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STUDIES ON WESTERN AUSTRALIAN PERMIAN BRACHIOPODS
4. PRODUCTELLIDAE SCHUCHERT & LE VENE 1929 AND OVERTONIIDAE MUIR-WOOD & COOPER 1960

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ABSTRACT: Productellidae and Overtoniidae (Productida, Brachiopoda) from the Early Permian sequences of the Carnarvon Basin, Western Australia are described. The following species are revised or described: *Stictozoster senticosa* (Hosking), *Comuquia australis* sp. nov., *?Lethamia obscurus* sp. nov., *Dyschrestia micracantha* (Hosking), *Dyschrestia colemani* sp. nov. and *Dyschrestia* sp.

This paper continues the series of studies on Western Australian Permian brachiopods (Archbold 1983). Representatives of the Productellidae and the Overtoniidae are restricted to the early Permian sequence of the Carnarvon Basin. None of the species are common. The stratigraphy of the Carnarvon Basin is documented in references referred to in Archbold (1981, p. 109). The basis for age assignment of species is also outlined in Archbold (1981). Terminology is standard as in previous studies.

COLLECTIONS

All figured and measured specimens are housed in the following institutions as indicated by the prefix to the registered numbers. CPC—Commonwealth Palaeontological Collections of the Bureau of Mineral Resources, Geology and Geophysics, Canberra, A.C.T. GSWA—Geological Survey of Western Australia, Perth, Western Australia. MUGD—Department of Geology, University of Melbourne, Parkville, Victoria.

SYSTEMATIC PALAEONTOLOGY

Order PRODUCTIDA Sarycheva & Sokolskaya 1959
Superfamily PRODUCTELLACEA Schuchert & Le Vene 1929
?Family PRODUCTELLIDAE Schuchert & Le Vene 1929

Genus **STICTOZOSTER** Grant 1976

TYPE SPECIES: *Stictozoster leptus* Grant 1976.

DIAGNOSIS: The diagnosis provided by Grant (1976, p. 96) is accepted.

DISCUSSION: Grant (1976) discussed the combination of features of this peculiar genus, noting that *Stictozoster* does not fit readily into any established family, however, the present author follows Grant and retains the genus provisionally within the Productellidae, 'extending the range of that family on somewhat doubtful grounds' (Grant 1976, p. 96).

Grant (1976) referred no other species to this genus although he did indicate that *Pustula senticosa* Hosking 1933 belonged to *Stictozoster*, an indication substantiated herein. Several other species, although known only from ventral valves, appear distinctive enough to assign to *Stictozoster*, as summarised by Archbold, (1982b, p. 9) and, in part, independently by Waterhouse (1981, p. 74). Waterhouse (1981) however, disputed the generic position of *S. senticosa* and suggested that the species belonged in *Lethamia*, a genus that has subsequently been fully described and figured (Waterhouse 1982a). *Lethamia ligurritus* (see Waterhouse 1982a, pl. 8, figs c-i; pl. 9, figs a-j) is of comparable size to *Stictozoster senticosa* but the dorsal septum of *S. senticosa* is delicate, thin and not raised anteriorly as in *Lethamia*. The large size of the only available dorsal valve of *S. senticosa* (width 30.6 mm) indicates that the specimen is not a juvenile. The dorsal septum of *S. senticosa* together with the concentric bands of minute pustules strongly resembles those of *Stictozoster leptus* (Grant, 1976, pl. 17, figs 18, 19). The main difficulty in assigning *'Pustula' senticosa* to *Stictozoster* is the ornament of external coarse spines (much coarser than those of *S. leptus* and species of *Lethamia*), but the dorsal interior features are taken to be more diagnostic. The cardinal process of *Lethamia* appears to be similar to that of *Stictozoster*.

Stictozoster senticosa (Hosking 1933)
Fig. 1A-H

1933 *Pustula senticosa* Hosking, p. 47, pl. 3, figs 2-3.
1937 *Pustula senticosa* Hosking; Raggatt and Fletcher. *Rec. Aust. Mus.*, 20: 176.
1943 *Krotovia senticosa* (Hosking); Prendergast, p. 30.
1957 *Krotovia senticosa* (Hosking); Coleman, p. 63, pl. 7, figs 11-15.

LECTOTYPE: GSWA1/4970al; Hosking, 1933, pl. 3, figs 2a, b. Chosen by Coleman (1957, p. 63).

MATERIAL, AGE AND LOCALITY: Hosking's (1933) syntypic series of 3 conjoined shells, all crushed, 1 with much of the dorsal interior exposed, GSWA 1/4970a1-1/4970a3, all from creek 0.75 km west of Callytharra Springs, Wooramel River; Callytharra Formation; Sterlitamakian (Late Sakmarian).

MEASUREMENTS (in mm): Lectotype*, *e* = estimate

Specimen number	Maximum width	Hinge width	Ventral height	Dorsal height
GSWA1/4970al*	23.5	16.7	17.1	15.5
GSWA1/4970a2	30.6	22.0	23.2	20.8
GSWA1/4970a3	28 e.	20 e	20.6+	18.0+

DIAGNOSIS: Large *Stictozoster* with coarse spines widely spaced. Dorsal interior characteristic of genus.

