AUSTRALIRHYNCHIA, A NEW LOWER DEVONIAN RHYNCHONELLOID BRACHIOPOD FROM NEW SOUTH WALES

by N. M. SAVAGE

ABSTRACT. *Australirhynchia cudalensis* gen. et sp. nov., family Rhynchotrematidae, is described and figured from the early Siegenian Mandagery Park Formation, New South Wales.

STUDY of a Lower Devonian brachiopod fauna from the Mandagery Park Formation, near Manildra, New South Wales, has led to the recognition of a new rhynchonelloid genus, *Australirhynchia*. The Mandagery Park Formation consists of interbedded limestones and tuffaceous sandstones of probable early Siegenian age (Savage 1967, 1968). A silicified horizon within the basal limestone of the formation, 3 miles south of Manildra, at locality 1 of Savage (1968), contains a rich brachiopod fauna from which the material described herein has been selected.

SYSTEMATIC PALAEONTOLOGY

Superfamily RHYNCHONELLACEA Gray 1848
Family RHYNCHOTREMATIDAE Schuchert 1913
Subfamily ORTHORHYNCHULINAE Cooper 1956
Genus AUSTRALIRHYNCHIA nov.

Type species. Australirhynchia cudalensis sp. nov.

Diagnosis. A plicate rhynchonelloid with strongly angular costae which multiply by bifurcation on the dorsal fold and intercalation in the ventral sulcus. The dorsal interior has a small boss-like cardinal process between ponderous inner socket ridges. No median septum is present. The ventral interior is without distinct dental lamellae and the long heavy teeth, which are fused to the valve walls, bear deep longitudinal grooves.

Comparison. The ponderous inner socket ridges and small cardinal process, together with the massive, longitudinally grooved teeth and absence of distinct dental lamellae, suggest a relationship to the genera grouped as the Orthorhynchulinae by Schmidt (1965).

Of genera possessing a cardinal process but without a septalium the nearest is *Machaeraria* Cooper 1955, for this genus also lacks a dorsal median septum and has similarly long curved crura, crescentic in cross-section; moreover, there is a suggestion of bifurcation on the dorsal umbones of the specimens figured by Cooper, though this feature is much less prominent and more variable than in *Australirhynchia*. There are, however, several major differences; the outline of *Machaeraria* is more triangular with the greatest width anterior, and not posterior, of mid-length, the shell contours are more rounded, and the costae are more numerous. Internally the hinge plate of *Machaeraria* is deeply

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cleft, the inner socket ridges are much smaller, and the teeth are less massive with no deep longitudinal grooves.

Another closely related genus is *Sicorhyncha* Havlíček 1961, from the Lower Devonian of Bohemia. This resembles *Australirhynchia* in lacking a septalium and a dorsal median septum. However, it differs greatly in general shell outline, being bluntly rounded posteriorly and very broad anteriorly with concave lateral margins. Furthermore, it does not possess the strongly inflated inner socket ridges and massive teeth of *Australirhynchia*.

Latonotoechia Havlíček 1961, also from the Lower Devonian of Bohemia, is another genus without a septalium and a dorsal median septum. In addition, it has massive teeth and inflated inner socket ridges (Havlíček 1961, p. 25, text-fig. 1). It is easily distinguished from the Manildra genus, however, for it has rounded contours quite unlike those of *Australirhynchia* and lacks the bifurcating and intercalating costae.

Of the genera referred by Schmidt (1965) to the Rhynchotrematinae, the Lower Silurian genus *Stegerhynchus* Foerste 1909, and the upper Silurian genus *Stegorhynchella* Rzhonsnitskaya 1959, both show a general resemblance to *Australirhynchia*. The Manildra form is distinct from these genera because of its unusual ornamentation and the absence of a median septum or callosity supporting the hinge plates. Moreover, both *Stegerhynchus* and *Stegorhynchella* have distinct umbonal cavities in their ventral valves, a feature completely absent from *Australirhynchia* where dental lamellae cannot be distinguished in any of the specimens examined.

Australirhynchia cudalensis sp. nov.

Plate 141

Material. Of a total of 167 silicified specimens 146 are complete shells with the valves conjoined. The remaining few specimens consist of 9 dorsal valves, 8 ventral valves, and 4 posterior fragments showing

EXPLANATION OF PLATE 141

Australirhynchia cudalensis gen. et sp. nov.

