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Ingelara Beds of Queensland

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The Fauna of the Permo-Carboniferous Ingelara Beds of Queensland

By K. S. W. CAMPBELL, B.Sc.

ABSTRACT.

The fauna of the Ingelara Beds in the Serocold anticline is discussed and correlated with beds in the Russian sequence in the region of the Artinskian-Kungurian boundary. Three new genera (*Cancellospirifer* and *Pleonella* (brachiopods) and *Platyteichum* (gastropod)) and five new species (*Cancrinella magnifica*, *Lissochonetes semicircularis*, *Pleonella acuta*, *Cancellospirifer maxwelli* and *Platyteichum costatum*) are named and described.

INTRODUCTION AND ACKNOWLEDGMENTS.

The Ingelara Beds have not been widely recognised outside the Serocold anticline, and the descriptions contained herein are based mainly on specimens collected from within that structure. Most of the material is from one-quarter to one-half mile north of the road in Dry Creek, west-south-west from Ingelara homestead, collected by myself, and much of the remainder is from the collection of J. H. Reid.

In the Dawson Valley, material which is possibly of Ingelara age has been collected from an "erosion gully, near culvert, north of Cracow-Theodore Road, half way between Delusion and Otrack Creeks" (L. 849, University of Queensland Colln., collected by D. Hill); "road between Portions L. 405 and L. 412, Parish Walloon, County Dawson (near Theodore) (L. 848, University of Queensland Colln., collected D. Hill); from road between Portions 405 and 412, Parish Walloon, L. 8, Geological Survey of Queensland Colln.; and from three miles east of Theodore (L. 1053, University of Queensland Colln.).

My thanks are due to Mr. Morton of the Geological Survey of Queensland, and to Dr. Walkom of the Australian Museum, Sydney, for the loan of specimens; to Dr. Dorothy Hill for advice throughout the work; to Professor W. H. Bryan for the use of University equipment; to the Ogg family of "Ingelara" and Mr. and Mrs. Wells of "Rewan" for hospitality in the field; and to Miss D. M. Watson for clerical assistance. The field work was financed from Commonwealth funds.

THE FAUNA.

The Ingelara fauna has been regarded as being characterised by corals, "*Martiniopsis*" and "*Mourlonia*."

Bryan and Jones (1946) record the presence of the genera *Euryphyllum*, *Cladochonus*, *Thamnopora*, "*Martiniopsis*," *Aviculopecten*, *Bellerophon* (*Warthia*), and *Conularia*. The present work revealed that the fossiliferous portion of the Ingelara Beds is divided into a lower sandstone and an upper mudstone, each having its own faunal assemblage. In the sandstone the "*Martiniopsis*," *Platyteichum*, *Glyptolela* assemblage predominates with *Warthia*, *Nuculana*, *Conularia*, *Terrakea* and *Strophalosia* as subsidiaries, whilst the mudstone carries *Thamnopora*, *Cladochonus*, *Euryphyllum*, *Spiriferella*, *Cleiothyridina*, *Cancrinella*, *Lissochonetes*, *Pleonella*, *Neospirifer*, "*Martiniopsis*," *Spiriferellina*, *Pseudosyrinx*, *Streblochondria*, *Hyolithes*, *Conularia* and rare *Glyptolela*. Although the mudstone has the more varied fauna, the sandstone is more prolific in its number of specimens.

Notable peculiarities of the fauna are:—

- (1) the remarkably rich development of the genus *Glyptolela*, which up till the present has been regarded as typical of the beds;

- (2) the gastropod *Platyteichum* is very prolifically developed;
- (3) the productid group is distinctly subsidiary both numerically and in number of forms, whereas in the other Permo-Carboniferous marine beds it is usually predominant. The genera *Terrakea* and *Strophalosia* which abound in the other beds are here represented by two specimens each in a collection of several hundred specimens;
- (4) the typical *Anidanthus springsurensis*, *Taeniothaerus subquadratus* and *Aulosteges* of the Dilly faunas, are absent;
- (5) the "martiniopsids" form a very distinctive assemblage, which can be readily distinguished from the "martiniopsid" assemblages of the other marine beds.

CORRELATION.

The Permo-Carboniferous fauna of Eastern Australia has long been recognised as having peculiarities markedly distinguishing it from faunas of the same age both in Western Australia and overseas. (Koken 1907 (unseen); Raggatt and Fletcher 1937; David 1950). In the latter work (pp. 373, 374) a number of species which have been recorded from both Eastern and Western Australia, has been listed, but due to the gross lack of critical work on the faunas already described and the vast amount of material as yet undescribed, this list will have to be considerably revised in the future. Perhaps the most significant features of all are:—

(a) the almost complete absence of cephalopods in Eastern Australia, only two having been authenticated, viz., *Adrianites meridionalis* from the Braxton stage of N.S.W. and ? *Paragastrioceras* from Mt. Britton, Queensland;

(b) the complete absence of fusulinids from Eastern Australia;

[The abundance of these groups in the Permian overseas and their occurrence in Western Australia, suggests that Eastern Australia was isolated by physiological, climatic or other ecological differences.]

(c) the development of the "*Martiniopsis*" fauna in Eastern Australia, its virtual absence in Western Australia and complete absence overseas, excepting perhaps South America.

This lack of similarity with overseas faunas has been forcibly impressed upon the author by the present studies, and as a result it will be noted that the foreign correlations are on the broadest scale. Also, due to the lack of information available on the brachiopod faunas of other States, no direct correlation within Eastern Australia has been possible.

Because of this lack, correlation within Australia has been based up to the present on tectonics. (Whitehouse, 1928; Teichert, 1941; David, 1950). Quoting Teichert (p. 398), "... even in the absence of reliable palaeontological data, there are certain outstanding features in the succession in various parts of Australia to which attention should be called. Even if one is disinclined to stress the importance of diastrophism in correlation there is a remarkable rhythm of sedimentation in most parts of Australia." On the basis of this rhythm, the Ingelara Beds are thought to be the equivalent of the Braxton Beds of the Upper Marine of N.S.W., the Cundlego Series of the North West Basin and the Grange Stage of Tasmania.

Hill (1942) regarded the Ingelara Beds, together with the Dilly and Mantuan *Productus* Beds, as Artinskian, with the possibility of extending into the Kungurian.

Fletcher (1945) on the basis of the assumed limited stratigraphic distribution of *Glyptoleda*, thought that the Cundlego Series of Western Australia is approximately equivalent to the Ingelara. Teichert (1941), however, believed that the brachiopod shark *Helicoprion davisii* and the goniatite *Paragastrioceras* which are found in the Wandagee Series overlying the Cundlego, indicated an Artinskian age for that series. Thus the Cundlego (and the Ingelara on the basis of the above argument) cannot be higher than Artinskian.

The discovery of a specimen of *Adrianites* in the Branxton Beds of N.S.W. is taken by Teichert to indicate an Artinskian age for these beds. He states: "Certain features of the suture of *Adrianites meridionalis* suggest affinities to earlier rather than to later species within this time interval and the evidence of the ammonoid is thus distinctly more in favour of an Artinskian age of the Branxton Stage."

Hill (1950) has suggested a Sakmarian or earlier Artinskian age for the Dilly Beds, with the Sakmarian the more likely. The latest published information is that the Dilly is followed by freshwater and marine (Cattle Creek) and then freshwater beds and then the Ingelara, a thickness of sediment of the order of 3,500 feet separating the two. This would suggest that the Ingelara is well up in the Artinskian at least.

The faunal evidence adduced from the present study for the extra-Australian correlation of the Ingelara Beds will now be considered. Direct comparisons with forms from the *Productus* Limestones of India and Indo China, the Maokou ? Limestone of China, and various horizons in both U.S.A. and Russia, have been obtained.

Spirigerella is represented by a species very similar to the form described as *Athyris subtriangularis* Reed, by Huang (1933) from rocks which he regarded as equivalent to the Chihsia and Maokou Limestones. These, on the basis of the most recent work (Gerth 1950), are regarded as Upper Artinskian and Kungurian respectively. Lee (1939, p. 454) apparently believes that both horizons recorded by Huang are Maokou equivalents, i.e., Kungurian, and records *Neoschwagerina* as coming in at the top of the beds containing *Athyris subtriangularis*. It would thus appear to be basal Kungurian.

A resemblance of the species of *Cleiothyridina* of the Ingelara to *C. gerardi* (Deiner) described by Reed (1944) from the Upper *Productus* Limestone of Salt Range, and to specimens figured by Broili (1916, Pl. CXXIV, Figs. 7 and 12) as *Athyris roysii* from the Baseleo, are noted, together with a similarity to the *Athyris semiconcava* of Netschajew (1911, Pl. XIII, Fig. 18) from the P₂a (Zechstein).

The representative of the genus *Spiriferellina* is similar to forms ranging from the Lower *Productus* Limestone (Artinskian, Gerth, 1950) to the Zechstein of Dorf Sandyrewa (Kazanian and Tartarian, Gerth, 1950).

The *Neospirifer* bears its greatest resemblance to a form described as *N. pseudocameratus* Girty by King (1931) from the Leonard (Artinskian, Gerth, 1950) of the Glass Mountains.

Canocrinella is represented by a species most similar to *C. cancriniformis*, which is not found higher than the Artinskian in Russia.

The other genera considered in this paper are either indigenous to Australia or give no indication of age.

Correlation with overseas faunas (keeping in mind the reservations made earlier) would thus appear to suggest an age toward the region of the Artinskian-Kungurian boundary.

PALAEONTOLOGICAL DESCRIPTIONS

PHYLUM BRACHIOPODA

CLASS ARTICULATA

ORDER PROTREMATA

Super-Family **Strophomenacea**

Family **Chonetidae**

Genus **Lissochonetes** Dunbar and Condra, 1932.

Genotype (by original designation) *Chonetes geinitzianus* Waagen. (*C. glabra* Geinitz, non Hall).

Generic Diagnosis (after Dunbar and Condra): "This genus is erected to embrace a group of late Palaeozoic chonetids, characterized by a smooth surface, entirely devoid of radial surface striations. These shells are strongly transverse and have a broad sinus in the ventral valve,

and a corresponding fold in the dorsal. Internally the valves are covered with radial rows of fine papillae. The dorsal median septum is almost obsolete. Otherwise the internal characters resemble those of *Chonetes*."

Remarks: The development of the smooth surface coupled with the constancy in the shallowness of the ventral sinus, would appear to provide an adequate basis for the generic distinction of this stock. *Lissochonetes* ranges from Carboniferous to Permian. In America it first appears in the Stanton limestone and ranges into the Permian as far as the Upper Kaibab (McKee, 1938, publication unseen by author). It has also been recorded from the Permo-Carboniferous of the Paraguay basin (Duarte, 1937, publication unseen by author).