DESCRIPTION: Outline transversely subelliptical; shell concavo-convex, visceral cavity thin, non-geniculate; hinge width about two-thirds of maximum width, hinge ends rounded; valves thin, no thickening at hinge; maximum width at midlength of shell; both valves covered with spines, those of dorsal valve being finer; ventral spines undifferentiated, arranged in concentric rows of fine concentric growth lines, concentric rows spaced at 0.5 to 0.75 mm anteriorly and spines spaced at 1 to 1.5 mm; anteriorly, posterior spacing of rows and spines both 0.5 to 0.75 mm; most spines erect; dorsal spines spaced more irregularly along concentric rows; dorsal valve with shallow dimples; concentric ornament of growth lines fine on ventral valve, more pronounced on dorsal valve; ventral beak fine, curved over hinge line.

Ventral interior unknown. Dorsal interior with small productellacean cardinal process, bilobed with lobes incised, shaft with alveolus; median septum low, thin, less than one-third valve length; muscle pad low, rounded; brachial ridges indistinct; endospines short, erect, arranged in concentric rows.

DISCUSSION: *Stictozoster senticosa* is atypical of the genus because of its larger size and relatively coarser and more widely spaced spines.

Coleman (1957) considered that the ventral spines are arranged quincuncially but this is because the spines are arranged in concentric rows, each being offset from the preceding row and as spines are coarser and more widely spaced than those of other species of the genus a quincuncial arrangement becomes evident. No other known species of *Stictozoster* possesses spines as coarse as those of *S. senticosa*; both *S. nielseni* (Dunbar) and *S. licharewi* (Frebold) possess ventral spines similar to those of *S. leptus* with respect to their size and arrangement (see Archbold 1982b) and the *Stictozoster* sp. cf. *S. leptus* from Irian Jaya is even closer to the type species (Archbold *et al.* 1982).

Family OVERTONIIDAE Muir-Wood & Cooper 1960
Subfamily OVERTONIINAE Muir-Wood & Cooper 1960

DIAGNOSIS: The diagnosis provided by Muir-Wood & Cooper (1960, p. 183) is accepted.

DISCUSSION: Waterhouse (in Bamber & Waterhouse 1971) recognized the Tubersulculinae within the Overtoniidae, differentiating the subfamial groupings on the strength of the concentric lamellae and the degree to which the ventral spines are concentrically arranged. However, several genera (e.g. *Dyschrestia*) are now known to be intermediate in these features and the subfamily groupings are not employed herein.

Genus **COMUQUIA** Grant 1976

TYPE SPECIES: *Comuquia modesta* Grant 1976.

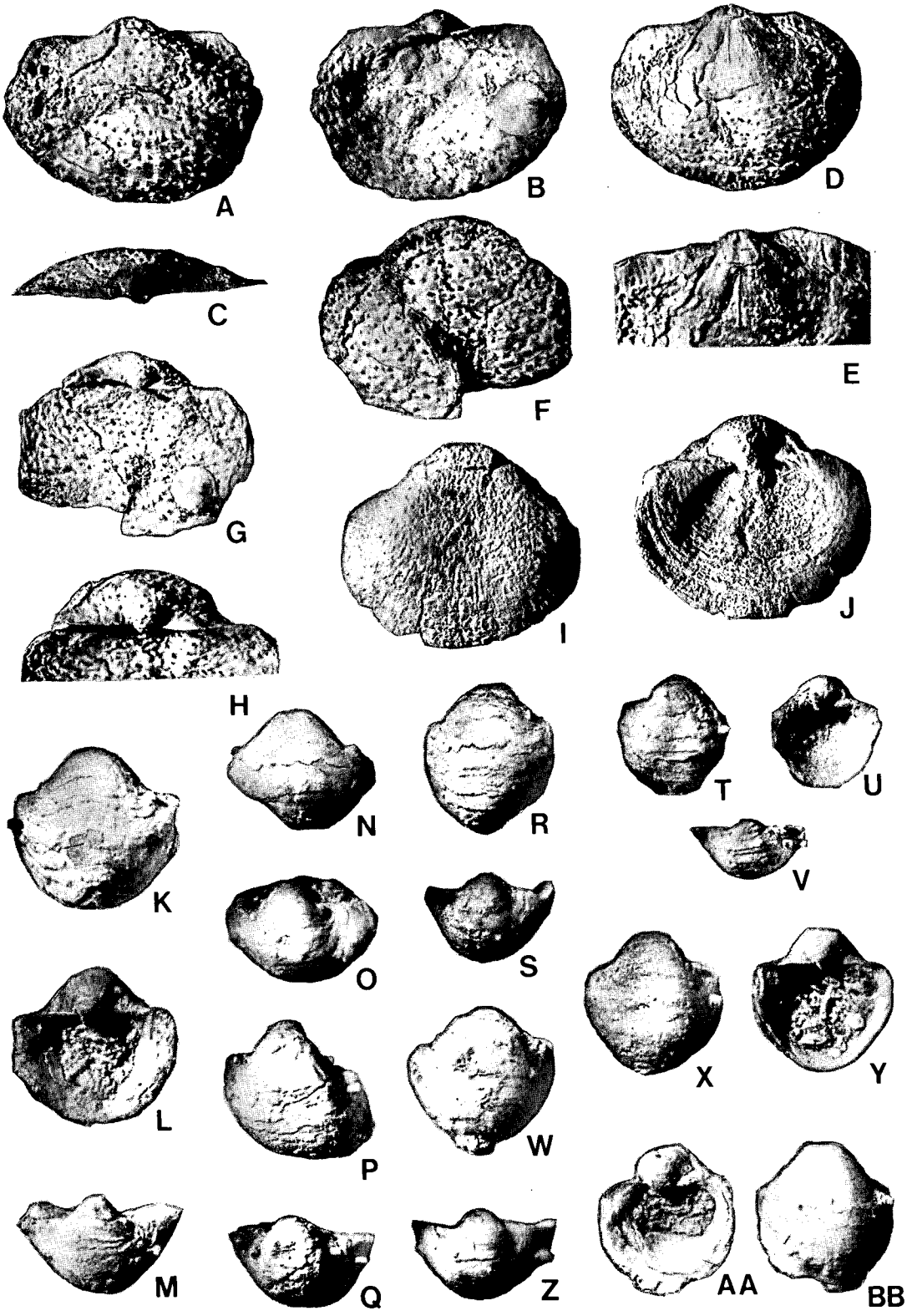
DIAGNOSIS: Small, elongate ovate; widest near midlength; growth lamellae strong, irregular; ventral spines variable in number, projecting from growth lamellae; dorsal spines few to absent; dorsal valve deeply concave; ventral valve strongly convex. Cardinal process bilobed with stout shaft; median septum thin, low; brachial ridges absent. (Revised from Grant 1976).

