# EARLY CAMBRIAN (?) JELLYFISHES FROM THE FLINDERS RANGES, SOUTH AUSTRALIA

*BY REG. C. SPRIGG*

**Summary**

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By Reg. C. Sprigg *

[Read 8 May 1947]

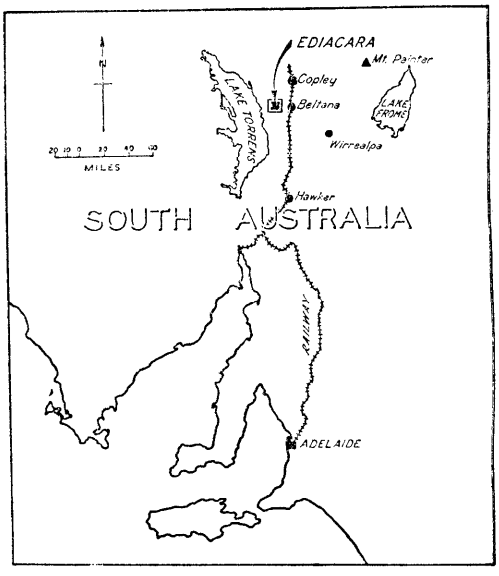
Plates V to VIII

## ABSTRACT

A richly fossiliferous horizon has been discovered within the massive Pound Quartzite formation which underlies the Cambrian Archaeocyathinae limestones in the Flinders Ranges, South Australia. The fossils occur as impressions on surfaces of flaggy quartzite. The five genera and species described are almost certainly all pelagic Coelenterates, and while several forms are referred to the class Scyphozoa, it is possible that one or more species may be more correctly assigned as Hydromedusae. The more problematical forms may prove to be pneumatophores or swimming bells.

## INTRODUCTION

In this paper a group of fossils recently discovered in the uppermost formation of the Adelaide Series (Upper Proterozoic to Lower Cambrian) is discussed. The fossils were found on a rise approximately three hundred yards south-west of the principal south-mine workings at Ediacara, near Beltana, South Australia. They occurred as impressions in flaggy quartzite and are among the oldest direct records of animal life in the world.




If the environmental associations of the forms have been correctly interpreted there is good reason to consider all the forms pelagic and free swimming. They all appear to lack hard parts and to represent animals of very varied affinities. All are probably Coelenterates and all may be jellyfishes, although in at least two cases insufficient detail is available to make reliable comparisons with any living or fossil animals (*viz., Papilionata, Dickinsonia* and the unnamed circular form described in association with *Beltanella*). Just possibly the latter two forms may be floats or pneumatophores of colonial coelenterates.

One form (*Ediacaria*) is referred tentatively to either of the orders Semaeostomeae (Discomedusae) or Rhizostomeae of the class Scyphozoa, while another (*Beltanella*) may be referable to either of the classes Hydromedusae or Scyphozoa.

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## STRATIGRAPHICAL CONSIDERATIONS

Fossil jellyfish as casts and impressions have been described from the Lower Cambrian of New York, Sweden, Russia and Bohemia, and now from Australia; from the mid-Cambrian of British Columbia and Alabama; from the Silurian of Victoria and from the Permian of Saxony; from the Jurassic of Solnhöfen, Bavaria and from the Cretaceous of Texas. The identity of some of these fossils has been questioned, and some are better referred to the Problematica. The stratigraphic range of jellyfishes is almost certainly pre-Cambrian to present.

As indicated above the fossil jellyfishes described in this paper are very probably Lower Cambrian in age. The fossil impressions were found in the "Pound' quartzite formation of the Upper Adelaide Series. This massive formation, which frequently measures several thousands of feet in thickness, immediately precedes massive Cambrian Pleospongia (= Archaeocyathinae) limestones. The impressions occurred at a horizon approximately 100 feet stratigraphically below the base of the limestone, and approximately 600 feet below the first Pleospongia remains yet located at this locality.[1]

Generally speaking the horizon of the Pleospongia is considered to be near the top of the Lower Cambrian (David, 1927). On this assumption the present fossils would have been living in about middle Lower Cambrian time. The "Pound" quartzite in which the fossils were found is considered tentatively (Mawson, 1939) to represent the base of Cambrian sedimentation in South Australia, although there is reason to believe that the dawn of the Cambrian may eventually be taken back still further (Sprigg, 1942).

With perhaps the exception of David's (1936) Lipalian problematica, and certain annelid tracks common in several quartzites of the Adelaide Series, the new fossils represent the oldest undoubted marine animals recorded in Australia (fig. 2). They provide the first reliable indication that the Pound Quartzite is of marine origin.

## MODE OF OCCURRENCE AND PRESERVATION

Considering the extremely perishable nature of jellyfishes and related soft-bodied coelenterates (many jellyfish contain 99% sea water), it is remarkable that any of them should have left traces of their existence in the fossil state. It is obvious that very special conditions of burial would be necessary for their preservation. Walcott (1898) suggests that in the case of many United States Cambrian forms the medusae probably had the habit of living on a muddy bottom in great numbers. Associated fossils suggest a shallow water environment. There appeared to be rapid burial and consolidation of the sediment, not by exposure between tides, but entirely beneath the water. In other cases, such as at Solnhöfen, Bavaria (Lower Jurassic), medusae have been found in extremely fine-grained slates.

