Records of the Western Australian Museum **20**: 387–392 (2002).

A new Jurassic Rhynchonellide Brachiopod from the Newmarracarra Limestone, Perth Basin, Western Australia

Robert S. Craig
Research Associate, Western Australian Museum, Francis Street,
Perth, Western Australia 6000, Australia
robert.craig@museum.wa.gov.au

Abstract – A new species of rhynchonellide brachiopod, *Cirpa fromontae* sp. nov., is described from the Middle Jurassic Newmarracarra Limestone, Perth Basin, Western Australia. This is the first species of *Cirpa* recorded from Australia and links the region with the Tethyan Sea.

INTRODUCTION

The Newmarracarra Limestone was named after the historic "Newmarracarra" property. It is part of the Champion Bay Group and lies conformably between the Colalura Sandstone (shallow-marine unit of Bajocian age) or the Bringo Shale (Bajocian) and the Kojarena Sandstone (Bajocian) or the Yarragadee Formation (Late Jurassic to Early Cretaceous). The type section is at Round Hill (28°46'S, 114°48'E). Where unaffected by laterization, the Newmarracarra Limestone is sandy, "hard, massive and crudely bedded" (Playford *et al.* 1975). It is extensively weathered in parts. The thickest exposed section is 11.5 m thick on "Moonyoonooka" property, but the formation reaches 14.3 m at the Geraldton racecourse bore.

Rich invertebrate faunas including ammonites, annelids, belemnites, bivalves, bryozoans, foraminifers, gastropods, and ostracods have been recorded. One nautiloid and one echinoid have also been recorded (Playford *et al.* 1976). It is regarded as equivalent to the middle Bajocian of the Middle Jurassic having been deposited in a warm shallow sea (Playford *et al.* 1975).

Method and Material

The specimens are housed in the Invertebrate Palaeontological Collection of the Western Australian Museum (WAM). All measurements were made with dial callipers. The matrix was removed from specimens using dental tools. Where possible, the interiors were also cleaned of matrix. Serial sections were prepared by grinding on a glass plate using carborundum powder and sections were drawn using a *camera lucida* microscope.

Photographs were taken with a Nikon F 90 X camera with a macro lens and each specimen was prepared with a coating of ammonium chloride to whiten it for photography.

SYSTEMATIC PALAEONTOLOGY

Family Wellerellidae Likharev in Rzhonsnitskaya, 1956

Subfamily Cirpinae Ager, 1965

Genus CIRPA de Gregorio, 1930

Type species
Rhynchonella primitiva Gemmellaro, 1874

Cirpa fromontae sp. nov.

1867 *Rhynchonella variabilis*; Clarke, p. 8.

1870 *Rhynchonella variabilis*; Moore, p. 231, 232, pl. X, fig. 11, 12.

1910 *Rhynchonella variabilis*; Etheridge Jr., p.30. pl. IX., fig. 3, 6.

1972 *Rhynchonella variabilis*; Skwarko, p. 60.

1976 *Rhynchonella variabilis*; Playford *et al.*, p. 153.

1992 *Burmirhynchia* sp.; McNamara and Brimmell, p. 10, fig. 35, 36.

Material Examined

Holotype
WAM 81.1396; Bringo Cutting, Newmarracarra Limestone, middle Bajocian, Middle Jurassic, Perth Basin, Western Australia.

Paratypes
WAM 63.84a, 66.98a, Waggrakine; WAM 74.885, Moonyoonooka; WAM 77.2280, north side of New Fossil Hill, Moonyoonooka; WAM 81.1499, 81.1943a and b, Bringo Cutting; Newmarracarra Limestone, middle Bajocian, Middle Jurassic, Perth Basin, Western Australia.