DISCUSSION: *Comuquia modesta* was well described by Grant (1976), however, the diagnosis of the genus requires broadening in order to include the new species *Comuquia australis* which is similar to the type species in its shell outline, concavo-convexity, growth lamellae and umbonal characteristics, but differs in possessing far fewer spines and in having a non spinose dorsal valve.

Rhytisia Cooper & Grant (1975, p. 967. pl. 311, figs 15-59) from the early Kungurian of Texas, is related to *Comuquia* yet differs in details of ventral spine pattern and in possessing distinct concentric wrinkles. *Comuquia* recalls *Scoloconcha* Gordon (1966) in details of size, convexity and ventral spinosity, but *Scoloconcha* possesses strongly developed marginal ridges and a trifid cardinal process.

Grant (1976, p. 98) considered *Comuquia* to provide an additional generic category for Permian Overtoniidae that would find wide applicability although he did not compare *C. modesta* with any other species. The group of *'Productus' curvirostris* Schellwein (1892, p. 26, pl. 3, figs 12-14) being both widely distributed in space and time, belongs in *Comuquia.* Originally described from possible Asselian strata of the Carnic Alps it is now known from Italy, U.S.S.R., Tien Shan, Karakorum and Thailand.

Fig. 1-A-H, *Stictozoster senticosa* (Hosking) from Callytharra Formation, Carnarvon Basin. A-C, GSWAF1/4970a1, lectotype, crushed shell in ventral, dorsal and posterior views, ×1.8. D-E, GSWAF1/4970a2, crushed shell most of ventral valve missing in ventral view, ×1.3 and enlargement of cardinal region, ×2. F-H, GSWAF1/4970a3, crushed shell in ventral, dorsal and posterior views, ×1.5, ×1.4 and ×1.8 resptctively. I-J, ?*Lethamia obscurus* sp. nov. from Callytharra Formation, Carnarvon Basin. I-J, CPC1952, holotype, crushed shell in ventral and dorsal views, ×2.2. K-Z, AA-BB, *Comuquia australis* sp. nov. from Callytharra Formation, Carnarvon Basin. K-M, GSWAF11050, holotype, shell in ventral, dorsal and posterior views, ×3.5. N-O, GSWAF11191, crushed shell in ventral and posterior views, ×3.3. P-Q, CPC19930A, ventral valve in ventral and posterior views, ×3.5. R-S, GSWAF11190, ventral valve in ventral and posterior views, ×3.2. T-V, CPC19930B, ventral valve in ventral, dorsal and posterior views, ×3.5. W, GSWAF11189, ventral valve in ventral view, ×3.2. X-Y, GSWAF11188, ventral valve in ventral and dorsal view, ×3.2. Z, AA-BB, GSWAF11187, shell in posterior, dorsal and ventral views, ×3.2.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Comuquia australis sp. nov.
Fig. 1 K-Z, AA-BB

HOLOTYPE: GSWAF11050, a complete conjoined shell from the type section of the Callytharra Formation.

MATERIAL, AGE AND LOCALITY: GSWAF11050, 11187-11191, 3 conjoined shells and 3 ventral valves from the Callytharra Formation type section at Callytharra Springs. CPC19930A-19930B, 2 ventral valves, same locality, 27-32 m above base of formation; Sterlitamakian (Late Sakmarian).

MEASUREMENTS (in mm): * = holotype

Specimen number	Hinge width	Maximum width	Ventral height	Dorsal height	Thickness
GSWAF11050*	7.4	7.8	7.5	5.5	4.7
GSWAF11187	6.5	6.6	7.4	5.6	4.0
GSWAF11188	6.2	6.3	6.4	5.0	3.8
GSWAF11189	6.9	7.1	7.0	–	4.1
GSWAF11190	5.6	6.1	7.2	–	4.1
GSWAF11191	6.0	–	–	–	–
CPC19930A	5.3	6.9	5.9	–	–
CPC19930B	4.1	5.2	5.4	–	–

DIAGNOSIS: Small *Comuquia* species with distinct lamellae, sparsely spinose ventral valve.