Agassiz (1862) notes that the living *Aurelia flavida,* after the spawning period, is frequently seen in large numbers floating on the water. There has been a thickening of the tissues by an increased deposition of animal substance. The disc of the animal has become thin and almost leathery and it is more elastic (and at the same time more brittle) than before. Many of the marginal appendages

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[1] It is to be noted that, contrary to popular conception, the South Australian Pleospongia are not reef builders. Their spatial distribution within the enclosing sediment simulates "coral meadows" conditions. This explains why, in this case (and in many other cases) Archaeocyathinae do not occur right from the base of the so-called Archaeocyathinae limestone. The Archaeos are usually restricted to more or less definite horizons within the limestone formation, and even in the most highly fossiliferous of these, actual fossil remains form only a relatively small portion of the rock. They are not massed remains as in modern coral reefs.

of the umbrella and oral region drop off during this period. It can be seen that in this dried out condition the medusae, when stranded on beaches and covered by sediment, offer much better chance for fossilization.

Caster (1945) notes that when *Aurelia* and other medusae are washed ashore and stranded during low tide in midsummer, they quickly dry out on the surface. "Dehydration of the aqueous jelly brings out in surface relief embedded structures, which in life would hardly be discernible, except by transparency, on the exterior. While the upper surface is hardened, thus inhibiting dehydration, the surface in contact with the beach remains soft and often turgid as in life. Depending on the texture of the strand, the imprint made by the surface may be faithful or indistinct. The incoming tide picks up the partially embedded jellies and carries them further ashore, and occasionally turns them over to embed them again at turn of tide with the erstwhile downside up." He notes further that extraordinarily rapid solidification of the entombing matrix is not necessary, as firm jellyfish can be dug from tidal sands of today wherein they have apparently remained buried for a much longer time than tidal periodicity.

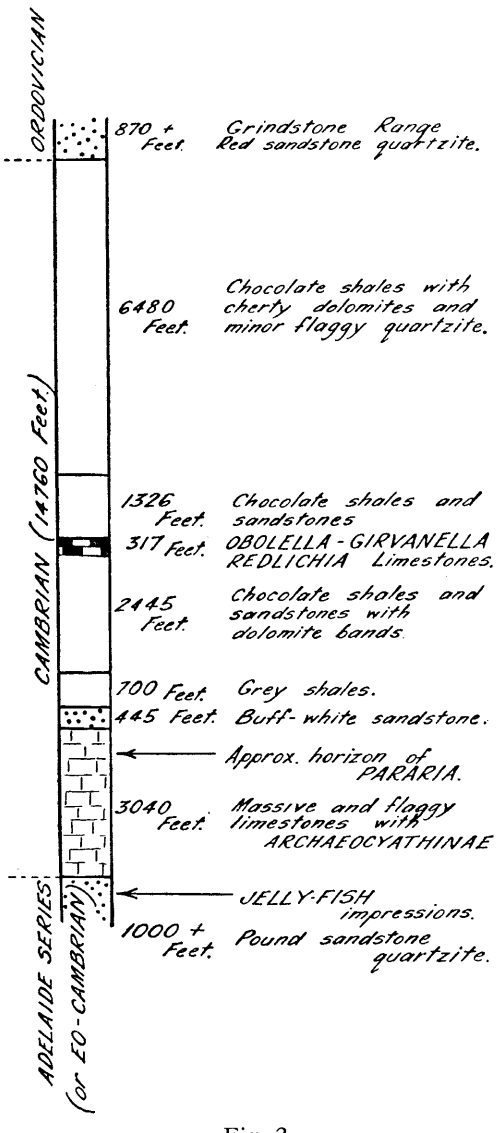


Fig. 2

Generalised Section across Cambrian and associated formations of Flinders Ranges [modified after Sir D. Mawson 1939 (2) ], showing approximate horizons of known fossils.

In the case of the newly discovered fossils we are dealing exclusively with buried pelagic forms. The fossils are impressions in flaggy sandstone quartzite, and the grooves of the impressions are stained with ferruginous material or possess a film of clayey material. The enclosing sediment was originally a fine-grained and well-sorted sand which had accumulated near the western margin of the vast Flinders sedimentary geosyncline. The environment of entombment was that of intertidal flats or of the strandline.

Toughening of the surface tissues of the fossil animals as described by Agassiz and Caster seems almost certainly to have occurred prior to burial, and judging from the attitude of the fossils in the field the animals were mostly preserved with their ex-umbrella surfaces uppermost.

It is noted that the fossils were all found on "free" faces of flaggy quartzite, and always on the upper surfaces of these slabs. (Beds dip at 10° to 20°). The fissility of the quartzite appears to have been controlled to some extent by the presence of clayey films, which might also have had significance in the preservation of the fossil impressions.

## DESCRIPTION AND TENTATIVE CLASSIFICATION[2] OF THE FOSSILS

### Class **SCYPHOZOA**

Order (?) **SAEMOSTOMEAE** or (?) **RHIZOSTOMEAE**

Genus **Ediacaria** Sprigg, gen. nov.

Genotype **Ediacaria flindersi** Sprigg, gen. et sp. nov.

