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ART. V.—*A New Trilobite from Cootamundra, N.S.W.*

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The purpose of this paper is to record Upper Silurian sediments at Cootamundra, New South Wales, and to describe a new trilobite which is a characteristic member of the fauna. Mr. W. E. Williams of Cootamundra has sent to the National Museum, Melbourne, a collection of fossils and some rock specimens from this area. I wish to thank him for also making available his geological sketch-map and notes, from which the following stratigraphical data have been compended. The strata strike approximately north and south, being bounded by porphyry hills in the west, and schistose hills in the east. Pitch causes conglomerates and grits to outcrop in the north, forming Bandangan Hill. The Cootamundra fauna is preserved in fine-grained shales, and the following is a provisional faunal list:—

PLANTAE	<i>Fragmenta indeterminata</i> comparable with those in the Victorian Yeringian of Lilydale and district.
ANTHOZOA	Tabulate coral, indet.
CRINOIDEA	Crinoid joints, indet.
POLYZOA	Branching form.
BRACHIOPODA	<i>Atrypa reticularis</i> (Linnaeus). <i>Atrypa</i> aff. <i>scotica</i> (McCoy). <i>Camarotoechia</i> sp. <i>Dalmanella</i> aff. <i>elegantula</i> (Dalman). <i>Lingula</i> sp. <i>Rhipidomella</i> aff. <i>oblata</i> (Hall). <i>Spirifer</i> sp. <i>Stropheodonta</i> sp.
PELECYPODA	<i>Cypricardinia</i> sp. <i>Leiopteria</i> sp. <i>Palaeoneilo</i> aff. <i>spectabilis</i> Chapman. <i>Palaeosolen</i> sp. <i>Paracyclas</i> aff. <i>lirata</i> Hall. <i>Pterinea</i> sp.
GASTEROPODA	<i>Loxonema</i> sp. <i>Pleurotomaria</i> sp.
PTEROPODA	<i>Tentaculites</i> aff. <i>tenuis</i> Sowerby.
TRILOBITA	<i>Calymene</i> (<i>Grazicalymene</i>) <i>cootamundrensis</i> , sp. nov.

CALYMENIDAE, H. Milne Edwards, 1840.

Calymene, Brongniart, 1822. Gravigalymene, Shirley, 1936.

GENOTYPE: *Gravigalymene convolva* Shirley.

CALYMENE (*Gravigalymene*) *cootamundrensis*, sp. nov.

CARAPACE:—Small, elongate, sub-ovate, widest across posterior of cephalon and tapering to posterior end of pygidium.

CEPHALON:—Sub-quadrilateral, approximately one-quarter of total length of carapace. Moderately convex. (See fig. 2.) Surface ornamented with tubercles of varying sizes. The mould shows that the larger tubercles, at any rate, are perforated in their apices by canals which apparently connect the exterior with the interior of the test. Glabella bell-shaped in outline, and standing well above the fixed cheeks; does not overhang preglabellar field; anterior border extends a little beyond the anterior border of the fixed cheeks. Three distinct lobes on each side, reducing in size posterior-anteriorly. First and largest lobes rounded-quadrilateral, with furrows deep and directed obliquely backwards. Second lobes rounded with their long diameter transverse; much smaller than first lobes but bigger than third. Second furrows deep, running almost straight in from axial furrows. Third lobes distinct and of rounded shape. Third furrows short and not so deep as others. Incipient fourth lobes present. Axial furrows deep and wide; contracted at the base. The "antennary pits" are placed outside the fourth lobes on each side in the axial furrows. Preglabellar field recurved with roll-like edge, which thins away at its ends. Fixed cheeks convex. Eyes anterior to second lobes, and nearer lateral margin of cephalon than axial furrow. Free cheek suture follows lateral border of cephalon very closely then swings in a fairly sharp curve to eye. From the eye the suture proceeds practically straight forward to anterior border of cephalon. (The nature of the suture was determined from material collected after the line-block of the whole trilobite was made.) Genal angles truncated so that the lateral border forms almost a right angle with the posterior border of the cephalon. Posterior intramarginal furrows broad; the posterior walls are steeper than the anterior. The corresponding marginal ridge is grooved for about one-third of its length at the glabellar end on the interior surface (as shown by the internal cast). Occipital groove much narrower, longitudinally, than intramarginal furrows. Occipital ring narrows at the extremities, which turn in towards the corners of the fixed cheeks.