DESCRIPTION: Subovate outline; profile an even spiral; beak prominent, strongly curved; shell widest near midlength; hinge width almost as great as maximum width; dorsal valve deeply concave, outline semicircular; growth lines visible over shell, stronger lamellose growth lines present at irregular intervals on ventral valve; ventral valve sparsely spinose, pair of spines flanking beak; row of up to three lateral spines, widely spaced; ventral spines rare, occasionally up to two on an individual growth lamella towards posterior of valve; dorsal spines apparently absent. Interior of shell unknown.

DISCUSSION: The characteristic outline and profile of this species indicate *Comuquia*; nevertheless *C. australis* is far less spinose than *C. modesta*. Bolkhovitinova and Markov's (1926) report of *Productus curvirostris* from the Sterlitamakian of the Perm region indicates a species particularly close to *C. australis* with respect to details of the beak, shell outline, size and growth lamellae. The Perm species is however more spinose than the Western Australian species although not as spinose as *C. modesta*. The group of *Productus capuloides* Stepanov (1937) possesses few spines on the ventral valve (Tschernyschew 1902, p. 271, pl. 30, figs 1, 2; pl. 53, figs 5, 6) and hence is similar to *C. australis* except for the incipient costae on the anterior of the ventral valve.

C. himalayaensis Jing & Sun (1981, p. 133, pl. 4, figs 17-26) from the early Artinskian Lasaila Limestone of the southern Himalaya, Tibet has few ventral spines but has a less curved ventral valve than *C. australis*.

Genus **LETHAMIA** Waterhouse 1973

TYPE SPECIES: *Lethamia ligurritus* Waterhouse 1973.

DIAGNOSIS: The diagnosis provided by Waterhouse (1973, 1982a) is accepted.

?Lethamia obscurus sp. nov.
Fig. 1 I-J

1957 *Krotovia* sp. ind. A. Coleman, p. 67, pl. 9, figs 22, 23.

HOLOTYPE: CPC1952, a crushed conjoined shell from the Callytharra Formation, Pell's Range, 24 km northeast of Towrana Homestead; 36 m (i.e. 118 feet) above base of Callytharra Formation (not '180 ft above the Callytharra Formation', as in Waterhouse 1981).

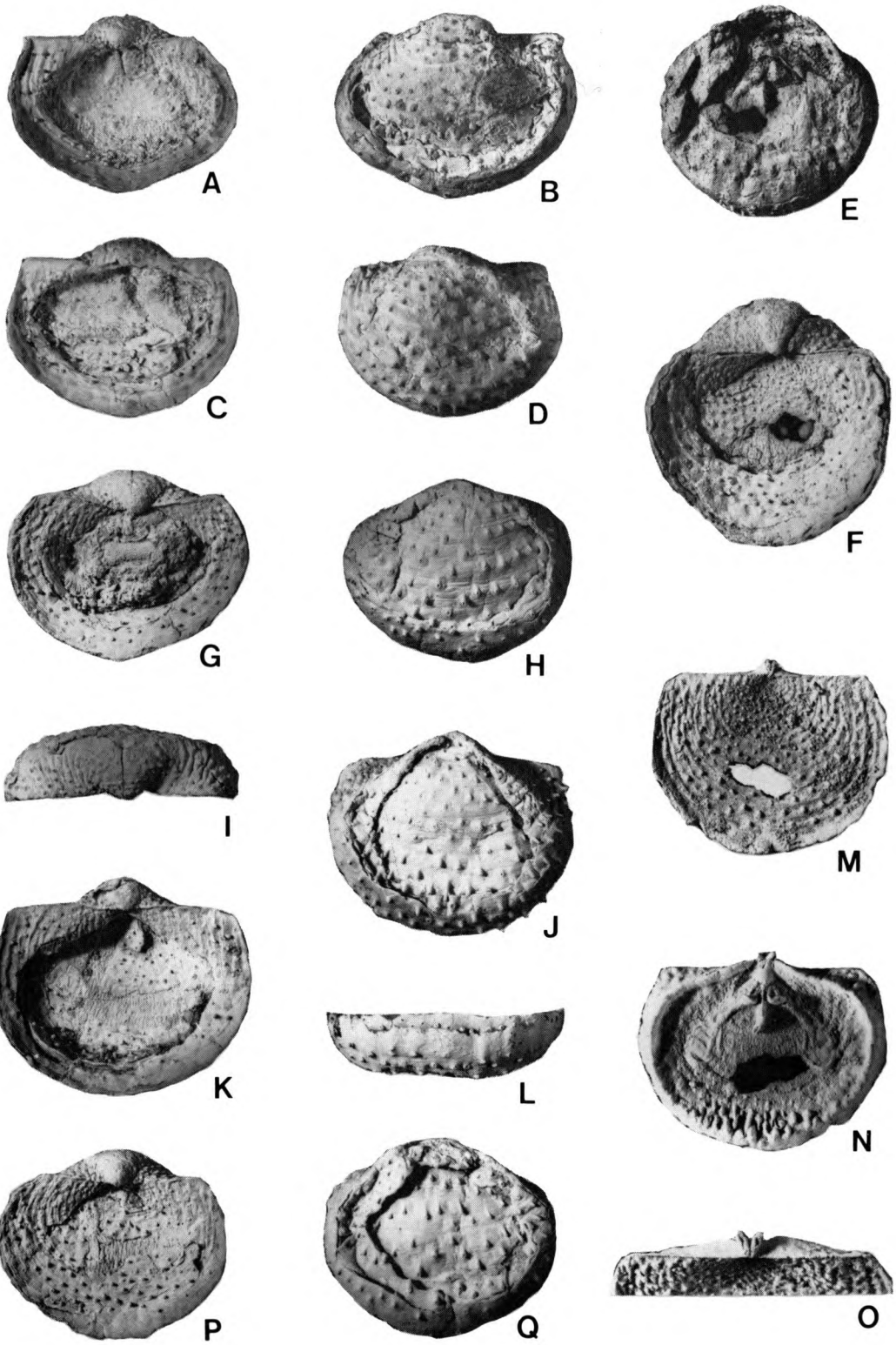
MEASUREMENTS: Maximum width 18.5 mm; hinge width 13 mm; height of dorsal valve 13 mm estimate.

