

DENCKMANNITES (TRILOBITA) FROM THE SILURIAN OF NEW SOUTH WALES

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ABSTRACT. The trilobite *Denckmannites* Wedekind is redefined and a new species, *Denckmannites rutherfordi*, is described from Siluro-Devonian shales near Orange in the Central West District of New South Wales.

THE genus *Denckmannites* has hitherto been recorded only from the Siluro-Devonian of Central Europe and the Devonian of Morocco (Richter, in Moore 1959, p. O 467). The species described in this paper, *Denckmannites rutherfordi*, was found in the Wallace Shale (Stevens and Packham 1952) at a locality about 18 miles west of Orange in the Central West district of New South Wales. The two bands bearing the trilobites were separated by a thickness of 100 ft. of apparently unfossiliferous olive-green shales. Some uncinatid monograptids accompanying the trilobites in both bands indicated either a late Silurian, or less probably, an early Devonian age. Other fossils in the lower band include *Dictyonema* sp., *Encrinurus mitchelli* Foerste, an indeterminate odontopleurid trilobite, orthoconic nautiloids, and small orthid and linguloid brachiopods. Apart from *Monograptus* sp., the only associates of *Denckmannites* in the upper band are *Dictyonema* sp. and *Encrinurus* sp.

The morphological terms are as in the Treatise, Part O.

SYSTEMATIC PALAEOLOGY

Order PHACOPIDA Salter 1864

Genus DENCKMANNITES Wedekind 1914

1931 *Phacopidella* (*Denckmannites*) Wedekind; Richter and Richter, p. 143 (cum syn).

1959 *Denckmannites* Wedekind; Richter, p. O 467.

Type species. *Phacops volborthi* Barrande 1852; SD Vogdes 1925.

Emended diagnosis. Cephalon with broad border and shallow border furrow along posterior edge, both continued antero-laterally as far as axial furrows; border furrow joins axial furrow in front of eye; in front of glabella border is reduced or absent. Margin of cephalon sharp, upper surface meeting doublure at acute angle; 3p and 2p glabellar furrows vestigial, equal in depth, unconnected with axial furrows; 1p furrows initially as deep as axial furrows, becoming much shallower axially. Intercalating ring tripartite, distinct from glabella. Eyes small, of *cryptothalmus* pattern. Entire posterior section of facial suture with forwardly directed convex curvature; genal angles rounded. Vincular furrow crenulate, developed only on postero-lateral doublure. Pygidium large, rounded, with narrow border and smooth surface.

Remarks. In 1914 Wedekind erected the subgenus *Glockeria* (*Denckmannites*) without selecting a type, referring the definition instead to the 'group of *Phacops volborthi* Barrande' which also included *P. miser* Barrande and *P. fugitivus* Barrande. *P. volborthi*

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was subsequently designated as the type by Vogdes in 1925; Richter and Richter (1931) confirmed this action by applying Art. 30, 1a of the then current Rules for Zoological Nomenclature. In defining *G.* (*Denckmannites*) Wedekind stated that the cephalon is totally surrounded by a border. However, this feature is found only in *P. volborthi* and possibly *P. fugitivus*, but not in *P. miser*, although Wedekind included them within his subgeneric conception. In addition, he stated that the 1p glabellar furrows did not coalesce, although they are shown connected in figures of *P. volborthi* and *P. miser* by Barrande (1852). Vogdes (1925) designated *P. volborthi* as the type for *Phacopidella* (*Denckmannites*), but retained Wedekind's diagnosis unaltered. Richter and Richter (1931), in revising the subgenus, omitted any reference to the cephalic border and 1p glabellar furrows. They distinguished *Phacopidella* (*Denckmannites*) from *P.* (*Phacopidella*) by its 'uniform glabellar surface anterior to the 1p furrows as in *Phacops* (i.e., an undivided glabellar surface with only mere vestiges of 2p and 3p furrows), eyes of a *cryptothalmus* pattern, and a tripartite intercalating ring' (p. 143, in German). Richter (in Moore 1959, p. O 467) raised *Denckmannites* to full generic status, at the same time modifying the 1931 diagnosis by referring to the intercalary furrow as tripartite instead of the intercalating ring. The genal angles were described as truncate, while the entire posterior section of the facial suture was specified as concave; i.e., with the concave side directed posteriorly. Alberti (1966) designated *P.* (*D.*) *micromma* (A. Roemer) as the type species for *Phacopidella* (*Struveaspis*) thus restricting the scope of the genus *Denckmannites* (*sensu* Richter 1959). This new subgenus is characterized by fusion of the reduced central lobe of a tripartite intercalating ring to the base of the glabella by medial reduction of the 1p furrows. For the sake of conformity in the two following lists, *Struveaspis* is regarded as being of the same generic status as *Denckmannites*.