Pound Quartzite, Upper Adelaide Series (Lower Cambrian), Ediacara, South Australia.

Being monotypic the new genus shows the species characters described below. Generic characters include the bell-like manubrial structure and other structures of the central disc area. Comparisons between *Ediacaria* and other most closely related genera are given below.

**Ediacaria flindersi** Sprigg, gen. et sp. nov.

(Pl. I, fig. 1)

Holotype: No. T.1, Tate Museum Collection, Adelaide University, South Australia.

*Description*—Medusa impression circular, radially symmetrical; surface flattened, but with radial and concentric features of low relief. Three concentric zones are clearly distinguishable.

*Inner Zone*—(?) Manubrium bell-like, constricted near its junction centrally with the sub-umbrella surface and expanded distally. It lies over sideways and is compressed laterally. Length 15 mm., and maximum width (flattened) 14 mm. At least three pendant lobate pouches extend 9 to 11 mm. centrifugally from the base of the manubrium. Beyond these pouches the central zone is essentially smooth, although there is an incomplete concentric groove half-way to the zone margin.

*Median Zone*—Surface smooth, somewhat inflated: zone delimited on inner and outer aspects by concentric grooves—one (or two) on inner margin, and one deeper with associated minor and less regular grooves on the outer. Two well-marked radial grooves are present, while indistinct radial striations are more numerous.

*External Zone*—Surface flattened or only slightly convex in transverse section with minor concentric undulations or flutings and numerous radial grooves or striae. In the annular segment representing three-fourths of the perimeter, at least 44 separate radial grooves can be recognised. Although somewhat irregular in themselves, they are distributed around the zone relatively evenly. Most diverge centrifugally, but some converge in this direction. The outer margin (perimeter of fossil) is fairly regular (circular), and with one or two doubtful exceptions is devoid of marginal notches. A concentric groove lies approximately 4 mm. in from the perimeter of the form.

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[2] Classification used in this work is based on that of Parker and Haswell 1940.

*Dimensions*—Largest diameter 114 mm. Respective widths of inner, median and outer zones along greatest radius 20 mm., 17 mm. and 25 mm.

*Discussions and Comparisons*—The specimen is considered to be the impression of the sub-umbrella surface of a "dried out" jellyfish. Organs adjacent to the oral surface of the original animal have come to stand out in relief, and the manubrium stands out strongly. The central zone probably corresponds with the gastrovascular cavity, and external structures of the central disc region are superimposed upon it.

The sub-triangular (?) manubrial structure has been so interpreted because of its apparent fusion centrally with the sub-umbrella surface, and because no other comparable structures are distributed radially about the centre. The flattened attitude of this manubrial bell bears a superficial resemblance to the insert lobes of the central discs of *Kirklandia* (Caster) and *Rhizostomites* (Haekel). However, the absence of more of these structures radially disposed about the centre largely contradicts this view. In life the manubrial structure would be suspended vertically from the central region. The shape of the mouth opening cannot be judged.

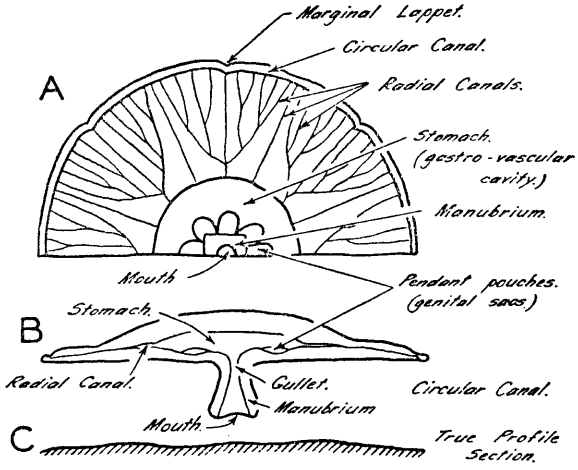


Fig. 3
*Ediacaria flindersi*

A, details of the subumbrella surface of the reconstructed form; B, cross section through radial canals; C, actual profile section along a diameter of the fossil.

The three pendant pouches extending radially from the base of the manubrium are possibly gastro-genital sacs in connection with radial canals. Judging from the distribution of the three sacs preserved there were probably eight of these in the original animal.

Various concentric flutings, with the exception of that adjacent the margin of the form, are referable to the circular muscles of the sub-umbrella. The epimarginal groove is probably a circular canal, in which case the narrow flange beyond it would probably be a "hood."

The well-marked radial grooves of the median zone correspond with inter-, ad-, or per-radial canals, whereas the much finer, numerous radial striations of the outer zone and to a much lesser extent of the median zone suggest more minor canals, splitting and radiating towards the circular canal. This may merely be shrinkage creasing, but in any cases such creases would tend to follow such relative weaknesses as the canal lines. The grooves are sub-parallel and tend to increase in number centrifugally, a feature which is in keeping with the canal theory.

Two marginal notches can be interpreted; these are at intervals corresponding with the separation indicated by projection to the margin of the stronger radial canals of the median zone. It is noticeable that in each case deeper radial striations continue to each notch. The annular (?) hood structure, where observed beyond one marginal notch, is indented in sympathy. This would support the view that the notches are regular marginal features, possibly originally enclosing sensory structures. On the other hand it is noted that in other portions of the fossil where continuous sections of the margin are preserved, other notches are not apparent. This would suggest that the two notches noted may be accidental invaginations of the margin consequent upon deformation during burial.