DESCRIPTION: Shell with transversely oval outline; nongeniculate; ventral umbo small, curving over hinge; greatest width anterior of hinge at about shell mid length; convexo-concavity of shell moderate, visceral cavity thin. Ventral valve covered in spines—very fine of uniform size; spines arranged subquincuncially over most of valve, on average 0.75 mm apart and 0.25 mm wide at their base; on anterior of valve spines in concentric rows; rows widely spaced, 1.5-2.0 mm apart. Fine concentric lirae on ventral valve. Dorsal exterior with fine spines and concentric lirae; spines of similar size and arrangement to those of ventral valve. No dorsal dimples. Shell interior unknown.

DISCUSSION: Coleman (1957) recognised that this shell represented a distinctive species from Western Australia. Despite additional extensive collections from the Callytharra Formation having been made by Dr G. A. Thomas, University of Melbourne and geologists of the Geological Survey of Western Australia no comparable specimens have been collected. Rather than leave the specimen in open nomenclature it appears advisable to formally name it to highlight its distinctive external morphology. The shell gives no indication of being a sport (e.g. aberrant growth patterns or outline) and is readily distinguishable from all other species.

?Lethamia obscurus is closest to *Lethamia* in that it lacks dimples on the dorsal exterior, lacks distinct concentric lamellae and has fine dorsal spines but generic certainty cannot be verified without details of the dorsal interior. Waterhouse (1981, p. 74) and Grant (1976) sug-

Fig. 2-A-Q, *Dyschrestia micracantha* (Hosking) from Callytharra Formation, Carnarvon Basin. A-B, GSWAF1/4970b2, crushed shell in dorsal and ventral views, ×2.2. C-D, GSWAF1/4970b1, lectotype, crushed shell in dorsal and ventral views, ×2.2. E-F, MUGDF6002, incomplete shell in ventral and dorsal views, ×1.8 and ×2 respectively. G-I, MUGDF6004, crushed shell in dorsal, ventral and posterior views, ×2. J-L, MUGDF6001, crushed shell in ventral, dorsal and anterior views, ×1.8, ×2 and ×1.8 respectively. M-O, CPC1954, dorsal valve in dorsal, ventral and posterior views, ×1.6, ×1.8 and ×2.2 respectively. P-Q, MUGDF6003, crushed shell in dorsal and ventral view, ×2.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gested that the specimen may belong to *Stictozoster* but that genus possesses distinct dimples and a stronger development of concentric lamellae on the dorsal exterior, also, when the spines are fine on *Stictozoster*, they are dense with the concentric rows being close together. The generic diagnosis of *Stictozoster* has already been enlarged to incorporate *S. senticosa*.

Genus **DYSCHRESTIA** Grant 1976

TYPE SPECIES: *Dyschrestia spodia* Grant 1976.

DIAGNOSIS: The diagnosis provided by Grant (1976) is accepted with the exception that the dorsal interior may possess a distinct marginal ridge, a distinct median septum with a raised anterior termination and raised adductor muscle scars.

DISCUSSION: Grant (1976) compared *Dyschrestia* with several other genera including *Grandaurispina* Muir-Wood & Cooper 1960 and *Holotricharina* Cooper & Grant 1975 of the Linoproductidae which are externally somewhat similar to *Dyschrestia*. Grant noted that *Krotovia* Fredericks 1928 was nearest to *Dyschrestia* in general outline and profile and may well have been a progenitor. *Krotovia* was distinguished from *Dyschrestia* by the more even distribution of spines not tending to be concentrically banded by the presence of growth lamellae, the larger number of dorsal spines and greater development of radial rather than concentric wrinkling due to some species of *Krotovia* having costae bearing spines. The reassessment of *Krotovia* by Brunton (1966) indicates that species of *Krotovia* may at times possess a distinct concentric ornament and spines arranged in concentric rows. *Dyschrestia* however, possesses coarser, rather more spaced out ventral spines than *Krotovia* and a more strongly developed interior dorsal median septum. The dorsal septum is strongly developed in both Western Australian species althouth weakly developed in the type species from Thailand, but, figured Thai dorsal valves appear juvenile when compared with Western Australian specimens and this may explain the discrepancy.

Jakutella Abramov (1970, p. 119, pl. 4, figs 1-17) possesses rather pronounced wrinkling—almost true concentric rugae—and a stronger concavo-convexity than *Dyschrestia*. The dorsal valve of *Jakutella* is strongly dimpled, like *Krotovia* and carries few spines. The anterior ventral spines of *Jakutella* bear short costae or radial ridges.

Lanispustula Klets 1983 is of similar size to *Dyschrestia* but possesses elongate spine ridges, internal striations over the dorsal visceral disc and larger brachial ridges than *Dyschrestia*. *Lethamia*, well illustrated by Waterhouse (1982a), is much larger than *Dyschrestia*, and although *Lethamia* possesses a dorsal septum and raised anterior adductor scars like those of *Dyschrestia* it lacks the pronounced dorsal marginal ridge of *Dyschrestia*. Spines are much finer on *Lethamia* than on *Dyschrestia*.