(All figures ×6)

Figs. 1–4. Dorsal, ventral, posterior, and lateral views of SU 19579, a large specimen with a distinctly pentagonal outline, an emarginate anterior margin, and an anacline ventral interarea.

Figs. 5–9. Ventral, dorsal, lateral, anterior, and posterior views of SU 19578 (holotype).

Fig. 10. Ventro-anterior view of broken dorsal valve SU 19584 showing the small, rounded, posterior adductor scars and the larger, ovate, anterior adductor scars.

Figs. 11, 12. Dorso-anterior and dorsal views of specimen SU 19581, a ventral valve with the socket plates and cardinalia of the dorsal valve still attached to show the articulation. The small, rounded, adductor scar is prominent within the long, faintly impressed, diductor field.

Fig. 13. Dorsal view of broken ventral valve SU 19585 showing the deep delthyrial cavity bounded by long, thick, deeply grooved teeth from which the distal parts are broken.

Figs. 14–18. Dorsal, lateral, ventral, anterior, and posterior views of young specimen SU 19577. Here the maximum thickness is more posteriorly placed than in older specimens and the ventral interarea is distinctly apsacline.

Fig. 19. Ventral view of dorsal valve SU 19580 showing the small cardinal process between large inflated inner socket ridges, and the elongate adductor muscle field.

Fig. 20. Posterior view of specimen SU 19580 showing further the inflated inner socket ridges.

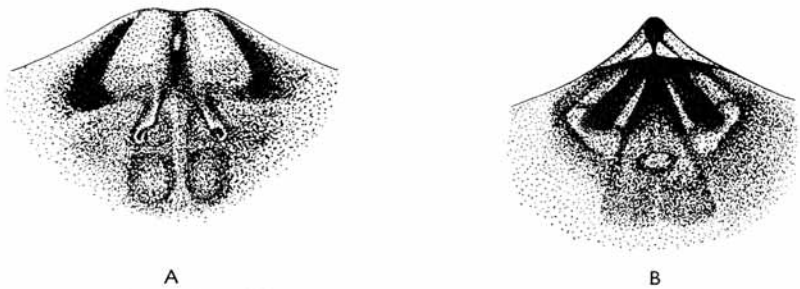
Figs. 21–5. Posterior, lateral, anterior, dorsal, and ventral views of specimen SU 19576, a young stage in which the bifurcation of the two central costae of the dorsal valve and the intercalation of two new costae in the ventral valve have just occurred. The fold and sulcus are poorly developed at this stage.

the valve articulation. The specimen numbers used are those of the Palaeontology Collection, Department of Geology and Geophysics, University of Sydney.

Holotype. Complete shell SU 19578.

Description. Exterior. In outline the shell is transversely ovate to subpentagonal with the greatest width at the hinge line. The cardinal margins are sharply rounded, the lateral margins are gently rounded, and the anterior margin is straight or emarginate. In lateral profile the shell is subequally biconvex with the greatest thickness between mid-length and the anterior margin (Pl. 141, figs. 4, 7).

The ventral valve is moderately convex with a strongly curved umbo and a prominent, suberect beak (Pl. 141, fig. 4). An apsacline to anacline interarea has a width about half the shell width and an apical angle of about 110°. The delthyrium includes an angle of



TEXT-FIG. 1. *Australirhynchia cudalensis* gen. et sp. nov. A. Interior of the dorsal valve showing the small cardinal process between the large inflated inner socket ridges. Note also the elongate adductor muscle field. B. Interior of the ventral valve showing the long, deeply grooved teeth and the small, rounded adductor field set within the larger diductor muscle field.

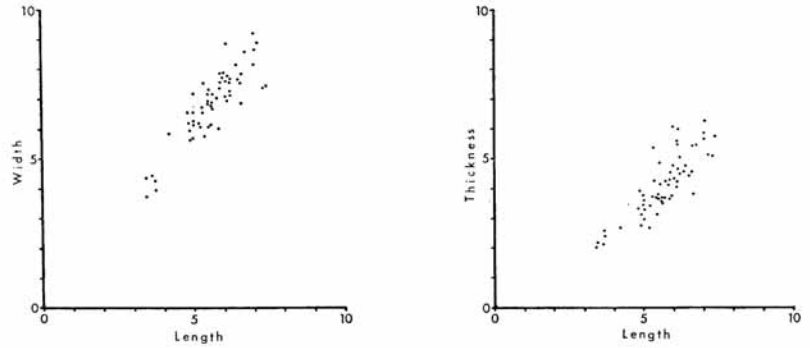
about 80° and is partly closed by small triangular deltidial plates. These roof over the dorsal umbo and almost meet to leave an oval foramen extending to the posterior extremity of the valve (Pl. 141, figs. 1, 6). The dorsal valve is strongly convex with a broad umbo and no interarea.