In Queensland it is found in both Dilly and Mantuan Downs faunas (these forms as yet undescribed) as well as in the Ingelara, but no species has yet been described from pre-Permo-Carboniferous rocks.

Lissochonetes semicircularis sp. nov.

(Pl. I, figs 10-13).

Material: Approximately fifteen specimens from Dry Creek, Ingelara.

Holotype: F. 14261, University of Queensland Colln.

Diagnosis: Medium sized, semicircular lissochonetids, somewhat flattened on the venter and usually without ventral sinus; no fold in dorsal valve; ventral septum strong and dorsal septum absent.

Description:

External: Shell semicircular in outline, with maximum width invariably at the hinge; ventral valve gently convex in lateral profile with the maximum convexity in the umbonal region; venter gently rounded or flattened, occasionally showing a very faint sinus; ears usually slightly flattened or gently rounded, and not well defined, being separated from the visceral disc by faint grooves; cardinal ridges poorly defined, diverging at approximately 95° from the umbo, this angle often becoming smaller anteriorly; ventral umbo pointed and moderately prominent; cardinal area is unknown; cardinal spines up to seven on either side of the umbo, becoming progressively weaker from the cardinal extremities toward the umbo; ventral valve bearing no external ornament, but sections through the shell giving an appearance of radial striation.

Dorsal valve following the contour of the ventral rather closely, but is somewhat flatter, particularly in the umbonal region; umbo small; cardinal area unknown.

Internal: Internal mould marked by numerous pustules arranged in radiating rows, as is common to all chonetids; ventral valve with strong median septum (formed by sharp duplication of the floor of the valve), extending from beneath the umbo to one-third of the distance to the anterior margin, maintaining an even height over most of its length; teeth strong; muscle scars slightly raised, both adductors and divaricators being long and narrow, and lying close to the median septum, the latter flanking the former.

Dorsal valve (known only from transverse sections) with two slightly curved and pointed crural bases supported upon very low crural plates which rapidly diverge and then become sub-parallel, delineating an area of thickened shelly material which bears the muscle scars; crural plates extending one-third of distance to anterior margin; no median septum present; cardinal process bilobed?

Dimensions:

<i>Length</i>	<i>Width</i>	<i>Height of Ventral Valve</i>
10 mm.	17 mm.	2.5 mm.
13 mm.	20 mm.	3 mm.
6 mm.	11 mm.	1 mm.
3 mm.	8 mm.	—
8 mm.	11 mm.	—

Remarks: This species differs from the genotype in the almost complete absence of the sinus in the ventral valve and its more nearly semicircular outline. The ventral valve is similar to that of "*Chonetes permianus*" Shumard, but differs in that *C. permianus* has fewer spines in the cardinal region and slightly mucronate ears. There are no dorsal valves in the types of *C. permianus*, and the dorsal valves of specimens ascribed to this species by King (1930) from the Glass Mountains, Texas, possess a short, sharp median septum. No septum is present in the dorsal valve of the present species.

Family **Productidae** Gray 1840.

Sub-family **Productinae** Waagen 1884, p. 612, 613; Prendergast, 1943, p. 12.

Genus **Cancrinella** Fredericks 1928.

Cancrinella Fredericks, 1928, pp. 784, 791; Dunbar and Condra, 1932; p. 257; Sarytcheva, 1937, pp. 78, 110.

Genotype (by original designation) *Productus cancrini* de Koninck.

Generic Diagnosis (after Sarytcheva): Small thin-shelled productids with ventral valve convex and without sinus, and dorsal valve concave or slightly geniculated. Ornament of thin radial striae and concentric wrinkles, and spines, scattered on the ventral valve and always along the hinge-line and on the ears. Hinge-line without area or teeth, with cardinal process in the form of two loops on an elevated ridge in the dorsal valve. Median septum well defined.

Range: Lower Carboniferous—Upper Permian.

Cancrinella magnifica sp. nov.

(Pl. I, figs 1-8).

Material: Six specimens from Dry Creek, Ingelara; possibly two from Banana Holding, Dawson Valley, and one from 2.75 miles west of Walhalla homestead.

Holotype: F. 14214, University of Queensland Colln.

Diagnosis: Large *Cancrinella* with transverse wrinkles weak on the visceral disc, becoming strong and irregular on the ears and the trail.

Description: Shell concavo-convex; visceral cavity thin; hinge-line approximately equal to the maximum width of the shell; visceral disc variable in proportion, but usually approximately two-thirds as long as wide; trail long.

Ventral Valve: Convex; lateral profile evenly convex over the visceral disc, but in some specimens tending to become geniculate; anterior profile showing sharply sloping convex lateral slopes with gently rounded or slightly flattened venter; umbo small, strongly depressed and slightly incurved over the hinge-line; umbonal angle approximately 90°; umbonal slopes steep; ears on well preserved specimens large, flattened and very slightly produced; ornament consisting of fine radial costae which increase by intercalation, there being approximately thirty-five to forty in 10 mm. on the trail; transverse wrinkling rather weak, but continuous (sometimes discontinuous) and rather regular across the visceral disc, very strong and irregular on the trail; spine bases developed by thickening of the radial costae and apparently developed over the whole valve, being most abundant on the ears; preservation too poor to determine any arrangement of spines; shell material of the visceral disc bearing tubular connections with the spines as in the genus *Terrakea*.

Dorsal Valve: Gently concave, with much less curvature than the ventral valve; geniculate; umbo concave; ears differentiated from the visceral disc by a slight change of slope; ornament similar to that of the ventral valve.

Internal Characters: Internal characters of ventral valve unknown; dorsal valve with short low median septum; cardinal process small (and simple?).

Dimensions:

<i>Width of Hinge</i>	<i>Maximum Length</i>
40 mm.+	30 mm.
28 mm.	24 mm.
36 mm.	25 mm.

Remarks: Two specimens which are much smaller than the average have no trail developed, and are not very strongly wrinkled occur in the fauna from Dry Creek. These may be representatives of another species, but more probably they are the young of the present species.

This species has affinities with *Canocrinella farleyensis* (Etheridge and Dun) which Hill (1950) has shown to be characteristic of the Dilly or lowest marine beds of the Queensland Permo-Carboniferous succession. (The types of *C. farleyensis* are from the Farley (Lower Marine) Stage, at Farley, N.S.W.). The present species, however, is generally smaller, less concave in the dorsal valve, much more strongly wrinkled, especially on the trail, and has a smaller umbonal angle. Certain specimens from the Cattle Creek Beds, e.g., Hill (1950, Pl. VIII, Figs. 3a/b), are more similar in size and the nature of the wrinkling to the present species than *C. farleyensis*, but they may be readily distinguished from the former by the slightly though consistently coarser costation. It appears that the trend towards stronger wrinkling was initiated in the Cattle Creek Beds, and carried into the Ingelara with accompanying decrease in size of the costae.

The species is somewhat similar to *C. rugosa* Cloud, from the Las Delicias region of Mexico, where it occurs in the *Waagenoceras* zone. The chief point of similarity is in the development of large wrinkles, but in *C. rugosa* these occur rather regularly over the whole length, whereas in the present species they are normal on the visceral disc and very strong and irregular on the trail. Furthermore, *C. rugosa* has only 12-14 costae in 10 mm. laterally, whereas the present species has 35+ in the same distance.

Some of the Russian forms described as *Lino-productus cancriniiformis* (Tschernyschew) have strong, irregular wrinkling similar to the present form, e.g. (Tschernyschew, 1902, Pl. LII, Fig. 6, from the *Schwagerina* limestone of Tastuba). The development of larger or smaller wrinkles on species developing independently in apparently isolated basins need not have taken place at the same time, and may possibly have occurred more than once in each basin. Thus no great weight has been placed stratigraphically on superficial similarity between forms developing in different basins. However, the degree of wrinkling appears to be useful stratigraphically within one area of deposition, as has been outlined above.

ORDER TELOTREMATA.

Super-Family **Spiriferacea**.

Family **Spiriferidae**.

Subfamily **Spiriferinae**.

Genus **Neospirifer** Fredericks 1919.

Genotype, *Spirifer fasciger* Keyserling.

Neospirifer King 1931; Dunbar and Condra 1932.

Diagnosis: See Dunbar and Condra 1932, p. 326.

Remarks: This genus was erected by Fredericks in 1924 and briefly described in 1926. *Spirifer fasciger* Keyserling being taken as the genotype. Ivanov and Ivanova (1937 English translation) state: "The specimens of *Spirifer fasciger* Keyserling cannot be considered as genotypes, since they represent three different forms, and are poorly preserved (impressions)." These authors suggested the substitution of *S. tegulatus* Trautschold as the genotype, but as Maxwell (1951) has pointed out, such a course is impossible, without the setting aside of the International Rules. However, in the genus *Neospirifer* they included two forms which they

regarded as Moscovian representatives of the American *Spirifer cameratus* Morton, which species Dunbar and Condra (1932, p. 327) had taken as a basis for their interpretation of the genus *Neospirifer* in America. Until the types of *S. fasciger* are re-examined, a lectotype selected, and the species thoroughly described, no satisfactory solution can be reached. However, as recent Russian opinion appears to be in agreement with the interpretation of Dunbar and Condra, that work will be used as a basis for the interpretation of the genus in this paper.

Maxwell (1951) has discussed the relation of *Neospirifer* Fredericks to *Trigonotreta* König (1825) and concludes that the former genus will have to be revised and greatly restricted, many of its species being referred to the later genus.

Neospirifer sp.

(Pl. II, figs. 1-8).

Material: Five adult (poorly preserved—only one complete specimen) and four juvenile (again only one complete) specimens from the environs of Dry Creek, Ingelara. Specimen numbers F. 14316-F. 14322, University of Queensland Colln.

Diagnosis: Rather large *Neospirifer* when fully grown; hinge-line slightly shorter than the maximum width of the shell (approximately six-sevenths of it); fascicles well developed, becoming less strongly differentiated anteriorly, being simple in the umbonal region, and becoming tricostate and multicostate anteriorly; sinial and fold costae characteristically developed.

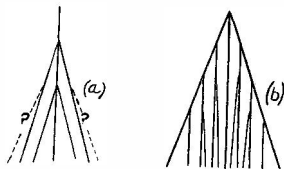


Fig. 1—Diagrammatic representation of costae in the fascicles (a) and the sinus (b) of *Neospirifer* sp.