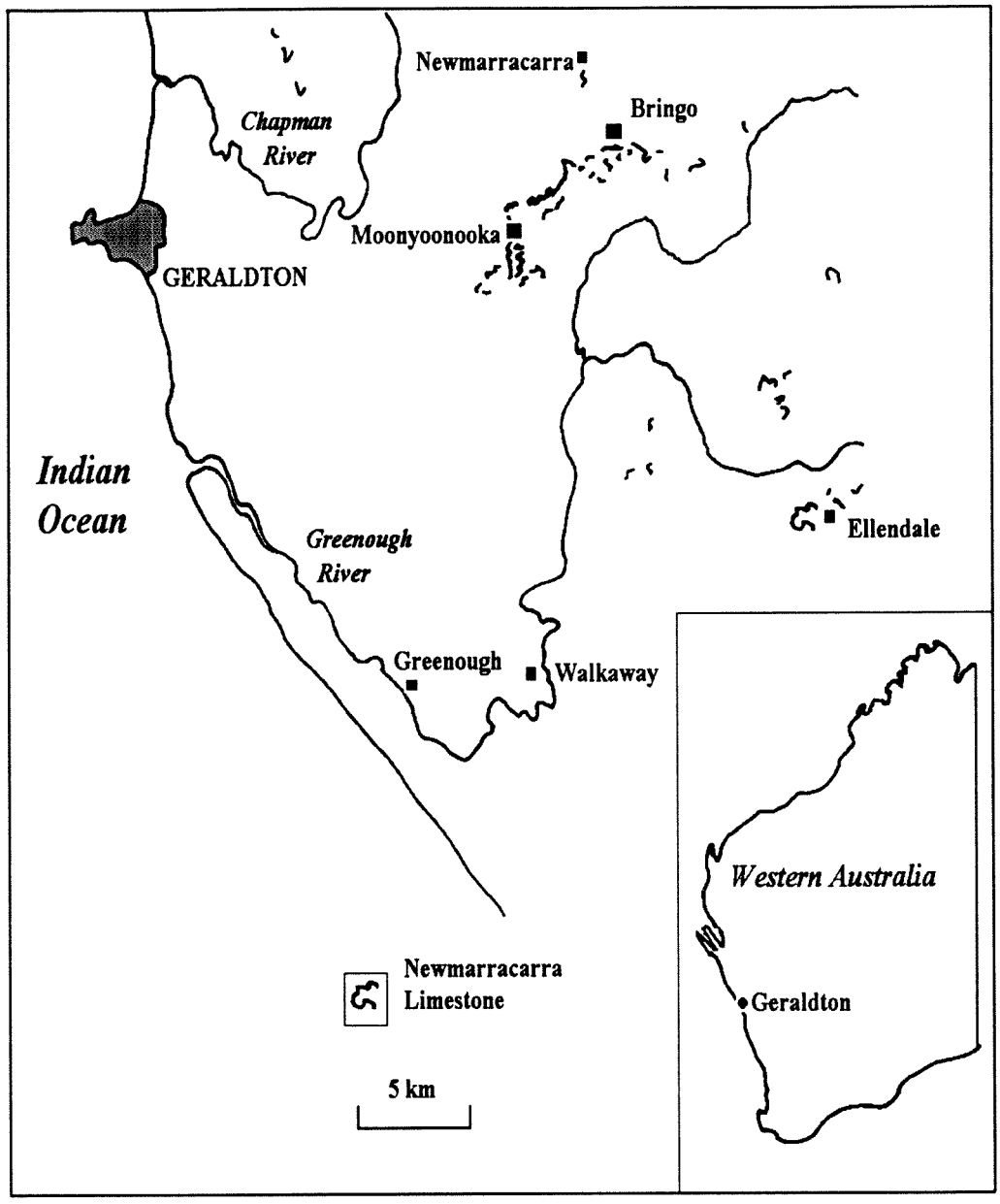


Figure 1 Map indicating the main sites of the Newmarracarra Limestone (after Hall 1989).