There are no indications of marginal tentacles, but in view of the coarse nature of the enclosing sediment and the probable delicate nature of such tentacles if present, it is difficult to imagine that evidence of them could have been preserved. Furthermore, experience with modern jellyfish (*Aurelia,* etc.) indicates that in many cases the marginal tentacles drop off in the senescent stages.

There appears little doubt that *Ediacaria* is a Scyphozoan. The form obviously had a flattened saucer or disc-like umbrella, and for this reason is referred to either of the orders Semaeostomeae (Discomedusae) or Rhizostomeae. To decide further to which of these orders the form belongs, a detailed knowledge of the structure of the mouth and oral arms would be necessary. In view of the nature of the preservation of the specimen this cannot be hoped for. However, it is noticeable that the manubrial structure as interpreted is relatively simple—a fact which suggests correlation with the Semaeostomeae, or could perceivably indicate an even simpler class relationship (*viz.,* Hydrozoan). The absence of marginal tentacles on the other hand is a Rhizostomid character, but in view of the difficulties already pointed out evidence such as this is primarily negative. It does seem, however, that no strong tentacles existed—a fact which would preclude membership of the order Trachymedusae of the class Trachylinae.

Detailed comparisons with other fossils is exceedingly difficult in view of the lack of knowledge of many critical features, but it is noticeable that closest (superficial) resemblance is perhaps with *Rhizostomites* and *Semaeostomites* (both Haekel) of the Upper Jurassic of Solnhöfen, Bavaria. In these forms three concentric zones can be inferred, but otherwise there is little similarity in available detail of the central disc regions. Ring muscles are well developed in the outer portions of *Rhizostomites,* as they are in *Ediacaria.* No obvious ring canal is present in *Rhizostomites* as it is in *Ediacaria* and *Semaeostomites,* and whereas the margin of *Semaeostomites* is split up into 120-128 marginal lobes, such subdivision is not apparent in the other two forms.

**Ediacaria** (?) sp. Sprigg

(Pl. I, fig. 2)

Specimen No. T.2., Tate Mus. Coll., Adel. Univ., S. Aust.

*Description*—Impression fragmentary; original form apparently circular, but less than one-eighth of the perimeter is preserved, although the outline of the central disc region is almost complete. In all, three concentric zones can be made out.

*Central Zone*—Surface smooth except where badly preserved; slightly inflated; perimeter sub-circular.

*Median and Outer Zones*—Zones poorly differentiated; median one is smooth and of variable width. Outer zone inflated somewhat towards outer margin, and traversed by numerous sub-parallel radial grooves which fade towards either margin. Exterior margin slightly lobate with indications of two minor notches.

*Discussion and Comparison*—In view of the absence of structures in surface relief in the central and median zones of this fossil, it is suggested that here is a cast of the ab-oral or ex-umbrella surface of a jellyfish. The poor state of preservation of the centremost portion of the fossil form prevents complete assessment of this fact, but nevertheless there appear to be no signs of mouth or gastro-genital structures. The centrally inflated region appears to have collapsed over the stomachs of the animal and preserved, therefore, the roughly circular outline of this region.

In the outer zone which, presumably, in the living animal was thin, the sub-parallel radial grooves are well preserved. These are very numerous and appear unbranched; they may represent radial canals or merely be shrinkage creases. Prominent radial striations continue directly to the two minor marginal notches, and there are no signs of marginal tentacles.

Tentatively the fossil is considered to be an impression of the ab-oral surface of a species of Ediacaria. As with the holotype specimen, three concentric zones can be interpreted, the outermost of which is traversed by very numerous radial striations. Indefinite notches which are separated by approximately equal intervals appear marginally in both forms. Width relations of the respective zones of the fossils agree favourably.

## Class (?) **SCYPHOZOA**

### Genus **Beltanella** Sprigg, gen. nov.

Genotype **Beltanella gilesi** Sprigg, gen. et sp. nov.

Pound quartzite, Upper Adelaide Series (Lower Cambrian) Ediacara, South Australia.

Being monotypic this new genus shares the species traits described below. Until more is known of the fossil, generic characters should include the octagonal arrangement of the circular (?) gonadial structures and their association with the radial canals, the presence of a well-developed delicate peripheral umbral or velar structure and the simple circular oral aperture.

**Beltanella gilesi** Sprigg, gen. et. sp. nov.
(Pl. ii, fig. 1)

Holotype: No. T.3., Tate Mus. Coll., Adel. Univ., S. Aust.

*Description*—Medusa impression circular. Umbrella rather flat, but falling away sharply near its outer margin. (?) Velarium horizontal, depressed approximately 4 mm. in relation to the flat ex-umbrella surface. Umbrella region subdivided into two zones by a faint annular groove as follows.

*Inner Zone*—Surface smooth, broken only by annular grooves respectively 5 and 12 mm. in diameter at the centre. Centremost area depressed very slightly.