Description. Shell biconvex, the ventral valve being the more convex longitudinally, but valves equally convex transversely; hinge straight, almost equal to the maximum width of the shell; cardinal extremities rounded; maximum width about the mid-length position; surface of shell covered by fine radial lirae (visible only under magnification) and fine growth lines, imparting a very finely cancellate appearance to the shell surface.

Ventral Valve: More strongly convex posteriorly; umbo acute, and distinctly, though not strongly, incurved; cardinal slopes strongly concave; umbonal angle approximately 90° ; area triangular, strongly concave, and extending the whole width of the hinge; delthyrium large and triangular; deltidial or pseudo-deltidial plates not observed; median sinus V-shaped in the umbonal region, becoming broad and open anteriorly; sinial angle 20° ; lateral slopes gently sloping, each bearing six fascicles of costae (including those bordering the median sinus), reaching to the umbo; fascicles becoming less distinct anteriorly, their formation taking place as follows: at approximately 1 cm. from the umbo each primary costa gives rise to two secondaries, one on each side. Between 2 and 3 cm. from the umbo the primary costa gives off two tertiary costae.

The method of increase in the number of ribs beyond this is unknown (see Fig. 1), but in the large specimens each fascicle consists of seven ribs at the anterior margin. The median sinus bears a simple median rib, and its slopes bear costae given off in the manner illustrated above.

Dorsal Valve: Semi-elliptical in outline; open V-shaped in transverse section through the mid-valve position; low triangular area present; chilidium (if present) not observed; median fold well developed, but not breaking the contour of the valve, bearing a faint median groove, and ribbing similar to that of the ventral sinus; ornament on each lateral slope consisting of five (six?) fascicles of ribs, constructed on a pattern similar to those of the ventral valve.

Internals: Ventral valve thickened in the umbonal region; dental plates short but strong, reaching the floor of the valve in the apical region only; area of muscle attachment not well preserved but was apparently elevated, well defined, and extending to the mid-valve position (approximate).

Internals of dorsal valve not observed.

Dimensions:

Maximum Width	Maximum Height	Maximum Length	Length of Dorsal Valve
68 mm.	30 mm.	52 mm.	—
29 mm.	14 mm.	22 mm.	18 mm.

Remarks: I was in considerable doubt whether to group these eight specimens together as they fall naturally into two groups on the basis of size, there being no intermediate specimens. However, a close comparison of the smaller forms with the neanic sections of the larger revealed no distinctions, and so they have been tentatively grouped together.

The species is quite unlike any Australian species of *Neospirifer* yet described. From *N. stokesii* (Konig) it differs in outline, the lower dorsal median fold and in the pattern and finer sculpture of its ornament. *N. tasmaniensis* (Morris) differs in its more quadrate outline, its much coarser ornament, the different arrangement of the costae in the fascicles and the coarser sinal costae. The internals of the present species are not well enough known for a comparison of these features to be made.

No close resemblance to any overseas form has been found, the best comparison being with specimens figured by King (1931, Pl. XXXIX, Fig. 3) as *N. pseudocameratus* (Girty) from the Leonard Formation of the Glass Mountains. As far as can be determined from the figures, outline, contour of the valves, proportions of the shell and the general nature of the fasciculation of the two forms are comparable. However, in King's form the sinus is narrower, sinal costae coarser, and the cardinal angles somewhat more angular. Again no comparison of internals is possible.

"Martiniopsis."

Non *Martiniopsis* Waagen, 1884.

Martiniopsis Etheridge, 1892.

Remarks: Two species of this genus are represented in the Ingelara faunas. They are to be discussed, together with the morphology of the genus, in a paper on the development of the genus "*Martiniopsis*" in Queensland. Representatives of the two species are figured on Pls. 4 and 5.

***Cancellospirifer* gen. nov.**

Genotype *Cancellospirifer maxwelli* sp. nov.

Generic Diagnosis: Spiriferids with the hinge-line shorter than the maximum width of the shell; cardinal extremities rounded; valves approximately equally convex; shell structure strongly lamellose, with lamellae arranged in groups at rather regular intervals, the intervals being crossed by occasional single lamellae and radial striae giving a strongly cancellate appearance.

Ventral umbo pointed and slightly incurved, but not overhanging the hinge-line; area not very high, triangular and concave; delthyrium broad and apparently open; prominent median sinus sharply defined; lateral slopes steep bearing broad simple rounded plicae, separated by grooves of similar shape and magnitude; median sinus bearing a few low simple plicae.

Dorsal valve roughly oval in outline; umbo small but distinct; area low but well marked; lateral slopes steep and bearing plicae similar to those of the ventral valve; median fold distinct, extending on to the umbo, and bearing a few low plicae.

Internally, ventral valve with relatively small dental lamellae reaching the floor of the valve in the umbonal region and supporting two strong hinge teeth anteriorly; slight callosity in the region of the muscle scars.

Dorsal valve with large hinge plate; cardinal process deeply striated, almost platy; dental sockets deep; no crural plates developed but very strong crural bases bear long curved crurae; spiralia apparently consisting of approximately six volutions each.

Remarks: This genus bears resemblance to the Lower Carboniferous *Brachythyris* in shape, nature of the plications and short hinge-line. However, although Buckman (1908) doubtfully records the presence of small dental plates, George (1927) states that in no specimens of *Brachythyris* seen by him do dental plates occur. The present genus bears distinct dental plates. Also no lamellation and cancellation as occurs in the present genus has been discovered in *Brachythyris*.

A superficial resemblance of the genotype to some species of *Spiriferellina*, e.g. *S. billingsi* Shumard is noted, but that genus is punctate, whereas the present one is impunctate, and the pronounced median euseptum of *Spiriferellina* is absent in the present genus.

Some species assigned to the genus *Spirifer* Sowerby, e.g. Dunbar and Condra (1932, p. 317, *et. seq.*) bear a similarity to the present genus, but they are distinguished by their lack of strong lamellation, their stronger sinial and fold ornament and their stronger dental lamellae.

***Cancellospirifer maxwelli* sp. nov.**

(Pl. III, figs. 1-10).

Material: Fifteen specimens from the Ingelara Beds in the Serocold anticline. Holotype F. 14242. University of Queensland Colln.

Diagnosis: Spiriferoid; valves sub-equally convex; width of hinge approximately two-thirds of the maximum width of the shell; prominent median sinus bearing two sub-parallel plicae arising from the bordering plicae, and a median plica in the anterior half of the shell; corresponding faint grooves on the dorsal fold; each lateral slope with approximately seven plicae; teeth well developed; shell substance impunctate, fibrous, and strongly lamellose; each major lamella with subsidiary lamellae, and bearing fine radial striae, giving a marked cancellate appearance when magnified.

Description:

Ventral Valve: Greatest convexity in the posterior half of the valve; umbo pointed and slightly incurved but does not overhang the hinge-line; in anterior profile the lateral slopes are steep but even; cardinal slopes straight or very slightly concave; area low, concave and triangular, extending the whole width of the hinge; delthyrial structures not observed; median sinus sharply defined, rather deep, extending on to the umbo, and bordered by plicae diverging at approximately 25°; sinus with two poorly developed sub-parallel plicae, one being given off from the bordering fold on either side at about 6 mm. from the umbo; a faint plica (or perhaps costa) developed in the median anterior of the sinus; seven simple, low, rounded plicae on each lateral slope (including those bordering the sinus); only the first two plicae on each side of the sinus reach to the umbo, the remainder stopping short leaving a narrow, smooth area on either side of the umbo extending to the cardinal extremities.

Dorsal Valve: Sub-oval in outline; lateral slopes straight or slightly curved and rather steep, but not as steep as those of the ventral valve; evenly convex longitudinally; umbo medium sized, distinct; area low and triangular; median fold distinct but not breaking the contour of the valve, and extending on to the umbo; very faint grooves developed on the fold corresponding with the plicae on the ventral sinus; each lateral slope with six plicae of the same type as those of the ventral valve.

Internals: (Known only from sections: see figures). Ventral valve with rather small dental lamellae, reaching the floor of the valve in the umbonal region; teeth strong; slight callosity in the region of the muscle scars; delthyrium broad and apparently open.

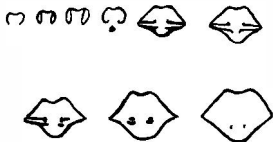


Fig. 2—Free-hand sections through *Cancellospirifer maxwelli* to show the internal structure.

Dorsal valve with ponderous hinge plate bearing deep dental sockets anteriorly; cardinal process strong and very deeply striate; crural bases strong and supporting long curved crurae; broken spires only observed, but apparently each spire consisting of approximately six volutions.

Dimensions:

Width of Shell	Length of Ventral Valve	Length of Dorsal Valve	Height of Shell
14 mm.	13 mm.	11 mm.	10 mm.
16 mm.	14 mm.	12.5 mm.	9.5 mm.
20 mm.	—	16 mm.	—
24 mm.	—	—	18 mm.
18 mm.	—	12 mm.	—
14 mm.	—	14 mm.	10.5 mm.

Remarks: No material of similar type of comparable age is available for comparison.

Sub-family **Syringothyridae**, Schuchert and Le Vene, 1929.

Pseudosyrinx Weller.

Genotype by original designation *Syringothyris sampsoni* (Weller).

Generic Diagnosis: Shell spiriferoid; ventral valve more or less acutely pyramidal due to the presence of a high cardinal area, which in the genotype is essentially flat but is slightly concave toward the beak; area differentiated into a central and two lateral portions, the former bearing vertical striae; ventral valve with non-plicate median sinus, and dorsal valve with similar fold; lateral slopes of both valves with numerous low and simple radial plicae, originating at the hinge-line; dental lamellae in ventral valve well developed; transverse plate present, but without any indication of a syrxinx; shell substance punctate.

Remarks: The genotype is from the Lower Mississippian of North America, but several species referred to the genus (Branson, 1948) have been found as high as, or higher than, the Sakmarian. This is the first record of the genus in Australia.

Pseudosyrinx sp. nov.

(Pl. II, figs. 12-14).

Material: One specimen from the upper (mudstone) bed on Dry Ck., Ingelara, almost complete; F. 14236, University of Queensland Colln.

Diagnosis: Shell syringothyrid in type; wider than long; width of hinge equal to greatest width of shell; fold and sinus well developed and extending into a tongue anteriorly; each lateral slope on both valves with seventeen plicae; ventral valve with delthyrial supporting plates and transverse plate strongly developed; syrinx absent.

Description: Shell strongly biconvex; wider than long; hinge width equal to the greatest width of the shell; cardinal extremities sub-rectangular, slightly rounded; lateral margins straight then curved rather sharply anteriorly to form the anterior margin; shell material densely punctate.