Other Material

WAM 65.1151, 8 km east of Moonyoonooka; WAM 62.191, 68.1240, 74.875, 77.2284, 95.333, Bringo Cutting; WAM 81.1369, 82.1055, Bringo siding, Bringo; WAM 96.388, 98.243, east part of Victoria Location, PT 2155, Bringo; WAM 92.679, Greenough River; WAM 78.4126, 81.1521, Mt Hill, Bookara; WAM 4968, 4971, 5009, New Fossil Hill; WAM 74.847, 77.2280, 82.8, 98.244, north side of New Fossil Hill, Moonyoonooka; WAM 4976, 4980, 4981,4983, 4984, Round Hill; WAM 5025, 5037, south corner of Horse Hill; WAM 65.1220, 65.1225, 66.358, 82.10, 85.1116, 96.408, Waggrakine; WAM 65.1105, 65.1111, no locality; Newmarracarra Limestone, middle Bajocian, Middle Jurassic, Perth Basin, Western Australia.

Diagnosis

A species of *Cirpa* with a low blade like median septum in the brachial valve that bifurcates posteriorly, a rimmed foramen and impressed muscle scars.

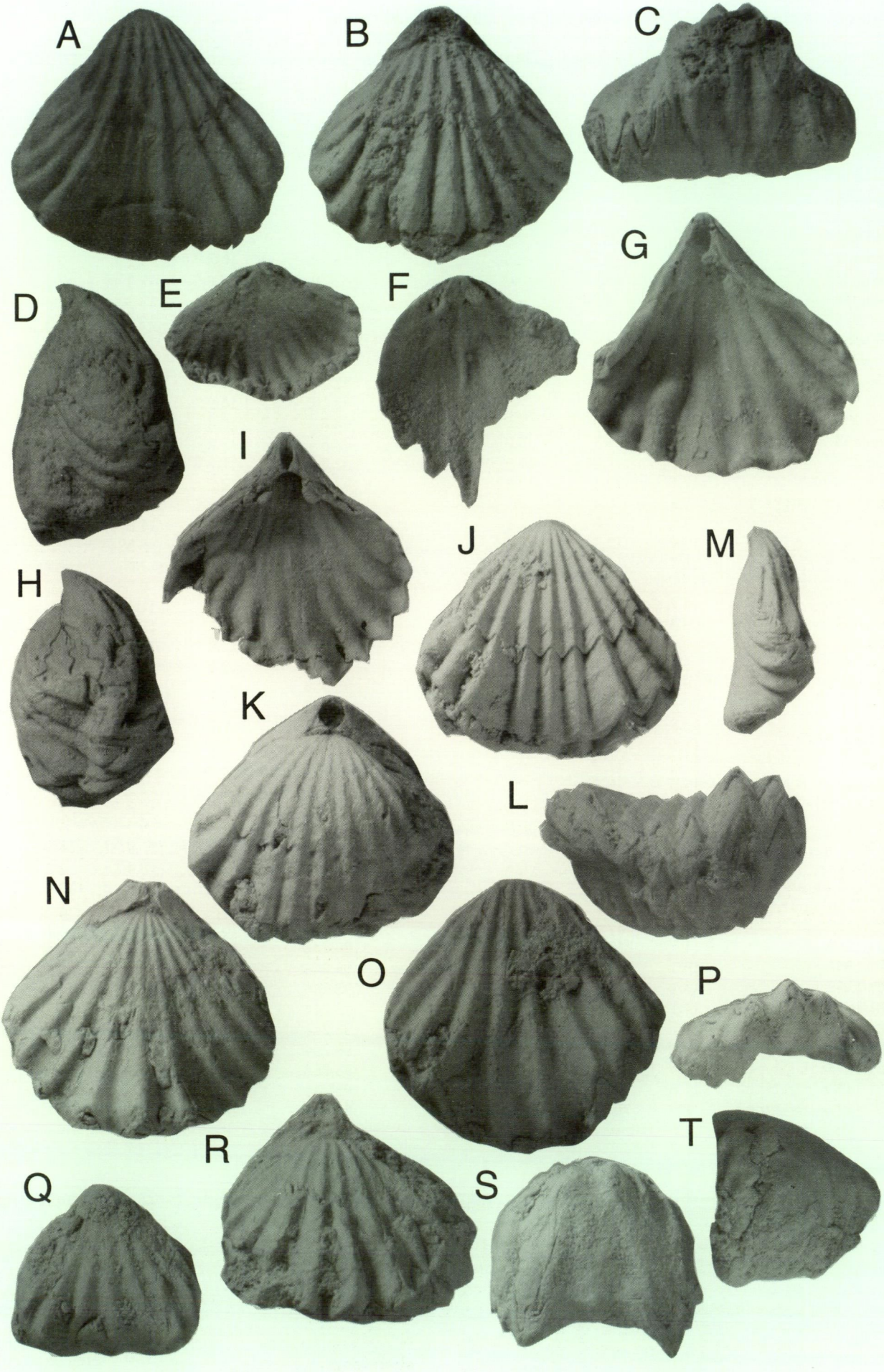
Description

Exterior. Shell triangular to sub-pentagonal; length to 17.5 mm; widest at midlength (although some specimens length greatest at or near anterior), width to 110 % length. Biconvex, dorsal valve deepest, depth to 140 % of length in deepest of the specimens. Two varieties, one variety has flatter dorsal valves and the plication less pronounced. Growth lines indistinct except where costae high. Cardinal margin wide, strongly

Table 1 Measurement of *Cirpa fromontae* sp. nov. in millimeters.

Specimen	Length	Width	Depth	Specimen	Length	Width	Depth
62.191	13.4	14.1	8.5	81.1499	12.9	13.0	3.7
63.84	10.0	12.4	10.2	81.1499	13.3	14.3	4.9
63.84	16.0	11.2	11.8	82.10	8.9	8.4	7.2
63.84a paratype	17.8	18.0	10.7	82.10	9.7	8.1	5.0
65.1111	14.3	14.2	13.3	82.10	9.9	11.5	7.5
65.1225	4.5	4.4	1.7	82.10	10.0	12.4	9.1
65.1225	9.2	9.2	3.7	82.10	10.1	12.1	5.8
65.1225	10.6	10.1	7.0	82.10	10.2	13.0	7.9