Dyschrestia micracantha (Hosking 1933)

Fig. 2A-O

1933 *Pustula micracantha* Hosking, p. 49, pl. 4, fig. 4a, b.
1937 *Pustula micracantha* Hosking; Raggatt and Fletcher. *Rec. Aust. Mus.*, 20: 176.
1943 *Krotovia micracantha* (Hosking); Prendergast, p. 30.
1957 *Krotovia micracantha* (Hosking); Coleman, p. 61, pl. 7, figs 16-18; pl. 9, figs 20, 21.

LECTOTYPE: GSWA 1/4970b1; Hosking, 1933, pl. 4, figs 4a, b. Chosen by Coleman (1957, p. 61).

MATERIAL, AGE AND LOCALITIES: GSWA1/4970b1 and 2, 2 conjoined crushed shells, from creek, 1.25 km west of Callytharra Springs, Wooramel River, Callytharra Formation, Carnarvon Basin. MUGDF6001-F6003, 3 conjoined crushed shells, from locality P477, measured section of type section of Callytharra Formation, Callytharra Springs, 24 m above base, collector Dr G. A. Thomas. MUGDF6004, a crushed conjoined shell, from Locality P498, as for P477, 34-38 m above base of formation. CPC1954, Pell's Range, Carnarvon Basin, 24 km northeast of Towrana Homestead, 36 m above base of Callytharra Formation; Sterlitamakian (Late Sakmarian).

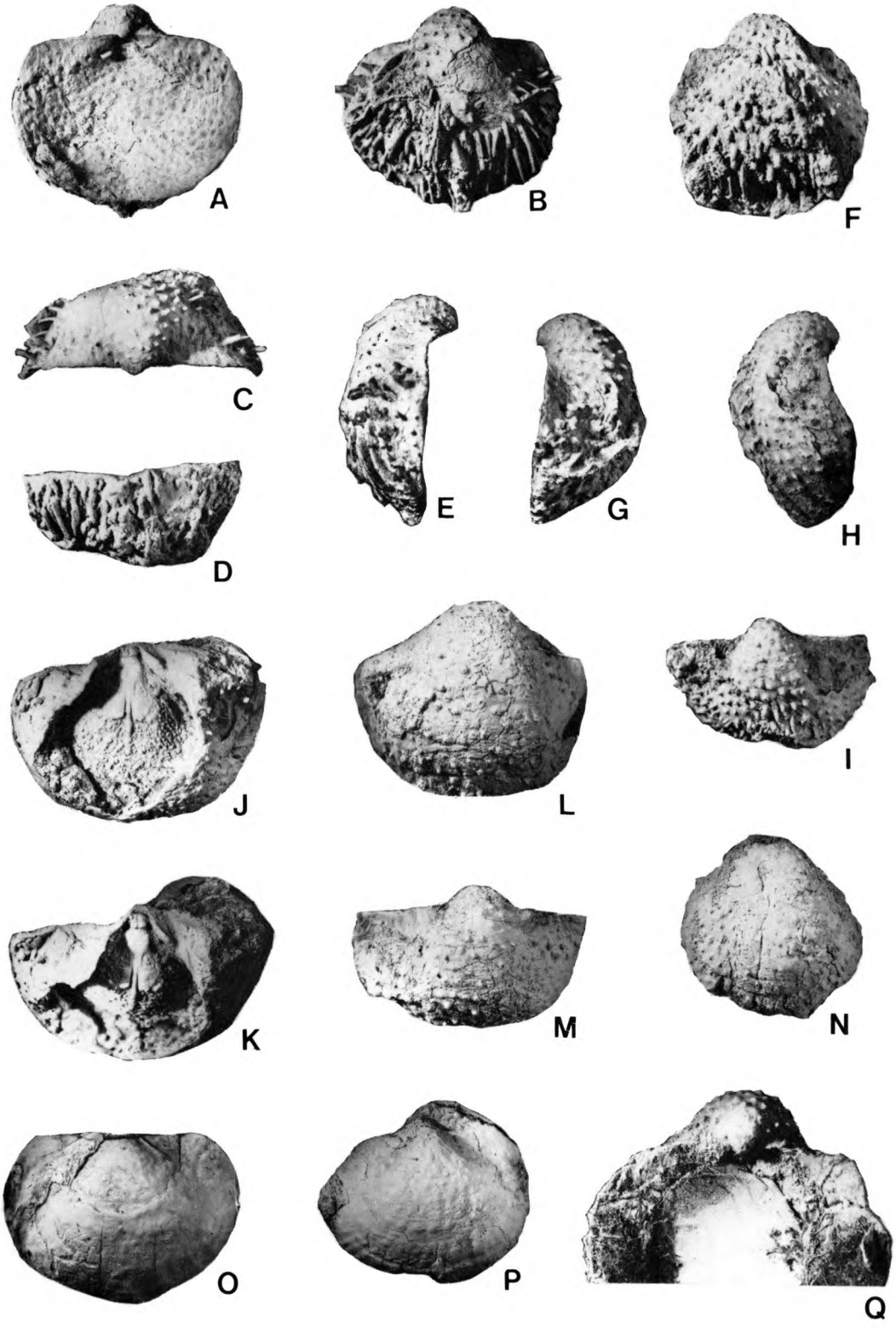
MEASUREMENTS (in mm): * = lectotype

Specimen number	Hinge width	Maximum width	Ventral height	Dorsal height
GSWA1/4970b1*	14.6	17.2	13.5	12.0
GSWA1/4970b2	13.2	17.3	13.8	12.0
MUGDF6001	18.7	21.1	17.9	15.5
MUGDF6002	16.5	20.0	–	15.2
MUGDF6003	14.5	18.5	15.8	13.4
MUGDF6004	15.5	20.8	17.0	13.5
CPC1954	15.5	19.5	–	15.6

DIAGNOSIS: Large sized *Dyschrestia* distinguished by high dorsal median septum which is raised anteriorly, smaller beak and less crowded spines on the ventral valve.