Ventral Valve: High prominent umbo only very slightly incurved; valve evenly convex; cardinal slopes well rounded, concave; area high, triangular, strongly concave, extending whole width of hinge; delthyrium high, relatively narrow, triangular; valve slightly thickened in the posterior third; median sinus well developed, rounded and extending into a tongue anteriorly; bordering plicae diverging at 20°-25°; four very faint plicae developed in the sinus, being given off from the bordering plicae near the umbo; each lateral slope with approximately seventeen simple low rounded plicae extending to the umbo and the cardinal slopes.

Dorsal Valve: Sub-rectangular in outline, evenly convex longitudinally; open inverted V-shaped transversely; umbo extending above the hinge-line, distinct; distinct but low median fold bearing a broad shallow groove down its centre; each lateral slope with seventeen plicae of the same type as those of the ventral valve.

Internals:

Ventral Valve: Two thick delthyrial supporting plates in the umbo where they reach the floor of the valve; at approximately 6 mm. from the umbo they leave the floor of the valve and become very low; transverse plate strong; syrinx absent.

Dorsal Valve: Imperfectly known; two small crural plates present.

Dimensions:

<i>Length</i>	<i>Width</i>	<i>Height</i>
35 mm. approx.	40 mm.	27 mm.

Remarks: No similarity with any overseas form has been noted. Branson (1948) has placed some Permian and Permo-Carboniferous species of *Spirifer*, *Syringothyris* and *Cyrtia* into the genus *Pseudosyrinx*, but as he does not give his evidence (the work is a bibliography), and as I have been unable to handle any of the material and see much of the literature, it has been deemed inadvisable to make any comparisons of the present material with these forms.

Family **Spiriferinidae** Davidson, 1884.Subfamily **Spiriferininae** Schuchert and Le Vene, 1929.**Spiriferellina.**

Spiriferellina Fredericks, 1924, p. 299; *Spiriferellina* Fredericks, 1926, p. 407; *Spiriferellina* Muir-Wood, 1941, p. 8.

Genotype *Terebratulites cristatus* Schlotheim.

Generic Diagnosis: Punctate plicate spiriferids, with few plicae on each valve; ventral fold and dorsal sinus well developed; ventral area high and triangular, not sharply demarcated from the lateral slopes; dental lamellae present; prominent median septum (euseptum of Fredericks) formed by the duplication of the shell floor; shell lamellose.

Remarks: The present specimens were referred to this genus on the basis of the following features:

- (a) strong dental lamellae and small apical callosity;
- (b) strong median septum formed by duplication of the shell floor;
- (c) the few strong plicae on the lateral slopes of each valve.

The genus *Spiriferellina* was proposed by Fredericks in 1924. Muir-Wood (1941, p. 8) briefly discussed the views put forward, to that date, on the morphology of the genus and its relation to *Spiriferina*. The same author (1948) summarized its distinctions from *Punctospirifer* North as follows:—" *Spiriferellina* differs from *Punctospirifer* in having a more flattened broader median fold, and a shallower median sinus. In *Spiriferellina* the cardinal area is not sharply demarcated from the lateral slopes. The concentric lamellose ornament is more prominent in *Punctospirifer*."

Spiriferellina is readily distinguished from *Spiriferella* by the development of the euseptum which, in the latter genus, "is fused with and embedded within the conjunct dental lamellae." (Muir-Wood, 1941, p. 35) (Fredericks, 1927).

Spiriferellina sp. nov.

(Pl. II, figs. 9-11).

Material: One dorsal and one ventral valve, from the upper (mudstone) bed on Dry Ck., Ingelara. F. 14259-F. 14260, University of Queensland Colln.

Description:

Ventral Valve: Evenly convex longitudinally; almost semicircular in outline and lateral profile; umbo strong and pointed; umbonal slopes rounded and concave; umbonal angle approximately 87°; lateral slopes slightly convex and at approximately 45° to the horizontal; hinge-line the greatest width of the shell; cardinal extremities very slightly produced; area extending the whole width of the hinge, high, triangular and strongly concave; delthyrial region not observed; sinus broad and deep and bounded by two strong plicae; ornament on each lateral slope consisting of four plicae (including the one bounding the median sinus) which rapidly weaken laterally, the most lateral one being scarcely visible; only the two innermost plicae on each slope reaching the umbo; shell material strongly punctate and lamellose.

Dorsal Valve: Valve semicircular in outline; strongly convex, and slightly more convex in the posterior half of the valve; umbo moderately well developed, slightly depressed; narrow concave area developed; cardinal extremities flattened and angular; median fold high and rounded; plicae on lateral slopes of the same type and number as on the ventral valve.

Internals: Apical collosity of ventral valve small; dental lamellae short but strong, slightly diverging; median septum strong; muscle scars not observed.

Internals of the dorsal valve are unknown, save that a median septum of unknown height extends over half the length of the valve.

Dimensions:

Valve	Width of Hinge	Maximum Height	Maximum Length
Ventral	24 mm.	8 mm.	15 mm.
Dorsal	22 mm.	6 mm.	12 mm.

Remarks: This species is characterised by the development of the few rapidly diminishing folds on the lateral slopes of each valve. It bears some relation to the form described as *Spiriferina insculpta* Phillips mut. *indosiniensis* by Mansuy (1914), from the *Productus* Limestone of Cambodia. There are three, sometimes four, plicae on the lateral slopes of the valves of *S. indosiniensis*, and when three only are developed, the most lateral of these appear to be more strongly developed than in the present species. Also *S. indosiniensis* is smaller and more transverse than the present species. However, when sufficient material is studied the limits of variation may well be broad enough to include specimens of the former type.

The number and position of the plications are similar to those of the specimen described as *Spirifer (Spiriferellina) subcristata* Netschajew by Reed (1944), from the Lower *Productus* Limestone of India, but the anterior of the present species is much more nearly semicircular than in this form. Greatest similarity is with the specimen figured as *Spiriferina subcristata* on Plate I, Fig. 21 by Licharew (1913) from Dorf Sandyrewa (Zechstein), from which it differs mainly in its larger size.

Superfamily **Rostrospiracea**, Schuchert and Le Vene, 1929.

Family **Athyridae**, Phillips, 1841.

Subfamily **Athyrinae**, Waagen, 1883.

Spirigerella Waagen, 1883.

Genolectotype (Hall and Clarke, 1894) *S. derbyi* Waagen.

Spirigerella Waagen, 1883; Grabau, 1932.

Remarks: There appears to be considerable confusion concerning the status of this genus, and as the author does not have access to the type material concerned, no generic description is given. Hall and Clarke (1894) regarded both *Composita* and *Spirigerella* as subgenera of *Athyris*. Schuchert and Le Vene (1929) regarded *Composita* as being restricted to the Lower Carboniferous, and *Spirigerella* to the Permian. This lead was not followed by King (1931) or Dunbar and Condra (1932), who both regarded *Composita* as extending into the Permian. Grabau (1932) however, claimed that the two genera were distinct in that the cardinal process of *Spirigerella* is "large, and projects upwards and outwards beyond the beak of the brachial valve, extending into the umbo of the pedicle valve."

"This genus (*Spirigerella*) entirely replaces *Composita* in the Permian, being represented by numerous species in South China and India."

Although the cardinal process of the present species has not been observed, it has been tentatively classified as *Spirigerella* on the assumption that *Composita* does not occur above the Lower Carboniferous.

Spirigerella sp. nov.

(Pl. VI, figs. 1-6).

Material: Seven specimens from the mudstone bed on Dry Ck., Ingelara. F. 14219-F. 14225, University of Queensland Colln.

Description: Shell strongly biconvex, with valves of approximately equal convexity; outline sub-triangular; hinge-line extremely short, the maximum width of the shell being about three-quarters of the distance from the umbo to the anterior margin; false cardinal areas well developed; sinus in ventral valve and fold in dorsal, either obsolete or absent; ventral umbo moderately high and pointed, overhanging its inconspicuous dorsal counterpart, and obscuring any cardinal area and delthyrial structures which may be present; specimens partially decorticated and thus external ornament cannot be observed; inner shell layers ornamented in the umbonal region with very fine concentric wrinkles, becoming coarser and more widely spaced anteriorly, probably corresponding with growth lamellae; shell impunctate.

Internal: (From cut sections only). Ventral valve bearing two strong teeth on strong dental plates which originate in the umbo; dental plates attached to the floor of the valve from the umbo to just posterior of the teeth, here rapidly weakening.

Crural plates in apex of dorsal valve, slightly curved in vertical section, having their ventral edges toward each other; hinge plate strong; cardinal process well developed; dental sockets deep; crural bases strong; spiralia large, each consisting of seven or eight delicate volutions; muscle scars not observed.

Dimensions: (of largest and only complete specimen).

Length	Width	Height	Apical Angle of Ventral Valve	Apical Angle of Dorsal Valve
16 mm.	16 mm.	12 mm.	85°	100°

Remarks: The pointed umbo and position of maximum width of the valves impart a characteristic appearance to this species. The degree of inflation is variable.

It agrees remarkably well with *Spirigrella subtriangularis* Reed, as described and figured by Huang (1933) from the *Productus nankingensis* zone of Lihaiikou, Szechuan, which is regarded by Lee (1939) as equivalent to part of the Maokou Limestone. The specimens are almost identical externally with Huang's figures, a slight divergence being in the rather larger apical angles of the largest of the present specimens, though there are some in which the angles are identical. The *S. subtriangularis* of Huang differs from the type material (from the Permian-Carboniferous of Tang-Chi, Yunnan) in having the junction of the two valves in the one plane, whereas the type has a curved junction.

Specimens described and figured by Prendergast (1935, p. 18, Pl. III, figs. 4, 5) as *Composita subtila* Hall, from 12 miles west of Oscar Range Homestead, about 120 miles E.S.E. of Derby, Kimberley, bear resemblance to the present species, but the differences in proportion and its much less triangular shape are quite marked.

Cleiothyridina Buckman, 1906.

Cleiothyridina Buckman, 1906; Dunbar and Condra, 1932.

Genotype *Athyris royssii* Davidson.

Generic Diagnosis: (after Dunbar and Condra). "Shells of sub-lenticular form with sub-circular or transversely elliptical outline and with sub-equally convex valves. A dorsal fold and ventral sinus may be well developed, faint or obsolete. The beak of the ventral valve is small and usually incurved so as to conceal the foramen and delthyrium in mature shells.

"The surface is marked with broad concentric fimbriate lamellae. Each of these lamellae is flat and smooth except at its anterior margin where it is deeply subdivided into slender, flattened, hair-like spines.