65.1225	11.8	12.5	5.5	82.10	10.3	9.7	5.5
65.1225	15.2	15.5	10.0	82.10	10.8	12.1	7.4
66.358	5.0	4.9	1.3	82.10	11.2	13.3	6.4
66.358	5.7	6.3	2.1	82.10	11.4	13.5	7.3
66.358	7.4	7.4	2.9	82.10	13.8	14.8	12.4
66.358	8.6	8.5	2.4	82.10	14.1	15.4	9.0
66.358	10.5	7.6	4.6	82.1055	11.6	13.0	12.8
66.358	10.9	12.0	7.5	82.1055	14.9	15.7	10.2
66.358	11.1	10.2	7.2	82.8	10.8	16.7	8.1
66.358	13.0	14.3	9.0	82.8	11.2	11.4	7.4
66.358	16.0	11.8	11.6	82.8	11.7	14.1	6.4
66.358	17.5	19.1	12.8	82.8	12.2	13.1	12.4
66.98a paratype	9.4	8.4	-	82.8	13.0	14.5	6.6
66.98	5.8	5.8	2.1	82.8	13.8	14.8	9.0
66.98	10.9	12.3	4.7	85.1116	9.2	8.5	7.7
66.98	11.2	10.5	6.5	85.1116	11.8	11.2	9.7
66.98	13.5	14.8	9.0	95.333	9.2	9.5	4.0
66.98	14.7	11.6	7.4	95.333	13.1	11.4	-
74.847	9.3	10.7	5.4	96.388	10.5	13.1	7.1
74.847	9.4	9.4	4.9	96.388	12.0	12.8	9.0
74.847	9.6	10.3	8.7	96.388	12.4	14.1	7.4
74.847	10.1	10.0	6.3	96.388	12.8	13.5	5.0
74.847	10.7	11.6	7.4	96.388	12.9	11.6	11.2
74.847	10.9	10.2	5.1	96.408	7.3	6.6	2.2
74.847	11.0	10.7	6.1	96.408	7.9	7.4	3.4
74.847	11.5	11.7	6.9	96.408	8.5	8.2	3.9
74.847	11.5	10.7	7.2	96.408	10.2	12.1	7.5
74.847	11.7	12.7	9.0	96.408	11.6	15.8	9.6
74.847	13.3	12.3	9.9	98.243	9.3	9.2	5.5
74.847	13.9	14.3	5.7	98.243	16.9	17.9	14.4
74.875	13.1	16.0	8.8	98.244	7.1	8.4	4.2
74.885 paratype	17.0	18.7	10.6	98.244	9.6	11.8	10.9
77.2280 paratype	15.0	15.1	6.2	98.244	9.8	9.9	6.3
78.4126	14.6	17.5	9.6	98.244	10.0	9.8	6.1
81.1369	11.7	12.4	6.5	98.244	10.1	11.2	7.4
81.1369	13.1	15.2	7.9	98.244	10.5	11.0	6.5
81.1369	13.1	13.2	11.4	98.244	12.3	14.0	17.7
81.1369	14.1	15.5	13.5	98.244	12.4	11.8	11.2
81.1396	10.7	12.1	6.5	98.244	12.7	12.7	7.6
81.1396a holotype	16.1	16.2	10.1	98.244	12.8	13.9	11.8
81.1493a paratype	5.5	7.9	-	98.244	13.2	13.9	4.2
81.1493b paratype	13.6	13.2	-	98.244	13.7	14.9	15.3
81.1499a paratype	9.9	10.1	-	98.244	14.7	15.8	7.1