*Outer Zone*—Surface dominantly flat, but slopes away steeply near outer margin of umbrella. This secondary (sloping) surface has the form of a highly truncate cone whose apical angle is approximately 80 degrees. Zone characterised by the presence of circular (?) gonadial structures, approximately 10 mm. in diameter. These regular structures are arranged on either sides of the major radial canals in an octagonal pattern centrally within the zone. At least four of these can be recognised and each possesses an inner concentric groove 3-4 mm. in diameter. Two paired radial grooves (? canals) are diametrically opposed, and a third set lies radially at right angles. The grooves pass intermediate between (?) paired gonadial structures but do not continue into the inner

zone. The ex-umbrella surface is slightly lobate at the edge of the flat raised portion, but below where the conical surface meets the (?) velarium the margin is smooth.

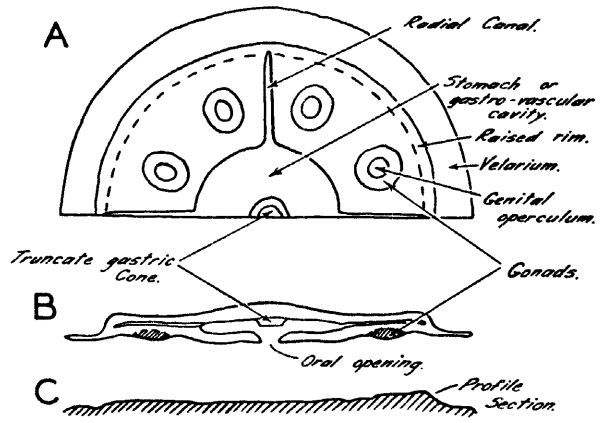


Fig. 4
*Beltanella gilesi*
A, details of exumbrella surface and related embedded organs; B, transverse section through restored form; C, true profile section along diameter of form.

*Velarium*—Structure marginal, obviously thin, well developed; undulose surface depressed; undulations annular in plan.

*Dimensions*—Maximum diameter of fossil 110 mm., minimum 97: widths along single radii of inner and outer zones and velarium respectively 18-20, 21-23 and 10-14 mm.

*Discussion and Comparisons*—The specimen is the cast of the ex-umbrella surface (ab-oral) of a jellyfish.

The central zone evidently corresponds with the gastrovascular cavity as at its margin it gives off paired grooves which are interpreted as interradial canals. There are no signs of subdivision within the cavity and no indication of complicated manubrial structures. The simple circular grooves situated centrally may be oral structures, or possibly representative of a collapsed truncate gastric cone which occurs in some jellyfish to aid in the even distribution of food to various portions of the animal's stomach.

The radial grooves of the outer zone are thought to be interradial canals, although why they should be paired is not known. There is no sign of branch canals from them, nor is there present any groove suggestive of a circular canal. The circular (?) gonadial structures which are distributed evenly around the centre of this zone may be considered as paired in relation to the supposed radial canals. The central annular grooves of each gonadial structure may mark a genital operculum.

The (?) velarium or peripheral umbral jelly is remarkably well preserved considering its obvious delicateness; its contained annular undulations may indicate ring muscles.

The decision to place *Beltanella* within the Scyphozoa must be regarded only as very tentative, as the animal has many restrictive features characteristic of either certain orders of the Scyphozoa or of the Hydrozoa. For example, the simple mouth, the presence of a few unbranched radial canals and the association

of the gonads with the radial canals are Trachylinid (Hydrozoan) characters. On the other hand the flattened disc-shaped umbrella, its relatively large size, and the absence of large tentacles are more characteristic of the Scyphozoa. It appears very likely, therefore, that *Beltanella* is a member of a group, ancestral to either or both the Scyphozoa and Hydrozoa of modern times. Indeed, this is to be expected considering the great age of the fossil. The author knows of no living or fossil jellyfish with which useful comparison of the foregoing specimen can be made.

The fossil is tentatively classified with the Scyphozoa, mainly in view of the absence of the large tentacles which are typical of the Trachylinids.

On the slab of rock carrying the holotype there are at least four additional circular structures (10-23 mm. in diameter) which may represent juvenile forms. All display annular grooves, and in the largest specimen, the central portion (9 mm. in diameter) is raised relatively to the outer zone. In the latter example (which is photographed with the holotype) there is very definite evidence of a velar structure, 2 mm. wide, similar to that of *Beltanella*.

Still another possibly related form found at the same locality is the disc-like impression shown on pl. ii., fig. 2 (specimen No. T4). This external cast is almost

Fig. 5
True profile section of un-named form figured on pl. ii, fig. 2.

perfectly circular with a slightly raised rim near the external margin. The whole structure stands in relief a little above the face of the quartzite slab, and its surface is evenly convex, except in the marginal region, where it is raised somewhat; it shows no recognisable anatomical structure or ornamentation. This smooth depressed (annular) area (7-10 mm. wide) is faintly reminiscent of a velar structure. Maximum diameter is 104 mm., not including the latter structure. The impression may be that of a simple discoid jellyfish or of a hydroid float.

## Class (?) **HYDROZOA** or (?) **SCYPHOZOA**

### Genus **Cyclomedusa** Sprigg, gen. nov.

Genotype **Cyclomedusa davidi** Sprigg, gen. et sp. nov.

Pound Quartzite, Upper Adelaide Series (Lower Cambrian) Ediacara, South Australia.