"Internal characters are like those of *Athyris*. The hinge teeth have short but stout dental lamellae. The dorsal beak has a short hinge plate perforated by a round foramen just inside the beak. This plate is bordered by deep dental sockets and at its front gives rise to the crural plates, which arch forward and ventrad. The primary lamellae of the spiralia are recurved abruptly at their origin from the tips of the crural plates running dorsad and forward and then curving ventrad to give rise to a pair of spiral cones with their apices directed laterally. The jugum is a complex structure with its two limbs rising ventrally to join a saddle-shaped structure, from which a process extends backward almost to the tips of the crural plates, and then subdivides into two lamellae which recurve dorsally, closely parallel to the bases of the primary lamellae."

Remarks: This genus is widely distributed throughout the Carboniferous and Permian rocks of the world.

Cleiothyridina sp. nov.

(Pl. III, figs. 11-16).

Material: Four specimens all from the mudstone bed on Dry Creek, Ingelara. F. 14255-F. 14258, University of Queensland Colln.

Diagnosis: *Cleiothyridina* broader than long; faint median sinus in both valves; ventral umbo truncated; consistently small.

Description: An athyrid form with ventral sinus and dorsal fold only slightly developed or absent; general outline oval; hinge-line short and curved and grading almost imperceptibly to the lateral margins; profile strongly lenticular, the valves being approximately equally convex; greatest width of shell at mid-valve position.

Ventral Valve: Umbo high and curved but only slightly overhangs the hinge-line if at all; maximum convexity in the umbonal region; umbo truncated by a large semicircular foramen; no cardinal area present; external ornament consisting of strong imbricating lamellae, occasionally with strong lamellae alternating with weaker ones; anterior edge of these concentric lamellae serrated due to the presence of small flattened spine bases which tend to join neighbouring lamellae; about twelve lamellae in 5 mm.; very faint sinus developed, extending from the umbo to the anterior margin.

Dorsal Valve: Maximum convexity in umbonal region but more evenly convex than the ventral valve; umbo broad and low; no cardinal area present; faint median sinus developed.

Internals:

Ventral Valve: Dental plates relatively strong and supporting strong teeth; muscle scars not observed.

Dorsal Valve: Crural plates strong and welded to the sides of the valve in the apical region; produced anteriorly into long crurae; brachial arms, consisting of about seven volutions on either side, beginning in about the mid-valve position; jugum not observed; short low median septum developed in umbonal region; hinge plate entire.

Dimensions:

<i>Length</i>	<i>Width</i>	<i>Height</i>
14 mm.	17 mm.	7 mm.
15 mm.	18 mm.	10 mm.
15 mm.	17 mm.	9 mm.

Remarks: Although the size of the present specimens is rather constant, there is some variation in their proportions, particularly in height. Apart from size and proportions, their most characteristic feature is their breadth across the shoulders.

The specimens figured as *C. gerardi* (Diener) by Reed (1944) from the Upper *Productus* Limestone of India are similar in shape and proportions, but differ considerably in size, being much larger. There is also a resemblance to the specimen figured as *Athyris royssii* Lev. by Broili (1916 Taf. CXXIV, Figs. 7, 12) as of Basleo age. It bears a close similarity to several forms described as *Athyris pectinifera* Sowerby, e.g., that figured by Netschajew 1911, Pl. XIII, Fig. 18. However, forms similar to this, at least externally, appear to have been developed at numerous horizons throughout the Carboniferous and Permian, and comparisons of superficial features are of very doubtful stratigraphic value.

Superfamily *Rhynchonellacea* Schuchert, 1896.

Family *Camarotoechiidae* Schuchert and Le Vene, 1929.

Subfamily *Camarotoechiinae* Schuchert and Le Vene, 1929.

Plekonella gen. nov.

Genotype *Plekonella acuta* sp. nov.

Generic Diagnosis: Small rhynchonelliform shells; biconvex with dorsal valve more swollen than ventral; dorsal fold and ventral sinus developed anteriorly; plicae developed on whole surface of both valves, extending on to the umbones; ventral umbo erect or slightly incurved; dorsal umbo flattened.

Internally ventral valve with strong hinge teeth supported by well developed dental lamellae; dorsal valve with hinge plate supported on strong median septum; septum with median incision in the apical region (Fig. 3; compare Weller, 1909, p. 507, Fig. 6 a-e) at first arched over but becoming open posterior of the articulation; median incision bearing a low ridge which increases in height and projects anteriorly on to the hinge plate (Fig. 3); median septum extending to the middle of the valve; two long ventrally curved crurae given off from strong crural bases.

Range: The genotype, from the Ingelara Beds of the Permian-Carboniferous of Queensland, is the only definite species known, but a few poorly preserved specimens of a very closely allied form have been obtained from the Cattle Creek Beds.

Remarks: The combination of the short crural cavity, the entire hinge-plate, the simple dorsal median septum and the radial plications extending on to the umbones of both valves, is sufficient to distinguish this genus from all others. External resemblance to certain species of *Camarophoria* King and *Camarotoechia* Hall and Clarke is often marked, but internal differences are distinct.

It is similar to *Wellerella* Dunbar and Condra, in having a hinge plate often bearing a bluntly angular median ridge, and a strong simple dorsal median septum, but differs in having plicated umbonal regions and the unusual "crural cavity" described above.

***Plekonella acuta* sp. nov.**

(Pl. III, figs. 17-26).

Material: Holotype (F. 14229) from Dry Creek, Ingelara; F. 14233 from Erosion Gully near culvert on east of Cracow-Theodore Road half way between Delusion and Otrack Creeks.

Description:

External: Shell small, rhynchonelliform, biconvex with the dorsal valve the more convex; usually slightly wider than long with maximum width in the anterior portion of the shell imparting a sub-triangular appearance to it; shell material impunctate, fibrous.

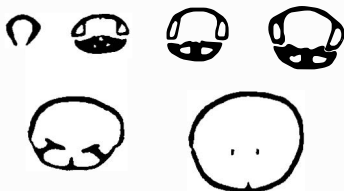


Fig. 3—Diagrammatic sections through the umbo of *Plekonella acuta* to show the internal structure. More than one specimen used.

Ventral valve gently convex with the greatest convexity in the umbonal region; umbo perforate, high and pointed, sub-erect or slightly incurved, but not overhanging the hinge-line; cardinal slopes gently concave; umbonal angle slightly less than 90°; sinus initiated at mid-valve, becoming stronger anteriorly; five rounded plicae on each lateral slope becoming less distinct laterally; sinus bearing two plicae which are slightly weaker than those on the lateral slopes; all plicae simple, and continued on to the umbo.

Dorsal valve inflated; umbo small, inconspicuous, and incurved; low fold developed on the anterior half of the valve; five plicae of similar type to those on the ventral valve on each lateral slope, and three on the fold.

Internal: Ventral valve with strong hinge teeth supported by strong dental lamellae attached to the floor of the valve in the umbonal region, but the lamellae rapidly weaken anterior to the teeth.

Dorsal valve as for the genus.

Dimensions:

	<i>Length</i>	<i>Height</i>	<i>Width</i>
Holotype	15 mm.	11 mm.	17 mm.
	13 mm.	9 mm.	14 mm.

Remarks: There is some slight variation in the degree of inflation of the dorsal valve and the height of the fold anteriorly, but the specimens form a compact homogeneous group.

There are a few poorly preserved specimens from the Cattle Creek Beds which are very similar to this species in the features which can be observed, but their state of preservation renders a detailed comparison impossible.

PHYLUM MOLLUSCA.

CLASS LAMELLIBRANCHIA Blainville.

Family *Aviculopectinidae* Eth. Jr. emend Newell, 1937.

Subfamily *Streblochondriinae* Newell, 1937.

Streblochondria Newell, 1937.

Streblochondria Newell, 1937, p. 80.

Genotype *Aviculopecten sculptilis* Miller, Westerville oolite, Missouri subseries, Pennsylvanian, Kansas City.

Diagnosis: (after Newell) "Shell slightly but persistently opisthoclinal, nearly equivalve, the right valve being slightly flatter—especially over the umbo—than the left; shell ornamented with numerous radiating intercalate costae on both valves, crossed by fine regular filae so that the surface has a regular latticed ornamentation; in some species the ornamentation becomes obsolete across the posterior part of the shell, or across the middle, in others the lattice ornamentation is preserved only at the umbones; resiliifer with a marked backward obliquity, most pronounced in young individuals, even at a stage prior to the opisthoclinal obliquity of the shell, becoming less oblique in large adults; resiliifer supported within the umbonal cavity by a buttress extending from middle of the inner surface of the "hinge plate" to the ridge on the inner surface corresponding to the external anterior auricular sulcus; shell substance in each valve composed of two layers, an outer thin film of radial crossed-lamellar calcite, and an inner ostracum of very much finer concentric crossed-lamellar aragonite; anterior auricle about twice as long as the posterior, both auricles having rectangular terminations; umbonal folds rounded, rather poorly defined; auricular sulci very well defined, narrow; surface of auricles above the sulci nearly flat."

Remarks: Newell (1937, p. 115) tentatively referred the species *Aviculopecten englehardti* Eth. and Dun to his new genus *Streblochondria*.

Of the specimens figured by Etheridge and Dun (1906) (which become the syntypes), only one exhibits the external ornament, viz., Pl. IX, Fig. 9 (designated later in this paper as the lectotype of *S. englehardti*), the others being moulds. An examination of the lectotype reveals that:—

- (a) In shape, obliquity, shape of auricles and auricular sulci, it could be referred to the genus *Streblochondria* Newell.
- (b) The hinge and resiliifer structures are not shown, rendering a comparison of these features with those of *Streblochondria* impossible.
- (c) The very fine "radii" referred to by Etheridge and Dun are almost imperceptible and are not true costae (in the sense of Newell, 1937), but are probably due to the structure of the shell itself. The fine concentric filae are well developed

Fletcher (1929) records the presence of fine radial costae on the surface of "*Aviculopecten parkesi*" which is closely related to *englehardti*, and to which I have referred specimens from the Ingelara Beds. These latter specimens bear no true costae but have "radii" similar to those of the lectotype of *englehardti*.

- (d) Shape of the body of the valve, size and shape of the auricles, and the nature of the ornament exclude it from the genus *Aviculopecten* McCoy with which it has been classified.

On the above evidence, the Australian forms should be excluded from *Streblochondria*, and, since no other existing genus is available for their reception, a new genus erected. However, because of lack of material, this course has been deemed inadvisable at present, and Newell's tentative assignment continued.

Streblochondria parkesi (Fletcher).

(Pl. VI, figs. 9-12).

Material: Specimens from the mudstone on Dry Creek, Ingelara, F. 14182-14191, University of Queensland Colln.