curved; lateral valve edge rounded, margin sigmoidal, anterior crenulate; anterior commissure gently to strongly uniplicate, crenulate with two plications in strongly uniplicate specimens to four plications in weakly uniplicate specimens. Sulcus in ventral valve commences just posterior of mid-length; fold in dorsal valve, where present, commences at mid-length. Costae very sharp edged, varying in height to 23 % of shell length, eight to twelve costae per shell with shallow specimens with greatest number of costae. Costae extend from posterior to anterior. Crenulate pattern on margins irregular. Rugose. Beak short, to 13 % shell length, erect to slightly incurved; beak ridges sharp. Foramen oval to round to 10 % shell length; mesothyrid. Deltidal plates triangular,


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T

small, conjunct at apex. Symphytium high, narrow, concave. Well developed planareas.

Interior. Ventral valve. Hinge teeth deltidiodont, grooved at cardinal margin; dental plates narrow, excavated. Pedicle collar sessile with median join. No median septum. Muscle scars indistinct.

Dorsal valve. Socket triangular, curved, deep. Bases slightly swollen. Outer socket ridge narrow. Inner socket ridges, outer hinge plates and crural bases fused. Inner hinge plates fused. Median septum blade like with swollen base. Septum extends from mid-length and bifurcates posteriorly to join base of fused hinge plates. Cardinal process indistinct. Adductor muscle scars either side of median septum small, kidney-shaped.

Remarks

Clarke (1867) mentioned three species of rhynchonellid brachiopods from a "parcel of fossils" that he received from north of Champion Bay; there are no descriptions or attempts to name these specimens. He (Clarke 1867) did mention *Rhynchonella variabilis* Schlotheim 1813 in a group of fossils sent to Moore by Clifton. Moore (1870) listed *R. variabilis* and included a plate that is consistent with the above description. Etheridge (1910) described *R. variabilis* from Snake Farm, Greenough River as being biplicate and triplicate. Ager (1959) noted that the name *Rhynchonella variabilis* has been applied to name a number of species from Europe and Asia. The species described above is not a *Rhynchonella* as it does not possess the sharp fold producing the cynocephalous shell form. The description of the Western Australian specimens in Etheridge (1910) is consistent with *Cirpa fromontae* sp. nov.