THORAX:—Consists of twelve or thirteen segments. Type incomplete, preserving ten whole pleurae and part of eleventh and twelfth. Axis approximately semi-circular in cross-section,

and about one-third of width of thorax; tapers posteriorly to accommodate itself to the narrower pygidial axis. Axal furrows deep. Axal rings and pleurae strongly grooved. Axal knobs fairly conspicuous. The pleurae run horizontally out from the axis to the fulcra, and then bend down vertically. The fulcra are situated half-way along the length of the pleurae.

PYGIDIUM—Convex, with drawn-bow outline. The axis is approximately semi-circular in cross-section and covers almost the full length of the pygidium. There are six axal annulations and four prominent lateral ribs grooved distally half their length. In addition there is on each side of the axis at the posterior end a very short ungrooved rib.

Measurements of specimens:—

(1) Holotype cephalon—

Width across base	15 mm.
Length (minus preglabellar field) ..	6 mm.

(2) Paratype thorax-pygidium—

Greatest width of thorax	12 mm.
Length of thorax (incomplete) ..	15 mm.
Greatest width of pygidium	8 mm.
Length of pygidium	5 mm.

(3) Paratype cephalon (right side incomplete)—

Width from left genal angle to centre of glabella	7.5 mm.
Length of cephalon	7.5 mm.

Matrix:—Yellow to brown fine-grained shale.

Occurrence:—Oak's Creek, Cootamundra, N.S.W.

Horizon:—Upper Silurian.

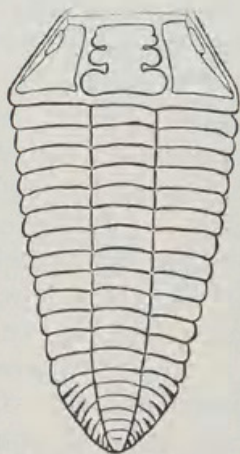


FIG. 1.—Diagram restoration indicating the general proportions of *Calymene* (*Gravicalymene*) *cootamundrensis*, sp. nov. $\times 2$ approx.

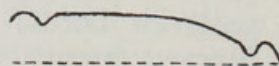


FIG. 2.—Profile of the cephalon of *Calymene* (*Gravicalymene*) *cootamundrensis*, sp. nov. $\times 4$.

Observations:—The new species is not uncommon in the Cootamundra shales. As it is the only trilobite found in that locality, there is the greater confidence in concluding that the separated cephalon and thorax-pygidium presented as the types belong to the same species. Three cephalae, two pygidia, and part of a thorax have been found associated on the same piece of shale $2\frac{1}{2}$ inches square.

Shirley, after describing the British species of *Calymene* (1931, 1933) presented a subdivision of the genus into nine genera (1936). Noting that the thorax and pygidium were relatively static, he concentrated on the cephalon and came to the conclusion that the variations of fundamental phylogenetic importance were:—

- (1) The presence or absence of papillate lobes in the glabella with corresponding buttresses on the fixed cheeks.
- (2) The plain, ridged, or roll-like character of the prelabellar field.

Principally by means of these criteria Shirley established his new genera. The genus *Gravicalymene* is characterized by the absence of papillate lobes and buttresses, and the presence of a roll-like edge in the prelabellar field. In describing fossils from the Baton River beds, New Zealand, Shirley (1938) referred *Calymene angustior* Chapman, a Victorian Yeringian form, to his new genus *Gravicalymene*. As far as the author is aware, *Gravicalymene cootamundrensis*, sp. nov., is only the third species to be referred to this new genus. The absence of the papilla-buttress structure is a feature confined to the Ordovician forms of "*Calymene*" in Britain and Scandinavia, but rare occurrences in the Silurian are known from America and Bohemia, (*C. celebra* Raymond and *C. baylei* Barrande). *G. convolva* Shirley belongs to the British Bala, but *G. angustior* (Chapman) and *G. cootamundrensis*, sp. nov., appear in the Australian Upper Silurian, and *G. cf. angustior* occurs in the New Zealand Lower Devonian.