A broad ventral sulcus extends most of the valve length to the rectangularly uniplicate anterior commissure where it is bordered by very steep lateral walls (Pl. 141, figs. 5, 8). The dorsal fold is less pronounced posteriorly but very distinct anteriorly (Pl. 141, fig. 8). About 10–12 strong angular costae are present on the dorsal valve, with 4 on the fold, and about 9–11 costae are present on the ventral valve, with 3 in the sulcus. The costae on the fold invariably bifurcate to increase from 2 to 4 (Pl. 141, figs. 1, 6, 14, 24), whilst the single initial costa in the sulcus increases to 3 by an intercalation on either side (Pl. 141, figs. 2, 5, 16, 25). In both valves the increase occurs at about the 1·5 mm. growth stage. Numerous faint concentric growth lines cross the costae.

Interior of ventral valve. The ventral interior has a deep, narrow, delthyrial cavity bounded by long thick teeth, each bearing a prominent longitudinal groove with which the corresponding dorsal inner socket ridge articulates (Pl. 141, fig. 11). The teeth diverge anteriorly at about 45°. A long and anteriorly expanding diductor muscle field extends almost half the valve length (text-fig. 1B). The more strongly impressed adductor field

is very small and rounded, with a length about one-quarter that of the diductor field in which it is almost centrally placed (Pl. 141, fig. 12).

Interior of dorsal valve. The dorsal interior has a small boss-like cardinal process placed between large inflated inner socket ridges (Pl. 141, fig. 19). The sockets, which are small, triangular, and widely divergent, are bounded postero-laterally by the low overhanging valve margin. Thin, ventrally curved crura, which arise from the inside of the socket ridges, are slightly crescentic in cross-section with the convex side directed outwards (Pl. 141, fig. 19). No median septum is present. The adductor muscle scars are clearly



TEXT-FIG. 2. *Australirhynchia cudalensis* gen. et sp. nov. Scatter diagrams of the dimensions of 60 specimens plotted in mm. A. Plot of width to length. B. Plot of thickness to length.

impressed and extend about half the distance to the anterior margin (text-fig. 1A). Rounded, widely spaced, posterior adductors are separated from larger, longitudinally ovate anterior adductors by narrow, transverse ridges (Pl. 141, fig. 10).

Measurements (in mm.)

		Length	*Width*	*Thickness*
SU 19577	Complete shell	3·5	4·1	2·6
SU 19578	Complete shell	4·5	5·4	4·0
SU 19579	Complete shell	5·3	7·3	4·6
SU 19580	Dorsal valve	6·5	8·6	—
SU 19581	Ventral valve	6·0	7·6	—

Variation. Shells display little variation in external form apart from differences in thickness and width related principally to ontogeny (text-fig. 2). The multiplication of the costae by bifurcation on the fold and intercalation in the sulcus is invariably present and shows remarkably little variation. The costation on the flanks also shows a low variability so that in most shells the dorsal valve possesses 10 costae and the ventral valve 11 costae. Internally even the younger specimens show the massive teeth and socket ridges.

Ontogeny. A good range of growth stages has been collected and the later part of the ontogeny of the species can be followed in detail. In the youngest stage available the

maximum width occurs just anterior to mid-length, no bifurcation or intercalation of costae has occurred, and the ventral interarea is apsacline. At a slightly larger stage (Pl. 141, figs. 24, 25) the bifurcation of the two central costae of the dorsal valve and the intercalation of costae on either side of the central costa of the ventral valve is already apparent. As the shell approaches maturity it assumes a more pentagonal outline with the maximum width posterior to mid-length (Pl. 141, fig. 6). In a mature specimen the ventral interarea is distinctly concave and more anacline than apsacline. The maximum thickness of a mature specimen is well towards the anterior of the shell, largely because of the strong development of the dorsal fold and ventral sulcus (Pl. 141, figs. 7, 8). Internally, large inflated inner socket ridges and deeply grooved teeth are present in all but the youngest stages. In mature specimens the adductor muscle scars in both valves are deeply impressed.