This genus also is monotypic, and in view of the lack of detail of most of the critical features of the form the generic characters are based tentatively on the sculpturing of the (?) ex-umbrella surface of the form.

### **Cyclomedusa davidi** Sprigg gen. et sp. nov.
(Pl. iii, fig. 1)

Holotype: No. T.5., Tate Mus. Coll., Adel. Univ., S. Aust.

*Description*—Impression circular, depressed, with concentric undulations. Central portion raised, distinctly nodular. The whole form exhibits striking radial symmetry. Surface subdivided by at least seven annular grooves. For convenience three major zones are recognised.

*Inner Zone*—Consists simply of the hemispherical nodular portion mentioned previously. Approximately 2·5 mm. in radial width and 1·5 mm. in height.

*Median Zone*—Subdivided into two annular portions of low relief, the inner of which is traversed in turn by two annular grooves, while the outer is

ornamented by very numerous radial striations about 3 mm. in length. There are approximately 16 of these grooves in each quarter. A poorly developed annular groove traverses the outer portion.

*Outer Zone*—Surface sculpture very similar to that of the median zone; the smooth inner portion is bounded by annular grooves and the outer is traversed by numerous poorly developed radial striations averaging 4 mm. in length. The outer margin to the zone is very poorly preserved.

*Dimensions*—Maximum diameter probably 50 mm. Average widths of the inner, median and outer zones along single radius 2·5, 11·0 and 11·0 mm. respectively.

*Discussions and Comparisons*—The surface ornamentations, which stand in strong relief, appear to be of superficial significance, but some of the annular flutings may be related to ring muscles of the subumbrella of a jellyfish. No structures which can be attributed to a body cavity or to gonads are visible.

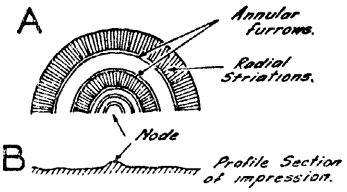


Fig. 6

*Cyclomedusa davidi*

A, details of the surface ornamentation of the restored form;

B, profile section along a diameter of the actual fossil.

There is no evidence of extra-marginal structures, but as noted, the marginal region of the fossil is poorly preserved.

In view of the paucity of critical detail, it is only with hesitation that the fossil is provisionally included within the Coelenterata. The form is highly problematical and possibly only represents the restricted central portion of a larger animal. It does seem certain from its regularity and complexity, however, that the form is not a pseudofossil.

Genus **Dickinsonia** Sprigg, gen. nov.

Genotype **Dickinsonia costata** Sprigg gen. et sp. nov.

Pound Quartzite, Upper Adelaide Series (Lower Cambrian) Ediacara, South Australia

This genus which is monotypic, exhibits the species characters described below. Animal of ovoid form, (?) inflated aborally and possesses a marginal crenulate flange. Median longitudinal furrow gives off very numerous subradial grooves to the outer (crenulate) margin of the form.

**Dickinsonia costata** gen. et sp. nov.
(Pl. iii, fig. 2)

Holotype: No. T.6., Tate Mus. Coll., Adel. Univ., South Australia.

*Description*—Impression ovoid, bilaterally symmetrical, essentially flat. Median longitudinal furrow approximately 35 mm. long, gives off 80 to 90 radiating or diverging grooves or costae (?) alternatively to the outer margin of the fossil. Margin slightly crenulate, the notches corresponding with the intersection of the radiating grooves. Well developed concentric epi-marginal sulcus marks off a marginal flange.

*Dimensions*—Length 68 mm.; width 60 mm. Flange width variable, from 2 to 7 mm., due to distortion.

*Discussions and Comparisons*—The fossil is the impression of the (?) dorsal aspect of a bilaterally symmetrical animal of very doubtful affinities. During burial the animal was flattened and compressed slightly obliquely in a manner which suggests that it was strongly convex dorsally. The animal was symmetrical across both longitudinal and transverse planes. Radiating grooves or costae may represent chitinous rods or canals, while the epimarginal groove may represent a circular canal. No gastrogenital structures or appendages are apparent.

It is exceedingly difficult to classify *Dickinsonia* on the little detail available. The author knows of no related animal with which to establish relationships, and until new specimens with more detail are found little more can be suggested than that the animal is probably a coelenterate.

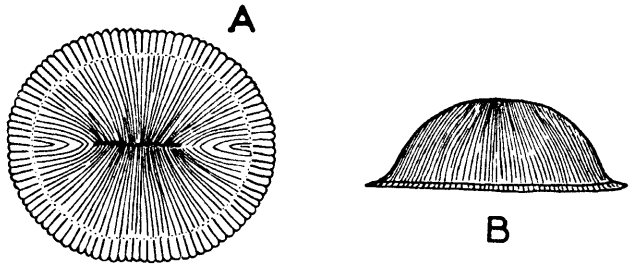


Fig. 7
*Dickinsonia costata*
Details of surface ornamentation of the restored form as viewed in elevation (A) and in plan (B).

There are certain superficial features in which it resembles the problematical form *Discophyllum peltatum* (Hall), but these apparent resemblances soon disappear when detailed comparisons are made. *Discophyllum* is a rounded or oval flattened form with bars which radiate from the centre of the form, and not from a longitudinal furrow as in *Dickinsonia*. Also there are fine concentric undulating lines that cross both the rays and the interspaces between them. Comparable structures do not occur in *Dickinsonia*. There is no flange structure in *Discophyllum*, nor is the external margin crenulate. The ribs fade out before the margin is reached.