Affinities:—*G. cootamundrensis* is nearest *G. angustior* (Chapman), (Chapman, 1915; Shirley, 1938, p. 487, cf. Etheridge and Mitchell, 1917.). They share such important features as the position of the eyes anterior to the second lobes (a rare character, according to Shirley), and the presence of an incipient fourth lobe. However, the new species is only about half the size of *G. angustior*, and as the fossils associated with *G. cootamundrensis* do not show abnormality in size, the difference cannot be environmental. Also the new species is much more elongate, and the quadrilateral cephalon with its narrow free cheeks are distinguishing features. The cephalon of the new species is

much flatter than that of the compared species. *G. cootamundrensis* has similar proportions to some specimens of *Calymene niagarensis* Hall (1843), which, although it is a papillate form (according to Shirley, but not shown in the figure quoted), has a roll-like preglabellar field like *Gravicalymene*. The quadrilateral cephalon and narrow free cheeks conspicuously mark off the new species.

Acknowledgment.

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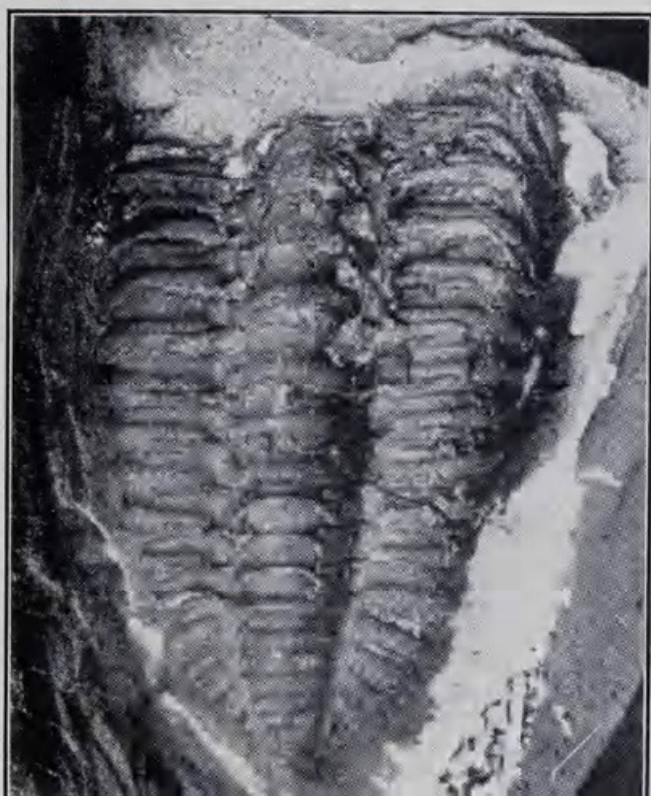
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Description of Plate.

- (1) Thorax and pygidium (Paratype) of *Calymene* (*Gravicalymene*) *cootamundrensis* sp. nov. × 4 approx. (No. 14083.)
- (2) Mould of cephalon (not No. 14084) showing ornament. × 4 approx. (No. 14085.)
- (3) Cast of cephalon (Holotype). × 4 approx. (No. 14084.)
- (4) Cast of another cephalon showing outline and nature of preglabellar field (Paratype). × 4 approx. (No. 14086.)

The numbers in brackets are the registered numbers of the specimens in the National Museum, Melbourne.

1.



1.

2.



2.



3.



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Gill, Edmund Dwen. 1939. "A new trilobite from Cootamundra, NSW."
Proceedings of the Royal Society of Victoria. New series 52(1), 106–111.

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