*Description**: Shell medium size, slightly inequivalve; obese; valves rather evenly convex, but right valve slightly flattened, particularly in the umbonal region; sections parallel with the length of the valves more convex in the umbonal than the ventral region; obliquity opisthocline; umbones small and pointed; antero-lateral ridges long, straight or slightly concave; postero-lateral ridges shorter, straight or slightly convex; ventral margin evenly rounded; hinge-line straight or slightly sloping both anteriorly and posteriorly; posterior auricular sulcus narrow and shallow and posterior auricle narrow and triangular; anterior auricular sulcus broad and open in the left valve, but sharper in the right valve; anterior auricle much larger than its posterior counterpart and medially divided (at least on the right valve) by a median groove; possibly with a byssal notch (not well preserved); ornament consisting only of faint concentric growth lines and very faint "radii" which are distinguishable by reflected light in certain positions only; no true radial costae present; shell thin and with a varnished appearance, the material being too poorly preserved to determine its structure; musculature not observed.

Dimensions: The hinge-line of most specimens is broken and so no measurements of this part are available.

	<i>Length</i>	<i>Breadth</i>	<i>Convexity</i>	<i>Umbonal Angle</i>
L1	27 mm.	26 mm.	6 mm.	95°
R1	33 mm.	32 mm.	7 mm.	95° Approx.
L2	—	35 mm.	8 mm.	93°
L3	—	—	—	93°

Remarks: The present typical specimens have come from the higher (mudstone) beds, there being three from the lower (sandstone) beds which may possibly belong to this species but which could be placed in *S. englehardti* Eth. and Dun.

The typical specimens appear to be identical with the figures of the types of the species, but differ from the description in having the hinge-line much shorter than the maximum width of the shell, and in the absence of fine radiating costae. According to Fletcher, the species is distinguished by the extreme convexity of both valves and its lack of distinct ornament, and from *S. englehardti* (which it closely resembles) by the exaggerated length of the anterior slopes also. However, some of the syntypes of *S. englehardti* of Etheridge and Dun (*e.g.*, Pl. XIV, Figs. 6, 7, 8) are equally as convex and have anterior slopes as long as or longer than the holotype of *S. parkesi*. The ornament of the two species is apparently very similar.

* Terminology following N. D. Newell, 1937.

I believe that distinction between the two forms is desirable for stratigraphic reasons, and that degree of convexity is the only available basis for their separation at present, though detailed study of good material may provide a more adequate basis in the future, e.g., shell structure. Now Etheridge and Dun named no holotype for *S. englehardti* and no lectotype has since been selected. Hence I here select the specimen figured by Etheridge and Dun, 1906, Pl. IX, Fig. 9 (Australian Museum Number F. 35302) from Wollombi Road, as the lectotype of *Strehlochondria englehardti* (Etheridge and Dun).

Since the above specimen is weakly convex, and the holotype of *S. parkesi* is strongly convex, the two species can be separated on the degree of convexity. However, even within the small community from Ingelara the degree of convexity is extremely variable, and it is probable that other collections will disclose gradational series in this character, between the two species.

Etheridge and Dun state that the obese forms are apparently typical of the Lower Marine "Series," whilst Fletcher (1929, p. 14) records *S. parkesi* from the Upper Marine only. The present collection from the Ingelara Beds would appear to be an Upper Marine equivalent.

Family Nuculanidae Stoliczka.

Glyptoleda Fletcher, 1945.

Glyptoleda Fletcher, 1945, p. 298.

Generic Diagnosis: (after Fletcher) "Shell equivalve, elongate; narrowing posteriorly, acuminate; closed all round, comparatively robust with thickened test, Umbones small, depressed, contiguous and slightly recurved posteriorly. Lunule and escutcheon well developed, elongated. Posterior umbonal ridge concave, bent upwards at the extremity.

"Hinge-plate furnished with strong teeth which abruptly diminish in size nearing the umbo. There are about ten wide teeth on the short convex anterior portion, while on the concave posterior portion twelve to fourteen narrower teeth are present. A ligmental pit situated below the umbones divides the teeth into two sets.

"Anterior and posterior adductor muscle scars well marked, deeply excavate. Pallial line entire.

"Surface ornamented with diverging V-shaped ribs, the sides of which in many cases have been developed into a wavy zig-zag pattern.

"The shells range from 30 mm. to 50 mm. in length and from 18 mm.-30 mm. in height."

Remarks: This genus is endemic to Australia, where it has a restricted stratigraphic range.

Glyptoleda reidi Fletcher.

(Pl. VII, figs. 6-8).

Material: Numerous topotypes.

Remarks: This species is very abundant at the type locality, but I am unable to add to the original description.

Glyptoleda glomerata Fletcher.

(Pl. VI, figs. 13 and 14; Pl. III, figs. 27 and 28).

Material: Numerous topotypes; three poorly preserved incomplete moulds from Mount Chalmers, Rockhampton district; a fragment of a mould from road between Pors. L 405 and L. 412, Par. Walloon, Co. Dawson (near Theodore).

Remarks on the topotypes: The extraordinary state of preservation of these specimens permits a little further information to be added to the original description, particularly that of the ornament.

The ornament on each valve may be divided into three sections—anterior, mid-valve and posterior. The anterior section bears rather widely spaced ribs (inter rib spaces wider than the width of the ribs), which are only slightly wavy. They begin on the anterior umbonal slopes and the anterior margin, and tend to become horizontal posteriorly.

These ribs meet those of the mid-valve section at a sharp, straight junction. On the latter section the ribs are highly inclined to the horizontal, are usually more wavy and are more closely spaced. The section of the valve bearing this type of ornament is in the form of a sharply delineated segment of a circle, with its apex at the umbo.

The ribs of the posterior section are either wavy or straight, are usually more widely spaced than those of the other two sections, and are inclined upwards toward the posterior umbonal ridge.

As Fletcher noted, the ornament is usually different on the two valves of the one shell. He states: "On the left valve, the ornamentation is similar except that the base of the large V, formed in the mid-line by the longer striae, is wide and crenulated." The present specimens indicate no such constant relationship, as in some specimens the large V's are highly crenulated in both left and right valves, and one specimen in particular shows the V more highly crenulate in the right valve than the left.

Remarks on specimens from other localities: Two very large specimens, F. 14290 and F. 14291, University of Queensland Colln. (length 50 mm. +, height 30 mm., thickness 22 mm.+) with very fine ornament, were found in the mudstone bed in Dry Creek. In their shape and the arrangement of the ornament they are very close to this species, but they differ in having much finer ornament. More material of this form would warrant the establishment of a new species.

The specimens from Mount Chalmers have been doubtfully referred to this species, their preservation being too poor for a precise determination to be made. What ornament is visible is similar in type to *G. glomerata*, and the measurements below lend support to this determination.

<i>Approx. Length</i>	<i>Approx. Width</i>	<i>Apical Angle</i>	<i>Approx. Height</i>
30 mm.	13 mm.	124°	—
—	12 mm.	—	18 mm.

Nuculana Link, 1809.

Remarks: For a discussion of the genus see Fletcher, 1945, p. 302.

Nuculana darwinii ? (de Koninck).

Material: A fragment from the lower (sandstone) bed in Dry Creek.

Remarks on the Dry Creek specimen: This specimen consists of the posterior portion of a left valve. It has been placed doubtfully in *Nuculana darwinii* on:—

- (a) the attenuated shape of the posterior portion of the valve,
- (b) the concave posterior umbonal slope.
- (c) the fine, slightly wavy, concentric ornament.

Remarks on the Mount Chalmers specimens: From this locality three fragments of external moulds have been collected. The ornament is fine and non-wavy, one specimen bearing over 50 striae. One specimen is 12 mm. high and approximately 8 mm. thick. In the absence of any conclusive evidence these specimens have been doubtfully referred to the above species.

CLASS GASTROPODA.

Family *Pleurotomariidae*.*Platyteichum* gen. nov.*Mourlonia strzeleckiana*, Reid, 1929, p. 83.Genotype *Platyteichum costatum* sp. nov.

Generic Diagnosis: Turbinate thick shelled form; four or five whorls developed; upper surface of whorls flat, lower surface strongly convex; strongly keeled at the slit band which is the periphery of the whorl; slit band bordered on each side by a sharp keel; ornament consisting of few revolving ridges on the upper surface of the whorl and many on the lower, coupled with distinct growth lamellae; finely umbilicate, sometimes with callus.

Remarks: Forms of this type have been referred in the past to *Pleurotomaria*, *Ptychomphalina* and *Mourlonia* (see Reid, 1929).

As pointed out by Knight (1941, p. 21), the name *Pleurotomaria* cannot be used for Palaeozoic forms, as the genotype of the genus is Mesozoic, and is "only remotely related to any Palaeozoic forms."

It bears little relation to *Mourlonia* Koninck (genotype *Helix carinatus* Sowerby, 1812) from the Lower Carboniferous of Yorkshire, because that genus has:—

- (a) a gently arched upper whorl profile, is sharply rounded at the periphery and is not strongly convex on the base, whereas the present genus has a flat upper whorl profile, is keeled peripherally and is more strongly convex basally;
- (b) much finer and abundant ornamentation;
- (c) a much larger pleural angle.

The genus *Ptychomphalina* Fischer (genotype *Helix ? striatus* Sowerby, 1817) from the Lower Carboniferous of Derbyshire differs in having a much less convex basal whorl profile, strong lirae following the growth lines and absence of revolving ornament.

A superficial resemblance in some features to the Scottish Carboniferous genus *Glabrocingulum* Thomas is noted. The whorl profile, nature of the slit band, its ornament and bordering keels, and the ornament on the final whorls of some species, are similar in both genera. However, the earlier whorls of specimens of the present genus are not sufficiently well preserved to enable a comparison of these portions of the two genera to be made. The main differences so far observed are the great difference in size (the genotype of *Glabrocingulum* is 8 mm. high whereas the average height of the present genus is 30 mm.), and the development of approximately twice as many whorls in the Scottish form.

Platyteichum costatum sp. nov.

(Pl. VII, figs. 11-14).

Material: Numerous forms from the lower (sandstone) bed on Dry Creek, Ingelara. Holotype, F. 14181, University of Queensland Colln.