It is placed herein within the genus *Cirpa* as the morphological characteristics are most consistant with this taxon. The lack of a preserved cura prevents assigning a new genus.

Unlike other species of *Cirpa*, *C. fromontae* has a distinct median septum that extends to the mid-length and bifurcates slightly posteriorly in some specimens. It is low and blade-like. The rimmed foramen and impressed muscle scars are also distinctive. The specimens examined vary a great deal in depth and width but the number of costae is similar. Some specimens are flattened while others are distorted laterally (WAM 82.1055). One specimen is much shorter than wide possibly due to growth constraints (WAM 82.8a).

This species is unlike the rhynchonellids described by MacFarlan (1992) or the Antarctic species described by Quilty (1972). Campbell (1994) described a species of rhynchonellid brachiopod from the Late Triassic Rowley Terrace. He assigned it to *Trigonirhynchella. C. fromontae* is the only brachiopod species so far described from the Jurassic in Western Australia.

Etymology

The species is named in honour of Dr Jane Fromont, the Curator of Marine Invertebrates at the Western Australian Museum.

Conclusion

This is the first record of *Cirpa* from Australia. All previous species of the genus are from Europe and the Middle East. This links the Northern section of the Perth Basin with the Tethyan realm supporting Swarko's suggestion of "sea connections between Western Australia and Europe and the Americas" (Swarko 1972 p 57). Distribution of the species across the Tethyan Sea may well have been by the attachment of larvae to seaweed or other drifting material such as pumice and wood. Wignall and Simms (1990) reported *'Rhynchonella' subvariabilis* attached to a piece of drift wood from the lower Mutabilis Zone (Lower Kimmeridge Clay, Upper Jurassic) at Wyke Rigis, Weymouth, Dorset, United Kingdom.

Studies by Arkell (Arkell and Playford 1954) suggested the Western Australian ammonites have strong generic affinities with Europe and the west coast of America and the bivalves have similar affinities. However, at the species level, the majority of Newmarracarra taxa are endemic. This, with the new species of brachiopod described above, supports Skwarko's (1972, p. 68) hypothesis that the Geraldton area was a "quiet embayment with limited access to outside influences"

ACKNOWLEDGEMENTS

I would like to thank the Western Australian Museum for the use of the collection and facilities to prepare this paper. I am grateful to G. W.

◀ **Figure 2** **A-T** *Cirpa fromontae* sp. nov. **A-D**, WAM 81.1396, holotype, **A**, ventral valve view, **B**, dorsal valve view, **C**, anterior commissure, **D**, lateral view, all x 2.9; **E**, WAM 81.1943a paratype, dorsal valve interior x 4.7; **F**, WAM 66.98 a, paratype, dorsal valve interior x 4.5; **G**, WAM 81.1499, paratype, ventral valve interior x 5; **I**, WAM 81.1943 b, paratype, ventral valve interior x 3.4; **H, J-L**, WAM 74.885, paratype, **H**, lateral view x 2.5, **J**, ventral valve view, **K**, dorsal valve view, **L**, anterior commissure (inverted), all x 2.6; **M-P**, WAM 77.2280, paratype, **M**, lateral view x 2.5, **N**, dorsal valve view x 3, **O**, ventral valve view x 3.4, **P**, anterior commissure x 2.6; **Q, S, T**, WAM 82.8a, **Q**, dorsal valve view x 2.5, **S**, anterior commissure x 2.7, **T**, lateral view x 2.6; **R**, WAM 63.84, paratype, dorsal valve x 2.4, showing lateral distortion.

Kendrick for reading the manuscript and offering suggestions for improvement. The constructive comments of D. A. B. MacFarlan and A. Wright were much appreciated.

REFERENCES

Ager, D. V. (1959). Lower Jurassic brachiopods from Turkey. *Journal of Paleontology* **33**: 1018-1028.