DESCRIPTION: Outline transversely subelliptical; non geniculate; ventral umbo small, pointed, slightly curving over hinge line; greatest width anterior of the hinge at about midlength of shell; ventral valve moderately con-

Fig. 3-A-O, *Dyschrestia colemani* sp. nov. from Wandagee Formation, Carnarvon Basin. A-E, AMF38446, holotype, shell in dorsal, ventral, posterior, anterior and lateral views, ×2.2. F-I, AMF38443, ventral valve in ventral, left lateral, right lateral and posterior views, ×2. J-K, AMF37579, shell with ventral valve cut away in ventral and postero-ventral views, ×2.2. L-M, AMF38442, ventral valve in ventral and posterior views, ×2. N, AMF37725, ventral valve in ventral view, ×1.6. O, AMF37518, decorticated dorsal valve interior, ×2. P, AMF37582, dorsal valve external mould with thin portions of dorsal valve remaining, ×2. Q, AMF38443, ventral valve in dorsal view, ×2.6.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vex; dorsal valve moderately concave; visceral cavity thin. Ventral valve covered in spines, lateral spines not distinct from visceral spines, spines arranged in concentric rows spaced usually at 1.5 mm to 2 mm intervals on anterior half of valve; successive concentric rows impart a quincuncial arrangement to the spines; dorsal spines finer than ventral spines, arranged concentrically over valve except for ears where arrangement is in two radial rows. Growth lines and delicate concentric ridges developed on ventral valve, lower and broader anteriorly; similar more pronounced concentric ornament on dorsal valve.

Ventral interior unknown. Dorsal interior with short bilobed cardinal process; muscle pads thickened and raised anteriorly; median septum arising between muscle pads, low posteriorly, narrow and high anteriorly, anterior extremely high, just under half valve length; brachial ridges weak, about two-thirds of valve length; remainder of valve covered by endospines, more pronounced at anterior extremity of valve. Pronounced marginal ridge present.

DISCUSSION: Examination of specimens not available to Hosking (1933), Prendergast (1943) or Coleman (1957) confirms that the ventral beak overhangs the hinge, that the species can be larger than previously thought and that hinge width is significantly less than maximum width of mature shells.

The species is differentiated from *D. colemani sp. nov.* and *D. spodia* by its strongly developed dorsal interior structures, notably the marginal ridge and the median septum that terminates anteriorly as a pronounced raised structure. *D. micracantha* is also distinguished by its ventral spine characteristics and a stronger development of the concentric ornament than that of the two younger species.

Dyschrestia colemani sp. nov.

Fig. 3A-Q

1943 *Krotovia spinulosa* (Sowerby); Prendergast, p. 30, pl. 4, figs 11-13.
1957 *Krotovia spinulosa* (Sowerby); Coleman, p. 65, pl. 7, figs 19-24.

ETYMOLOGY: For Dr P. J. Coleman, who has added extensively to the knowledge of Western Australian Permian Productidina.

HOLOTYPE: AMF38446, a complete conjoined shell, from the Wandagee Formation.

MATERIAL, AGE AND LOCALITIES: Nine specimens in various states of preservation. AMF37579, 403 m west of shale outcrop, north bank of Minilya River, Wandagee Formation; AMF38442, 38443, 38446 Wandagee Station, Minilya River, Wandagee Formation; AMF37563, 37564, 37578, 37582, bank of Minilya River, North West Division, Wandagee Formation; AMF37725, Wandagee Station, Minilya River, Wandagee Formation; Late Baigendzinian (Late Artinskian).

MEASUREMENTS (in mm): * = holotype

Specimen number	Hinge width	Maximum width	Ventral height	Dorsal height	Thickness
AMF38446*	12.8	17.3	15.5	13.5	8.1
AMF38443	12.0	16.5	16.0	13.2	8.8
AMF37725	–	16.1	15.6	–	–
AMF38442	15.5	19.0e	17.0+	–	–
AMF37578	–	18.0e	–	15.0	–
AMF37582	10.8+	16.0	–	12.3	–

DIAGNOSIS: Average sized *Dyschrestia* distinguished by distinctly developed median septum and muscle pads. Externally close to type species of the genus.

DESCRIPTION: Outline transversely subelliptical to circular; non geniculate; ventral umbo small, pointed, distinct; greatest width anterior of the hinge at about midlength of shell; dorsal valve distinctly concave; spines closely spaced on both valves, finer on dorsal valve; ventral lateral spines in single row in juvenile stages, double row in adult stages; remainder of ventral spines as coarse as lateral spines or at times finer; dorsal spines normally broken leaving fine pustulose bases, arranged quincuncially on most of valve except for ears where arrangement is in two distinct radial rows; growth lines poorly expressed on ventral valve, stronger on dorsal valve.