Description: A turbinate thick shelled form; four whorls—occasionally five—developed; sutures between whorls of well preserved specimens shallow; whorl profile flattened on the upper surface, strongly keeled at the slit band, and strongly but evenly convex on the base; each whorl overlapping the previous one up to the base of the slit band; slit band rather narrow, crossed by growth lines which are concave to the aperture, and bounded on each side by a sharp keel; lower keel forming the periphery of the shell; depth of the slit and nature of the aperture not observed; ornament consists of slightly irregularly spaced spiral ridges and transverse growth lamellae; details of ornament observed on final whorl only where the upper surface bears seven to twelve spiral ridges and the lower a much larger number (up to 30 approx.); growth lamellae on upper surface sweep back towards the slit band meeting it at approx. 45°; growth lamellae on lower surface directed towards the slit band at right

angles, but curved backwards slightly below it; where spiral ridges cross growth lamellae small pustules are developed; well preserved specimens present a cancellate appearance; finely umbilicate, with umbilicus apparently slightly eccentric.

The largest specimen in the collection measures 32 mm. in height; pleural angles vary considerably, the largest being 81° and the smallest 55° —average 67° approx.

None of the specimens are sufficiently well preserved to trace the development of the shells from the earliest whorls; slit band is known to be developed on at least three whorls.

Dimensions:

	<i>Maximum Height</i>	<i>Maximum Width</i>	<i>Pleural Angle</i>
	<i>of Shell</i>	<i>of Shell</i>	
	28 mm.	26 mm.	70°
	32 mm.	30 mm.	65°
	28 mm.	24 mm.	55°
	29 mm.	26 mm.	65°
(Holotype)	27 mm.	23 mm.	69° max.

Remarks: This species has in the past been referred to either "*Mourlonia*" *strzeleckiana* (Morris) or *Ptychomphalina morrisiana* (McCoy). I have not seen the type material of either of these species.



Fig. 4—Median section through *Platytecticum costatum*.
Note whorl profile and umbilicus.

In 1845 Morris noted a well defined impression of a species of *Pleurotomaria* from Illawarra, "nearly related to *P. conica* Phillips, in having a bicarinated mesial band, and numerous small, oblique rather acute striae on each volution; it differs from that species in being smaller, more elongate and acutely conical." McCoy in 1847 on the basis of more material from Black Head, N.S.W., and the Muree Sandstone, N.S.W., erected the new species *P. morrisiana*, adding the further information that it is "acutely conical, width four-fifths of the length; volutions four or five, each having a small double keel below the middle, and a slightly tumid margin to the sutures; no umbilicus; surface with fine unequal striae arched backwards from the suture to the keel. Width four lines, scarcely five lines."

The present species corresponds with this description in proportions, the presence of the double keel, number of volutions, and the striae "arched backwards from the suture to the keel." However, it differs in having a much more convex basal whorl profile, an umbilicus, a much greater size and numerous distinct revolving ridges. The two species appear to be quite distinct and it is probable that *Pleurotomaria morrisiana* McCoy does not even belong to the present genus.

Morris in 1845 described and figured a form from Glendon and Illawarra, N.S.W., as *Pleurotomaria strzeleckiana*. Dr. K. P. Oakley, to whom I am greatly indebted, informs me that the specimen figured by Morris on Plate XVIII, fig. 5, and now in the British Museum (Natural History), is for the most part an internal cast, but there are small traces of shell mainly in the sutures, but also on the umbilical region which is clearly depressed and covered with matrix. There is no evidence of revolving ornament on the small areas of shell which remain, but recrystallisation may have obscured any fine ornament.

It would appear that "*Pleurotomaria*" *strzeleckiana* differs from *Platyteichum costatum* in having more distinct sutures, the slit band situated higher on the whorl, and possibly an absence of revolving ornament.

Family **Bellerophontidae** McCoy.

Warthia Waagen, 1880.

Genotype by subsequent designation of de Koninck, 1882, *Warthia brevisinuata* Waagen, 1880.

Warthia, Waagen, 1880; Girty, 1908.

Generic Diagnosis: Involute anomphalous or minutely phaneromphalous, spiral gasteropods; whorl profile rather broadly rounded; without sutures; anterior margin with a rounded sinus not culminating in a notch or slit; lateral margins convex forward, extending as rounded lobes on each side of the apparent sinus; ornamentation usually consisting of growth lines; no spiral ornament; the genoholotype measures about 12 mm. in diameter and 14 mm. in width.

Remarks: The genotype is well described by J. Brookes Knight (1941), but unfortunately its state of preservation is rather poor. The genus has been recorded from the Lower and Upper *Productus* Limestones of India and from the Guadeloupe and Delaware Mountains of Texas as well as from Australia.

Warthia sp.

(Pl. VII, figs. 1-5).

Material: Three specimens from the lower (sandstone) bed in Dry Creek, Ingelara. F. 14237-F. 14239, University of Queensland Colln.

Description: Shell planispiral, completely involute; profile evenly rounded; shell rather thick in later whorls but very thin in earlier whorls; whorls evenly expanding, there being five or six present; venter broadly rounded on final whorl; selenizone absent; aperture with broadly rounded sinus, slightly infolded; lateral margins rather strongly convex forwards; small slightly flared lapets developed at the columellar edge of the whorl; surface of whorl apparently without ornament except for growth lamellae; anomphalous.

Dimensions:

<i>Maximum Diameter</i>	<i>Width</i>
27 mm.	21 mm.
34 mm.	23 mm.
27 mm.	20 mm.

Remarks: Teichert and Fletcher have recently (1943) discussed the history of the species *Warthia micromphala* (Morris) to which all Australian smooth bellerophontids without slit bands have been relegated. I have been unable to study the type of this species, but from the figure of the holotype, it differs from the present species in having a narrower venter, a higher aperture and a reflexed lip. Morris believed that his species was minutely umbilicate, whereas the present species from sections cut through testiferous material has been determined to be anomphalous. It is important that Morris' observation be confirmed, as many weathered forms give the appearance of being umbilicate. The plications of *W. undulata* (Dana) are not found on the present species.

Conularia.

Conularia sp.

Material: Three imperfect specimens from Dry Creek, Ingelara. F. 14309-11, University of Queensland Colln.

Description: Shell large; best specimen completely flattened but was apparently gently tapering; apical angle (measured by extrapolation) 10° +; faces approximately equal in width; transverse section apparently rhombic; transverse ridges narrow and bladed, straight or slightly curved, being separated by broad plain grooves and numbering approximately 13 in 10 mm.;

ridges not always continuous but may die out occasionally at irregular intervals; facial grooves distinct, interrupting the transverse ridges which are almost at right angles to them, and frequently alternate across them; marginal grooves shallow, rather narrow and smooth, with the transverse ridges upturned at their margins.

Remarks: These specimens are too poorly preserved for accurate determination, but they are readily distinguishable from any described Australian species. They are closest to *C. levigata* Morris and *C. inornata* Dana. From the latter species they differ in having a slightly larger number of transverse ridges per unit length (13 as compared with 10 to 12 in 10 mm.), in the nearly equal sides, and the almost straight angle at which the transverse ridges meet at the median line. They are readily distinguishable from *C. levigata* Morris, by the angle of meeting of the transverse ridges at the facial median line.

***Conularia cf. levigata* Morris.**

Material: F. 14330-14332, University of Queensland Colln.

Description: Size of complete shell unknown; width of widest face preserved 12 mm.; cross section rhombic (distorted; may have been square originally); faces approximately equal; apical angle and nature of aperture and marginal grooves indeterminate; transverse ridges straight, angular or slightly rounded and smooth, there being 10 in 10 mm. where the face is approximately 10 mm. wide but slightly more crowded towards the apex; facial groove central and distinct; across it transverse ridges may be continuous or alternating, and meeting at approximately 130°.

Remarks: The present specimens are too few and too poorly preserved to enable a specific determination to be made. They appear to be closest to *C. levigata* Morris, but they differ from the type in having slightly fewer transverse ridges per unit length, and almost-equal faces. However, Dana (1849) in describing specimens from Harper's Hill, N.S.W., stated that the sides were subequal, and Fletcher (1938), after a survey of "a large series of specimens, from many localities in New South Wales," concluded that "the cross section of this species appears to be almost square, with a slight tendency toward rectangularity in some specimens."

Whether they belong to Morris' species is indeterminate, but they appear to be members of *C. levigata* Morris, as interpreted by Fletcher (1938).

Hyolithes.

***Hyolithes lanceolatus* (Morris).**

Material: One specimen only, from mudstone bed Dry Creek, Ingelara; imperfect, one side only visible. F. 14308, University of Queensland Colln.

Description: Shell small, apical angle approximately 12°; upper ? (transversely striate) surface less convex than the lower; transverse striae on upper ? surface fine, arched towards the aperture, and usually regular, though occasionally bifurcating or becoming discontinuous for short intervals along their length; approximately 25 striae per 5 mm.; lower surface and aperture not visible; the obtuse ridge on the upper ? surface of the internal cast referred to by Morris was not observed.

Dimensions:

Length (measured by extrapolation)	..	30 mm. approx.
Maximum width at aperture	..	6 mm. approx.

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EXPLANATION OF PLATES

(All specimens figured are in University of Queensland collections, and are natural size unless otherwise stated.)

PLATE I.

- Figs. 1 and 2—*Canerinnella magnifica* sp. nov. Holotype showing ventral and dorsal valves; from the Ingelara mudstone bed; F. 14214.
- Figs. 3 and 4—*Canerinnella magnifica* sp. nov. An immature specimen showing ventral and lateral views; from the Ingelara mudstone bed; F. 14215.
- Fig. 5—*Canerinnella magnifica* sp. nov. Ventral view of a broken specimen from the sandstone bed on Dry Creek, Ingelara; F. 14216.
- Figs. 6 and 7—*Canerinnella cf. magnifica* sp. nov. Ventral and lateral views of a specimen from the Cracow-Theodore Road, half way between Otrrack and Delusion Creeks; F. 14273.
- Fig. 8—*Canerinnella cf. magnifica* sp. nov. From the same locality; F. 14274.
- Fig. 9—*Canerinnella* sp. An immature form from the Ingelara mudstone bed; F. 14226.
- Figs. 10 and 11—*Lissochonetes semicircularis* sp. nov. Holotype. Ventral and posterior views of ventral valve; from the Ingelara mudstone bed on Dry Creek. X 3. (Ventral sinus appears deeper than it really is because the specimen has been photographed at a slight angle.) F. 14261.
- Fig. 12—*Lissochonetes semicircularis* sp. nov. From the same locality. X 3. F. 14262.
- Fig. 13—*Lissochonetes semicircularis* sp. nov. From the same locality. X 3. F. 14263.

PLATE II.

(All specimens from the mudstone bed on Dry Creek, Ingelara).

Figs. 1 to 8—*Neospirifer* sp.

Figs. 1 and 2—Dorsal and ventral views of a large distorted specimen; F. 14316.