Ager, D. V. (1965). Mesozoic and Cenozoic Rhynchonellacea. *In* Moore, R. C. (ed.), *Treatise of Invertebrate Paleontology, part H, Brachiopoda.* Volume 2: H597-632. The University of Kansas Press and the Geological Society of America Incorporated, Lawrence, Kansas.

Arkell, W. J. (1954). The Bajocian ammonites of Western Australian. *Philosophical Transactions of the Royal Society of London* **B 237**: 547-604.

Campbell, J. D. (1994). Late Triassic brachiopods from a dredge haul on the slope below Rowley Terrace, northwest Australia. *Journal of Australian Geology and Geophysics* **15**: 135-136.

Clarke, W. B. (1867). On marine fossiliferous secondary formations in Australia. *The Quarterly Journal of the Geological Society of London* **23**: 7-12.

de Gregorio, A. (1930). Sul Permiano di Sicilia (Fossili del calcar con Fusulina di Palazzo Adriano non descritti del' Professor G. Gemmellaro conservati nel mio privato gabinetto). *Annales de Géologie et de Paléontologie* (Palermo) **52**: 18-32.

Etheridge, R. (1910). Oolitic fossils of the Greenough River District. *Palaeontological Contributions to the Geology of Western Australia. Western Australian Geological Survey Bulletin* **36**: 29-50.

Gemmellaro, G. G. (1874). Sopra alcune faune giuresi e liasiche della Silicia. Studi paleontologici. 3: Sopra I fossili della zona con *Terebratula Aspasia* Menegh. della provincia di Palermo e di Trapani. *Giornale della Societa di Scienze Naturali ed Economiche di Palermo* **10**: 53-112.

Hall, R. L. (1989). Lower Bajocian ammonites (Middle Jurassic; Soninniidae) from the Newmarracarra Limestone, Western Australia. *Alcheringa* **13**: 1-20.

MacFarlan, D. A. B. (1992). Triassic and Jurassic Rhynchonellacea (Brachiopoda) from New Zealand and New Caledonia. *Royal Society of New Zealand Bulletin* **31**. 310pp.

McNamara, K. J. and Brimmell, K. (1992). *A guide to the fossils of the Newmarracarra Limestone.* Department of Earth and Planetary Sciences, Western Australian Museum, Perth, 12 pp.

Moore, C. (1870). Australian Mesozoic geology and palaeontology. *Geological Society of London Quarterly Review* **26**: 226-261.

Playford, P. E., Cope, R. N., Cockbain, A. E., Low, G. H. and Lowry, D. C. (1975). Phanerozoic. *In* Geology of Western Australia. *Western Australian Geological Survey, Memoir* **2**: 223-432.

Playford, P. E., Cockbain, A. E., and Low, G. H. (1976). Geology of the Perth Basin. *Geological Society of Western Australia, Bulletin* **124**: 151-157.

Quilty, P. G. (1972). Middle Jurassic Brachiopods from Ellsworth Land, Antarctica. *New Zealand Journal of Geology and Geophysics* **15**: 825-851.

Rzhonsnitskaia, M. A. (1956). Systematisation of Rhynchonellida: Resumenes de los Trabajos Presentados, XX Congreso Geologica Internacional, Mexico: 125-126.

Schlotheim, E. von. (1813). Beiträge zur Naturgeschite der Versteinerunger. *Leohards Mineral Tashent* **7**: pl. figure 4.

Skwarko, S. K. (1972). Jurassic Fossils of Western Australia. 1. Bajocian Bivalvia of the Newmarracara Limestone and the Kojarena Sandstone. *Bureau of Mineral Resources, Geology and Geophysics Bulletin* **150**: 57-109.

Wignall, P. B. and Simms, M. J. (1990). Pseudoplankton. *Palaeontology* **33**: 359-378.

Manuscript received 20 June 2000; accepted 2 March 2001.