Ventral interior unknown. Dorsal interior with short bilobed cardinal process; muscle pads thickened anteriorly; median septum arising between muscle pads, low posteriorly, narrow and high anteriorly, anterior extremity low, about half valve length; brachial ridges weak, in posterior of valve, enclosing smooth floor; remainder of valve covered with endospines.

DISCUSSION: *Dyschrestia colemani* is similar to *Dyschrestia spodia* in many respects. The Thai species, however, at times is widest at the hinge (Grant 1976, pl. 22, figs 19, 20) and possesses ventral spines arranged in distinctly concentric rows (Grant 1976, pl. 22, figs 9, 29) both unlike the present species. The dorsal median septum of *D. colemani* is more strongly developed and longer than that of *D. spodia*. Comparisons with *D. micracantha* are under that species heading. The specimen from Bitauni, Timor attributed to *Productus opuntia* by Broili (1916, pl. 3, fig. 10) may be related to the Western Australian species judging from gross shell form and ventral spine pattern.

Waterhouse (1981, p. 76) considered that *D. colemani* specimens were particularly close to *Lethamia*, whereas he (1982a, p. 43) noted that the Western Australian shells are smaller, with a higher ventral umbo, more angular cardinal extremities and relatively coarser spines. Spines on *D. colemani* are certainly much coarser than on *Lethamia* and the Western Australian species possesses distinctive external dorsal dimples and distinctive dorsal adductor muscle pads. The specimen recorded by Coleman (1957) from the Cundlego Formation is also numbered T42 which is a locality of Dr C. Teichert's from the Wandagee Formation and hence the occurrence of the species from the Cundlego Formation cannot be confirmed.

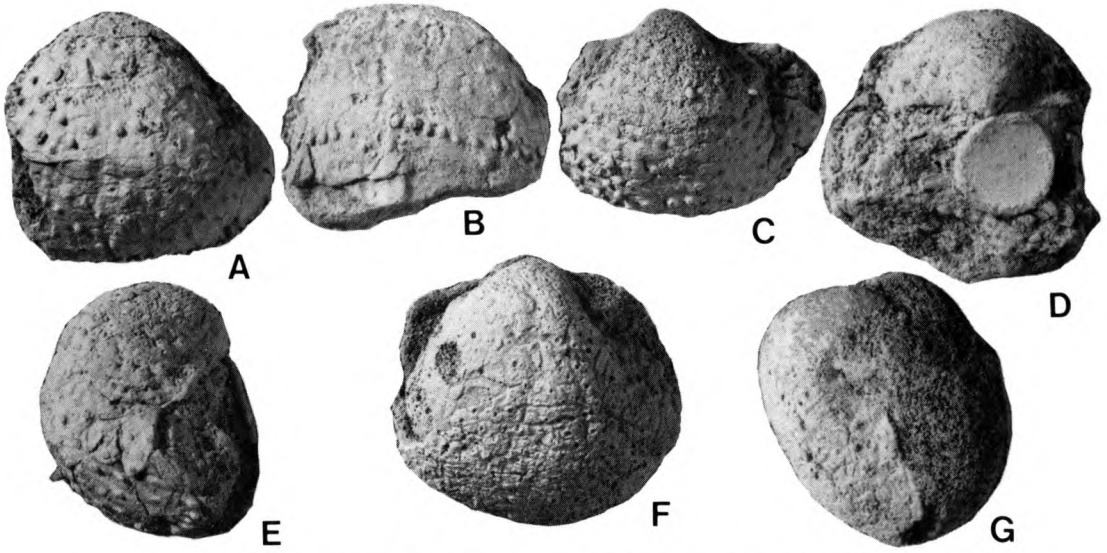

Fig. 4-A-G, *Dyschrestia* sp. from Coolkilya Greywacke, Carnarvon Basin. A-E, UWA28145b, ventral valve in ventral, anterior, posterior, dorsal and lateral views, ×2.5. F-G, UWA28145a, ventral valve in ventral and lateral views, ×2.5.

Dyschrestia sp.

Fig. 4

1957 *Krotovia spinulosa* (Sowerby); Coleman (*partim.*), p. 65, non. illus.

MATERIAL, LOCALITY AND AGE: 2 incomplete ventral valves, UWA 28145a and 28145b, a few hundred yards (metres) south east of Wandagee Hill, Mungadan Paddock, Wandagee Station (collected by Dr C. Teichert). Coolkilya Greywacke; middle Kungurian.

MEASUREMENTS (in mm): e = estimate

Specimen number	Hinge width	Maximum width	Ventral height
UWA28145a	11.5e	15.9	14.8
UWA28145b	–	15.1+	13.6

DESCRIPTION: Circular outline; ventral valve strongly enrolled, ventral umbo small, pointed; greatest width at about midlength of shell; spines closely spaced on ventral valve (1.0 to 1.5 mm), arranged in distinct concentric rows anteriorly; spines fine with fine, circular or only slightly elongated spine bases; lateral spines in single row and, judging from bases, fine and undifferentiated from remainder of spines; ventral growth lines very weakly developed.

DISCUSSION: Although inadequate for detailed description the two specimens indicate a distinct species, differentiated from other Western Australian species by means of a highly convex ventral valve with an ornament of fine spines and fine spine bases. Details of the shell outline and the arrangement of the ventral spines may also prove specifically distinctive.

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