Figs. 3 to 5—Ventral, dorsal and anterior views of a young form; F. 14317.

Figs. 6 and 7—Dorsal and ventral views; F. 14321.

Fig. 8—Dorsal view of a similar specimen; F. 14320.

Figs. 9 to 11—*Spiriferellina* sp. Ventral, lateral and antero-dorsal views; F. 14259 and F. 14260.Figs. 12 to 14—*Pseudosyrinx* sp. Ventral, dorsal and lateral views; the ventral apex has been ground away to ascertain the internal structure, and has been replaced by a plaster cast; F. 14236.

PLATE III.

(All specimens from the mudstone bed on Dry Creek, Ingelara, except Fig. 21).

Figs. 1 to 3—*Cancellospirifer maxwelli* sp. nov. F. 14247; X 1.1.Figs. 4 to 6—*Cancellospirifer maxwelli* sp. nov. Holotype. Dorsal, ventral and anterior views, F. 14242; X 1.1.Figs. 7 to 9—*Cancellospirifer maxwelli* sp. nov. Ventral and dorsal valves; X 1.2 approx.; F. 14271.Fig. 10—*Cancellospirifer maxwelli* sp. nov. Magnified portion of the ventral sinus to show delicate ornament; F. 14271; X 10.Figs. 11 to 13—*Cleiothyridina* sp. Ventral, dorsal and anterior views; F. 14256.Figs. 14 to 16—*Cleiothyridina* sp. A decorticated specimen; F. 14255.Figs. 17 to 20—*Plethonella acuta* gen. et sp. nov. Holotype. Dorsal, lateral, anterior and ventral views; F. 14229.Fig. 21—*Plethonella acuta* gen. et sp. nov. A plaster cast; from the Cracow-Theodore Road, half way between Oxtreck and Delusion Creeks; F. 14233.Fig. 22—*Plethonella acuta* gen. et sp. nov. Lateral view of broken specimen; F. 14228.Figs. 23 to 25—*Plethonella acuta* gen. et sp. nov. Slightly squashed specimen; ventral, dorsal and anterior views; F. 14230.Fig. 26—*Plethonella acuta* gen. et sp. nov.; F. 14231.Figs. 27 to 28—*Glyptoleta glomerata* Fletcher; right and left valves of F. 14284; note ornament.

PLATE IV.

(All specimens from the sandstone bed on Dry Creek, Ingelara, and are slightly less than natural size).

Figs. 1 to 3—" *Martiniopsis* " sp. a.; ventral, dorsal and anterior views; F. 14168.Figs. 4 to 6—" *Martiniopsis* " sp. b.; ventral, dorsal and anterior views; F. 14195.Figs. 7 to 9—" *Martiniopsis* " sp. b.; ventral, dorsal and anterior views; F. 14297.

PLATE V.

(All specimens from the sandstone bed on Dry Creek, Ingelara, and are slightly less than natural size).

Figs. 1 to 3—" *Martiniopsis* " sp. a.; ventral, dorsal and anterior views; F. 14170.Figs. 4 to 6—" *Martiniopsis* " sp. b.; ventral, dorsal and anterior views; F. 14292.

PLATE VI.

(Specimens figured 1 to 12 from the mudstone bed and 13 to 17 from the sandstone bed on Dry Creek, Ingelara).

Figs. 1 to 3—*Spirigerella* sp. nov.; ventral, dorsal and lateral views; F. 14226; X 3 approx.Figs. 4 to 6—*Spirigerella* sp. nov.; an inflated specimen; F. 14219.

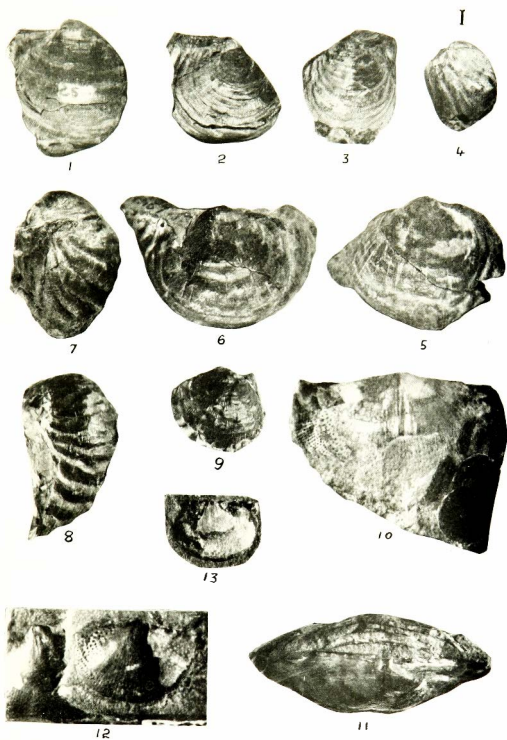
Figs. 7 and 8—A small dielasmid; F. 14275; X 3 approx.

Figs. 9 and 10—*Sveblochondria parkesi* (Fletcher); F. 14186.Figs. 11 and 12—*Sveblochondria parkesi* (Fletcher); a slightly flattened specimen; F. 14190.Figs. 13 and 14—*Glyptoleta glomerata* Fletcher; left and right valves of F. 14278; note ornament.Figs. 15 to 17—" *Martiniopsis* " sp. b.; ventral, dorsal and anterior views of F. 14294.

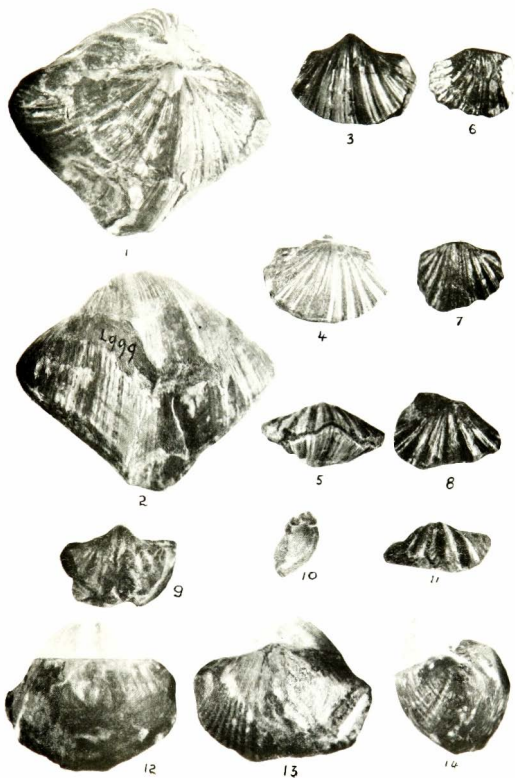
PLATE VII.

(All specimens from the sandstone bed on Dry Creek, Ingelara, except Figs. 9 and 10).

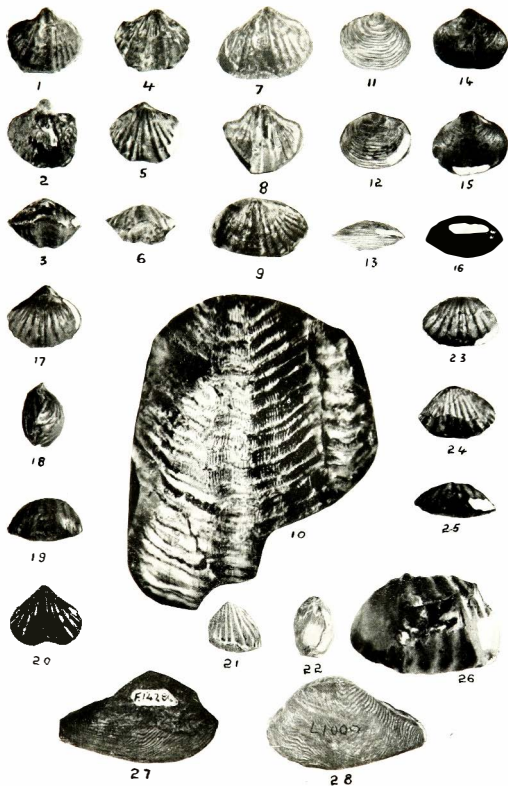
Figs. 1 and 3—*Warthia* sp. Fig. 1 showing exterior, and Fig. 3 showing a median section; F. 14238A.Fig. 2—*Warthia* sp. F. 14238A.Figs. 4 and 5—*Warthia* sp. A complete specimen; F. 14237.Figs. 7 and 8—*Glyptoleta reidi* Fletcher. Right and left valves; F. 14290.Fig. 6—*Glyptoleta reidi* Fletcher. A right valve; F. 14300.Figs. 9 and 10—*Glyptoleta* sp. nov. Right and left valves; from the mudstone bed on Dry Creek, Ingelara; F. 14280.Fig. 11—*Platyteichum costatum* gen. et sp. nov.; holotype; F. 14181.Figs. 12 to 14—*Platyteichum costatum* gen. et sp. nov.; F. 14315; F. 14177; F. 14174.Fig. 15—*Glyptoleta glomerata* Fletcher; right valve of F. 14282.



II



III



IV



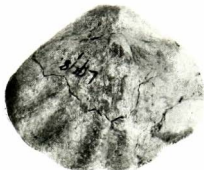
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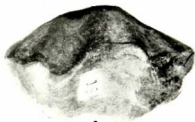
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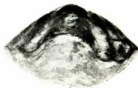
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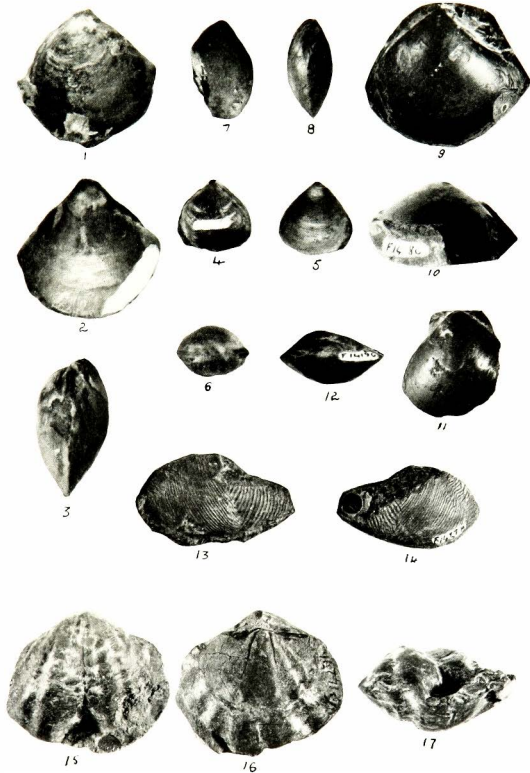


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VI



VII



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13



11



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