Species retained in genus *Denckmannites*:

Denckmannites volborthi (Barrande) 1852

Denckmannites miser (Barrande) 1852

Denckmannites rutherfordi sp. nov.

Species transferred to *Struveaspis*

Struveaspis micromma (A. Roemer) 1852

Struveaspis fugitivus (Barrande) 1872

Struveaspis thuringica (Kegel) 1932

Struveaspis prantli (Růžička) 1946

Struveaspis n.sp. A. Alberti 1966

Denckmannites rutherfordi sp. nov.

Plate 133

Source of name. After the Rutherford family, on whose property the fossils were found.

Material. Six more or less complete exuviae preserved as internal moulds with fragments of the exoskeleton adhering; USGD (University of Sydney Geology Department) 8914, 8916, 8934, and MMF (Geological and Mining Museum, Sydney) 14467. The external counterparts of USGD 8929 and 8934 have also been preserved. The only deformation is that caused by burial pressure, with crushing of the glabella. In addition, abundant imperfect specimens were also collected from the same locality.

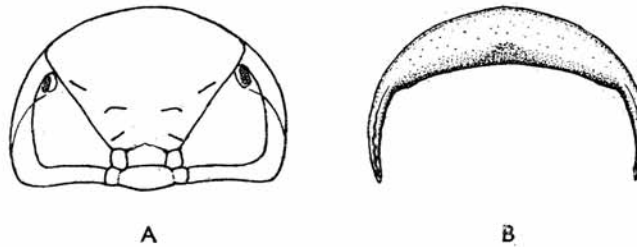
Holotype. USGD 8927 a, b.

Paratypes. USGD 8929, 8934, MMF 14467.

Locality. Portion 216, Parish Boree Nyrang, County Ashburnham.
Sydney University Geology Department Locality catalogue MN/II/27.

Diagnosis. *Denckmannites* with very small eyes (about 20 lenses in each), deep transglabellar 1p furrows becoming shallow axially, and exceedingly narrow anterior cephalic border; pygidium with 6-7 discrete axial rings.

Description. The carapace possesses a long oval outline and, except for a strongly convex axis, has only moderate relief. The cephalon has a micro-granulose surface and a semicircular outline, with rounded genal angles which do not project noticeably beyond its posterior edge. The interior of the cephalon is pitted. The wide border is defined by a shallow border furrow, and is continuous along the posterior and lateral



TEXT-FIG. 1. A. Reconstruction of cephalon showing inferred position of facial sutures. B. Reconstruction of ventral surface of cephalon, showing approximate shape of doublure.

edges of the cephalon, maintaining a more or less uniform width. In front of the glabella the border narrows considerably; none of the specimens was sufficiently well preserved to determine if it disappears altogether. The border furrow runs parallel to the margin as far as the anterior corner of the cheeks, where it swings sharply into the axial furrow. Anterior to the 1p furrows the axial furrows are straight, and are generally deeper than the border furrow. Near the cephalic margin they fade, and outline the glabellar curve to the edge of the cephalon before disappearing entirely.

The glabella is large, pentagonal, and slopes forward gently to meet the doublure in an acute angle. The 2p and 3p furrows are weak, and do not meet the axial furrows. In different specimens the 2p furrows are represented by straight or curved furrows, the curve always being directed anteriorly. The posterior branches of the 3p furrows are generally more strongly curved than the 2p furrows; the 3p anterior branch is straighter and inclined at about 30 degrees to the axial furrows. The 1p furrows cut deeply into the glabella for about one-third of their length, where they divide into two branches. The anterior branches swing forward decreasing in depth, being joined axially by a shallow depression. The posterior branch cuts the intercalating ring and joins the occipital furrow. The intercalating ring is thus trisected into a broad medium lobe and two ovoid lateral lobes. This division is reflected by the vaguely tripartite occipital ring. The cheeks have a slightly lower relief than the glabella; approximately triangular in shape, they support very small eyes at their anterior corners. Preservation does not indicate whether an anterior section of the facial suture exists or not; the posterior section has a forwardly directed curvature throughout, and intersects the cephalic margin just in front of the genal angles.