(?) **Dickinsonia** sp.
(Pl. iv, fig. 1)

Specimen No. T.7., Tate Mus. Coll., Adel. Univ., South Australia.

*Description*—Impression fragmentary, radially costate; costae continue to the margin. Margin rounded, slightly crenulate in sympathy with the disposition of the costae. A slight bending of the costae, noticeable 7-8 mm. in from the margin of the fossil, indicates a tendency to flange formation.

*Discussions and Comparisons*—From the little detail available for comparison of this specimen with the foregoing holotype the major similarities are concerned with the radiating costae, which in both forms are strongly developed and continue to the somewhat crenulate margin. In the holotype specimen the costae are interrupted by a very well marked concentric sulcus, whereas in the latter specimen there is only the faintest hint of interruption of the radial costae in a similar position. None of the costae in the second specimen appear to diverge as if to unite alternatively into a central furrow as in the type form.

The correlation of this fossil with *Dickinsonia* is quite tentatve and the form must be considered problematical.

## Genus **Papilionata** Sprigg, gen. nov.

Genotype **Papilionata eyrei** gen. et sp. nov.

Pound Quartzite, Upper Adelaide Series (Lower Cambrian) Ediacara, South Australia.

The genus is monotypic and shares the species characters described below. Unfortunately, the generic characters must be based on the shape of the fossil and its restricted surface sculpture. The form is bilaterally symmetrical, papilionaceous with the amygdaloidal "wings" fused anteriorly. A marginal groove is present and the posterior margin of the wings is met by sub-parallel or slightly radiating grooves.

### **Papilionata eyrei** Sprigg, gen. et sp. nov.

(Pl. iv, fig. 2)

Holotype: No. T.8., Tate Mus. Coll., Adel. Univ., South Australia.

*Description*—Impression bilaterally symmetrical. Left hand portion imperfectly preserved and fragmental. Complete impression papilionaceaus, the "wings" being fused for approximately 30 mm. in the anterior aspect. The left hand wing is amygdaloidal in plan, curved convexly on the inner margin, and rounded and slightly lobate (posteriorly) on the lateral margin. From the posterior portion of this margin, radial grooves converge towards a central point near the inner margin, but fade out after 10 to 20 mm. The grooves are stronger and longer at the posterior extremity, and they are not visible forward of the centre of this margin. The single notch on the lateral margin may not have anatomical significance, being probably a crenulation due to the animal's assumed position of rest. The lateral margin is paralleled by a well-developed groove through which the radial costae continue uninterrupted. The groove diverges slightly from the margin at the anterior end. A similar divergence is apparent in the "reflected" wing.

*Dimensions* — Maximum width of complete extended form 150 mm. Maximum length and width of single wing 112 and 56 mm. respectively.

*Discussions and Comparisons*—The impression has been described as bilaterally symmetrical, but there is a possibility that two separate organisms may be represented, the line of "fusion" as described being a fortuitous overlap of the respective organisms. Nevertheless, the excellent "reflection" of the two portions appears to predispose of this view. The single wing impression suggests a disc-like jellyfish lying upon its margin with portion of its umbrella surface folded under.

The author knows of no similar organism with which useful comparison can be made.

## ACKNOWLEDGMENTS

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Photo by K. P. Phillips

Fig. 1 *Ediacaria flindersi* Sprigg
(approx. x $\frac{5}{6}$).

Photo by K. P. Phillips

Fig. 2 *Ediacaria* (?) *flindersi* Sprigg
Slightly less than natural size.

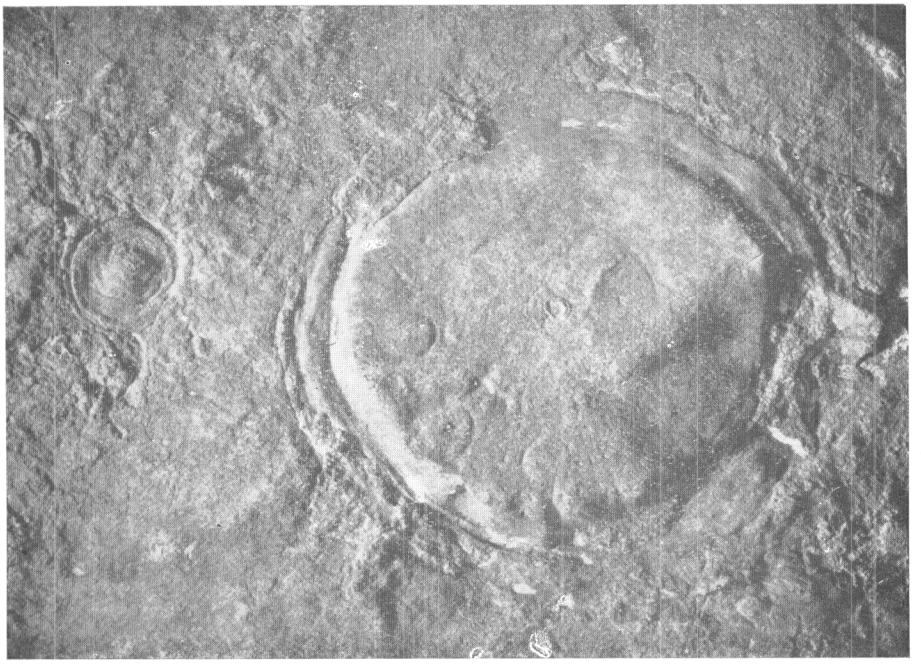

Photo by K. P. Phillips

Fig. 1 *Beltanella gilesi* Sprigg
Two thirds natural size.

