening of the sclerotised body segments. (Such artifacts occur also in fossil insect nymphs where their true nature can be ascertained by comparison with the nymphs of recent species.) Pleural margins of the components of the dorsal trunk-shield not produced postero-laterally to any marked extent. Caudal four trunk segments much narrower than anterior segments; lateral margins not produced; each with a median elongated tubercle; segments subequal, but terminal segment tapering slightly. Caudal style with a median longitudinal crest.

The structure of the cephalon is difficult to interpret for apparently some structures on both the dorsal and ventral surfaces are preserved. It is considered that the anterior doublure or labrum is preserved. The margins of this median structure are thickened and so are clearly defined. The labrum is more or less rectangular in outline. Arising from the region of the postero-lateral corner of the labrum there is a broad but elongated, laterally-directed segment which extends to partly cover the eye. This is considered to represent the basal segment of the antenna. A much enlarged somewhat paddle-shaped segment lies over the genal area and on the first three "segments" of the trunk shield there are smooth flattened areas that most probably are indications of more-distal segments. The indications of segmentation in the glabella are most probably faint sutures between the cephalic sternites. This would indicate the presence of at least three cephalic segments behind the antennae. There are no clear indications of appendages on these segments, though grooves on the genal area close to the caudal margin of the cephalon may be indications of their presence.

A second, slightly larger specimen, F.30969, lacks the caudal style and posterior two segments of the trunk; preserved portion 43 mm. It preserves more clearly the ventral surface but the elongated tubercles of the dorsal trunk shield are clear as, too, are the insertions of the appendages. These two structural landmarks allow a direct comparison between the specimens. Sternites transverse, their surface very finely shagreened; the anterior sternites with straight margins but the eighth to the eleventh sternites with margins distinctly concaved from behind; the margins of the most posterior sternites much more concave than the corresponding tergite margins. The insertion of the appendages midway between anterior and posterior margin and slightly closer to the lateral margin of the sternite; appendages not preserved. The first defined sternite appears below the junction between the cephalon and trunk (as it did in the holotype). If this sternite belongs to the trunk segments it would seem that there are two segments incorporated in the first component of the trunk shield to give a total of 16 trunk segments.

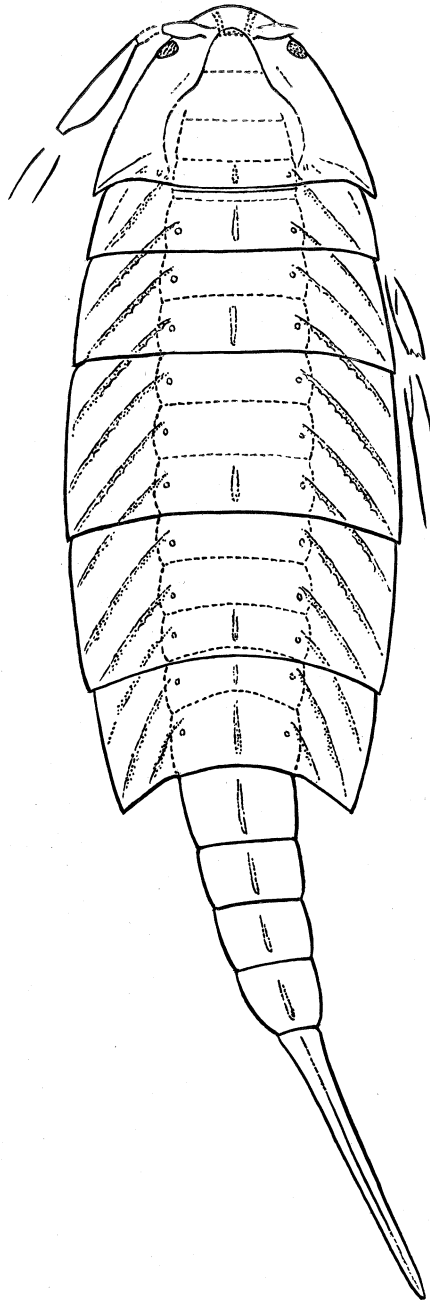


Figure 1: Part reconstruction of *Synastrus brookvalensis* gen. et sp. nov. based on holotype, F.30969 and the unregistered specimen of Figure 2.

The third specimen, known at present only from a photograph, is preserved as an undistorted dorso-ventral compression but it lacks the caudal style and possibly the last trunk segment. The outline of the gut is clearly distinguishable in the trunk, especially over the anterior portion. It is a straight tube without diverticula. The trunk shield is very clearly preserved. The lateral margins of its components are not strongly produced. Its pleural regions appear grooved, with the grooves continued from one section of the shield to the next. This grooving is most probably an artifact produced by the appendages which apparently lie below the raised areas and parallel to the grooves. The basal insertions of the appendages are clearly preserved.

Types: Holotype F.30953 and paratype F.30969 in the Australian Museum, Sydney.

Type locality and horizon: Beacon Hill shales of the Hawkesbury Series, Middle Triassic, at Brookvale, near Sydney, New South Wales.

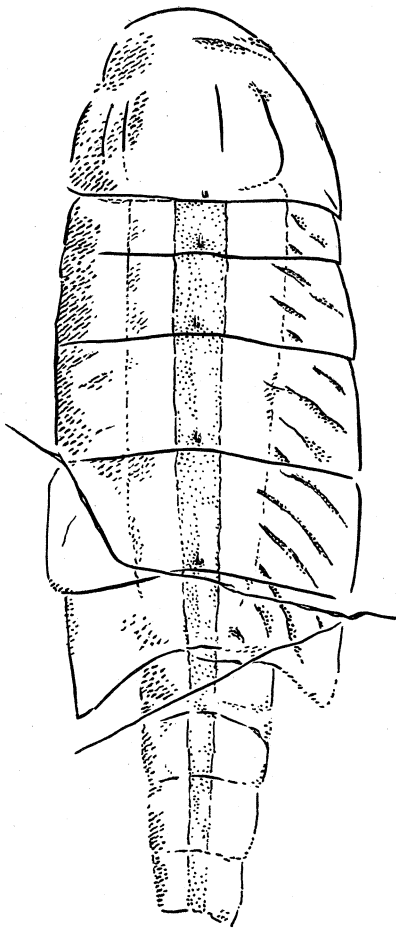


Figure 2: Unregistered specimen, location not known, of *Synastrus brookvalensis* gen. et sp. nov., showing outline of gut and undistorted pleural regions.

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EXPLANATION OF PLATE

Plate 35: *Synastrus brookvalensis* gen. et sp. nov.

1. F.30953, holotype, length 40 mm., with indications of the appendages under the crumpled pleura.
2. Photograph of specimen, location unknown, complete except for caudal style, showing undistorted pleural regions.
3. Portion of Figure 2, with reversed lighting, to show bases of appendages.