The eyes are oval in shape, supported on a reniform palpebral lobe. Preservation does not allow an accurate count, but each eye probably has between 19 and 21 lenses arranged in six vertical rows as follows (front-rear): 2, (?3), 3, 3, (?4), 4, 4, 3. In the holotype (USGD 8927) a portion of the exoskeleton partially covering one of the eyes shows no expression of the underlying lenses, unlike other species even in the same genus where the lenses are quite prominent surface features. Unless the exoskeleton in this region was transparent, it seems unlikely that the eyes could have functioned as light sensitive organs.

The hypostome is triangular in shape with a slightly convex anterior margin. The anterior wings are particularly well developed, with appreciable thickening at their tips. On the ventral surface there is a small longitudinal ridge which runs from the lateral notch, fading at the anterior margin: on the dorsal surface the ridge is expressed as a shallow furrow. The border is continuous posterior to the lateral notches, and is broadest along the posterior edge. Any other details of the posterior border were obscured in all specimens by either cephalon or thorax. The median body is subcircular, apparently undivided, and strongly convex. No maculae were observed. The entire surface of the hypostome is finely granulose.

The cephalic doublure is crescentic in shape, broadest beneath the glabella, with a paraboloid posterior margin which commences near the genal angles and passes just behind the eyes. The crenulate vincular furrow is widest near the genal angles, tapers forward, and disappears near the axial furrow. The doublure on small specimens seems comparatively rigid, as in such cases the posterior portion of the glabella, and to a lesser extent that of the cheeks, is crushed along an arc corresponding to the portion of the cephalon unsupported by the doublure. In large specimens, crushing of the cephalon is quite independent of the doublure. As regards ornament, the doublure seems comparable to the dorsal cephalic surface.

The thorax is virtually parallel-sided, showing an appreciable taper in only the last three segments. The axial rings are strongly convex, and have a tripartite division into a central lobe, flanked by smaller, globose, lateral lobes. The central lobe carries a particularly well-formed articulating half-ring, separated from it by a deep but broad transverse furrow. At the junction of central and lateral lobes, the extension of this

EXPLANATION OF PLATE 133

Denckmannites rutherfordi sp. nov.

- Figs. 1, 2, 5, 8, 9. Holotype USGD 8927. 1, composite internal mould of cephalon, showing eye covered by exoskeleton which gives no indication of underlying lenses, $\times 5$. 2, Composite internal mould of cephalon, $\times 1.5$. 5, hypostome, $\times 3$. 8, Composite external mould of cephalon, and internal mould of thorax and pygidium. Short hooks are visible on the fragments of exoskeleton adhering to the pleural extremities. 9, Silastic cast of external mould and hypostome, $\times 1.5$. The anterior granulation is caused by pitting on the interior surface of the exoskeleton.
- Fig. 3, Paratype MMF 14467. Internal mould exhibiting phacopid or Salterian mode of moulting, $\times 2$.
- Fig. 4, Paratype USGD 8934. Latex cast of external mould, showing border and interpleural furrows on pygidium, $\times 1.5$.
- Figs. 6, 7, Paratype USGD 8929*a, b*. 6, Internal mould, showing crushing of portion of cephalon unsupported by doublure, $\times 3$. 7, Interior of dorsal carapace showing apodemes, $\times 3$. An attempt to make a latex cast resulted in damage to the exoskeleton.

furrow projects downward to form a robust apodeme. These apodemes are flange shaped and taper downwards, with a slight expansion at their tips. The pleurae are more or less uniform in width throughout their length, with deep pleural furrows extending from axial furrow to articulating facet. These facets are large, extending about one half the length of the leading edge and a third the length of the posterior edge of the segments. The first five segments have rounded extremities; the remaining six show progressive development of a short spine or hook, possibly a feature associated with enrollment.

The pygidium has a very rounded outline, marked by a flat border. On internal moulds this border is exaggerated by the imprint of the doublure which extends about one-third the distance across the pleural region. Articulating facets occupy about half the length of the leading ribs. The axis contains six discrete axial rings, a seventh vaguely discernible in some specimens, followed by a fused terminal piece. The first ring is partially obscured by the last thoracic segment. Both the first and second rings are transversely tripartite, though the division is much less pronounced than in the thoracic axial rings. Each pleural field bears five rather flattened ribs, separated by straight and narrow pleural furrows. Interpleural furrows are seldom observed except on external moulds, and are parallel to the pleural furrows. The surface is free of ornament.