Phylogeny. Although *Australirhynchia* is distinct from *Stegerhynchus* and *Machaeraria* in several important respects, these two genera appear to be the most closely related forms. It seems possible that both *Australirhynchia* and *Machaeraria* evolved independently from *Stegerhynchus*, although there is little evidence for this apart from the general morphological similarities mentioned above and the absence of possible alternative precursors during the Silurian. It is unlikely that *Australirhynchia* was derived from *Machaeraria* as it retains such features as inflated inner socket ridges and a relatively angular shell shape; features characteristic of *Stegerhynchus* but not present in *Machaeraria*.

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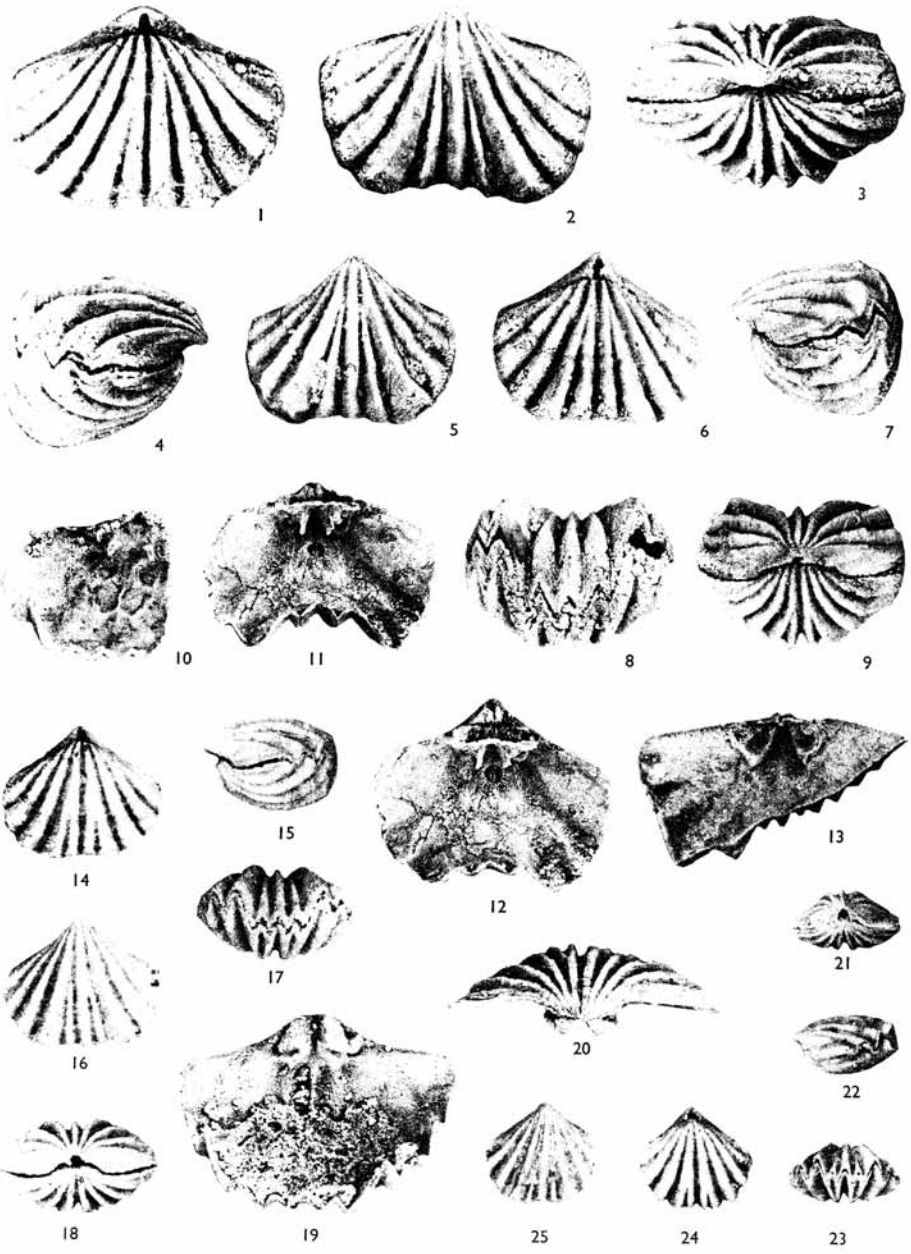

SAVAGE, *Australirhynchia*