Photo by K. P. Phillips

Fig. 2 Discoid Scyphozoan or Zooidal float ($\times \frac{6}{7}$).

Photo by K. P. Phillips

Fig. 1 *Cyclomedusa davidi* Sprigg (x $1\frac{2}{3}$)

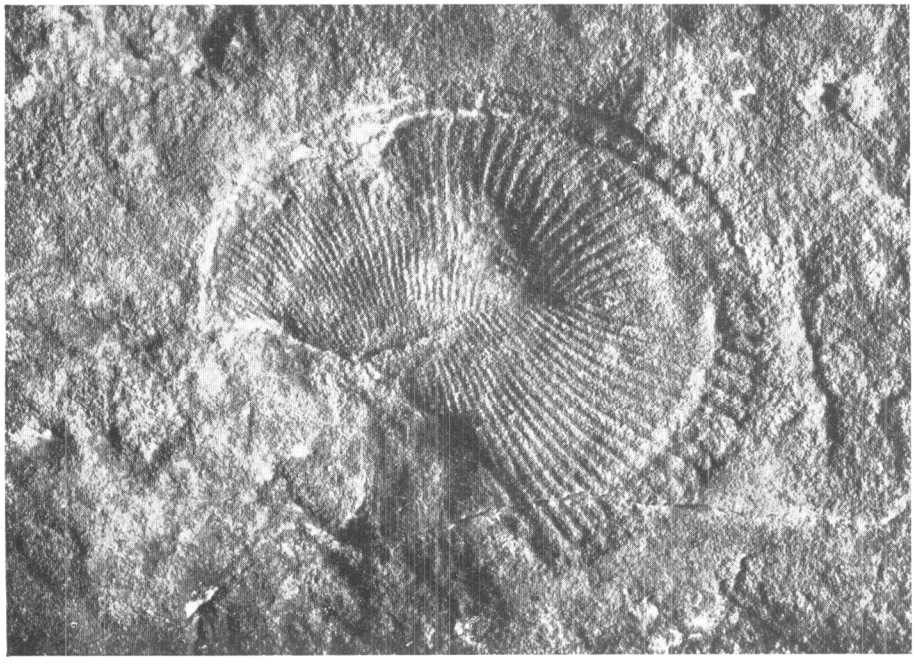

Photo by K. P. Phillips

Fig. 2 *Dickinsonia costata* Sprigg
Slightly larger than natural size.

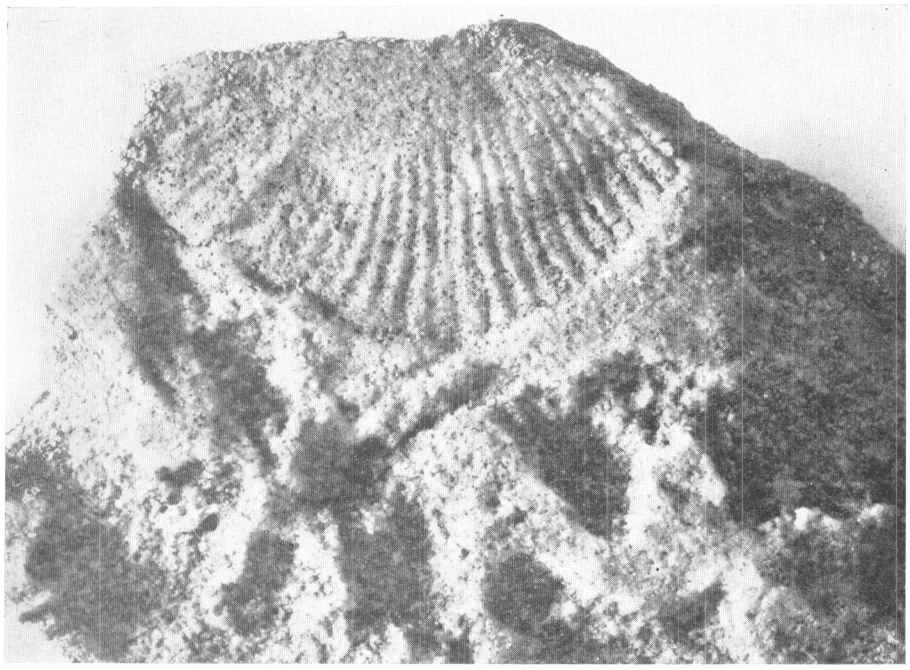

Photo by K. P. Phillips

Fig. 1 *Dickinsonia* (?) *sp.* (approx. x $1\frac{3}{4}$)

Photo by K. P. Phillips

Fig. 2 *Papilionata cyrci* Sprigg
(approx. x $\frac{3}{4}$).