Dimensions (in mm.). Holotype USGD 8927:

	<i>Width</i>	<i>Length</i>
Cephalon	22	12
Thorax	24	20
Pygidium	17	9

Remarks. The bohemian species, *Denckmannites miser* (Barrande), most closely resembles *D. rutherfordi*, but has much larger eyes, and the 3p glabellar furrows, as shown in Barrande's illustrations, appears to be whole, not bipartite. *D. volborthi* (Barrande) has eyes of about the same size, with a similar number of lenses in each, as *D. rutherfordi*, but its cephalon is wholly surrounded by a border, while the pygidium has almost twice as many axial segments as *D. rutherfordi*.

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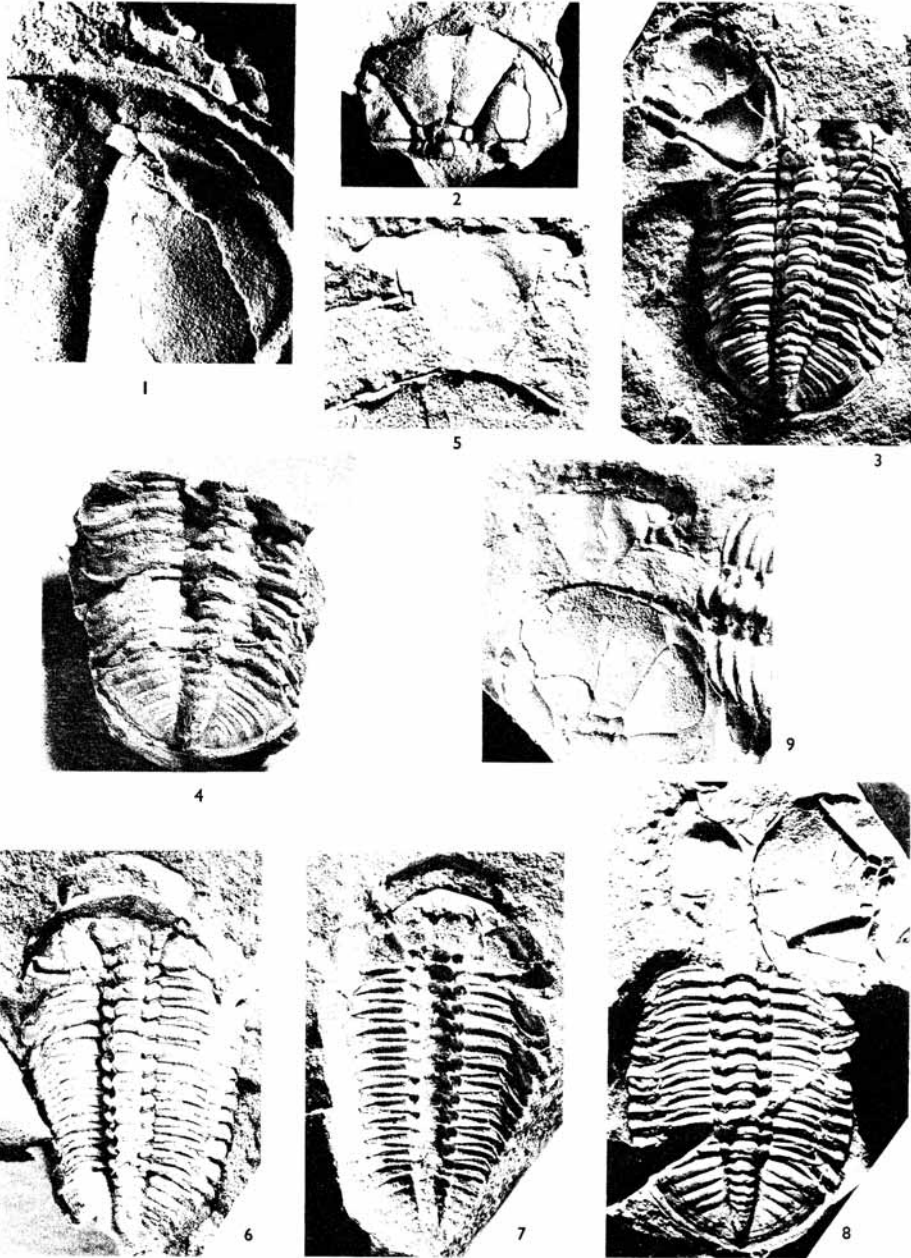
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