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CAMBRIAN GEOLOGY AND PALEONTOLOGY

V

No. 2.—CAMBRIAN AND LOWER OZARKIAN
TRILOBITES

(WITH PLATES 9 TO 14)

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INTRODUCTION

The field work of the past decade has resulted in the accumulation of extensive collections of fossils from the Cambrian and Lower Ozarkian formations. In order to aid in the delimitation of geological formations preliminary studies were made of portions of the material and names assigned to supposedly new genera and species. A few of these have been used in published lists and the study of the brachiopods published.¹ Realizing that the publication of generic and specific names of the trilobites without description and illustration was of little service it was decided to print from time to time the new genera and species. In this paper are presented in an outline form characterizations of those genera which were ready for preliminary publication. These are presented at this time to meet the needs recently expressed by a number of field workers. No attempt has been made to group the genera in biological or geological order.

Dr. E. O. Ulrich has been studying the faunas of the Upper Cambrian and Ozarkian formations, especially of the Mississippi province for many years, giving special attention to the trilobites. When unpublished genera and species were found in the collections that he had already identified and named his work was accepted, which explains the reference to unpublished species and genera by Ulrich.

It was thought that outline drawings of the type species would present in the most concise manner possible the characters of the genera. These drawings are to be regarded as preliminary and subject to correction as better material becomes available.

AMECEPHALUS new genus

Pl. 9, fig. 1. (Nat. size.) Diagrammatic outline of the type species as restricted.

Amecephalus includes those forms with the wide frontal border that were formerly referred to the type species.

¹ Smithsonian Misc. Coll., 67, No. 8, 1923, and 75, Nos. 1 and 9, 1924.

Genotype.—*Ptychoparia piochensis* Walcott (Bull. U. S. Geol. Surv., 30, 1886, p. 201, pl. 26, fig. 2 and pl. 28, figs. 1 and 2).

Range.—Middle Cambrian of Great Basin and Rocky Mountains.

ANORIA new genus

Pl. 9, fig. 2. (Nat. size.) Diagrammatic outline of the type species.

Anoria is characterized by the absence of a frontal border.

Genotype.—*Dolichometopus tontoensis* Walcott (Smithsonian Misc. Coll. 64, 1916, p. 373, pl. 51, fig. 1).

Range.—Upper Cambrian, Grand Canyon.

ARMONIA new genus

Pl. 10, fig. 1. (Nat. size.) Diagrammatic outline of type species.

Armonia differs from *Elrathia* in the characters of the frontal limb and the relatively larger pygidium.

Genotype.—*A. pelops* Walcott, new species.

Range.—Upper Cambrian, Southern Appalachians.

BELLEFONTIA

Ulrich (MSS.) New genus, pl. 9, figs. 3, 4 and 5. (Nat. size.) Diagrammatic outlines of the cranidium and pygidium of the type species and of *Niobe frontalis* (Dalman) and *Hemigyraspis affinis* (McCoy), the types of the respective genera.

Bellefontia differs from the similar genera in the characters of the pygidium and the absence of a dorsal furrow.

Genotype.—*Hemigyraspis collieana* Raymond (Carnegie Mus., Annals, vol. 7, no. 1, 1910, p. 41, pl. 14, figs. 9-13).

Range.—Canadian, Central Pennsylvania, Ozarkian of the Rocky Mountains.

BURNETIA new genus

Pl. 10, fig. 2. Diagrammatic outline of the cranidium.

This genus is characterized by the peculiar wide frontal limb. Other parts of this trilobite unknown but possibly included in the large unworked collections from the type locality.

Genotype.—*Ptychoparia* (?) *urania*, Walcott (Proc. U. S. Nat. Mus., 13, 1890, p. 274, pl. 21, figs. 10, 11).

Range.—Upper Cambrian of Texas.

BYNUMIA new genus

Pl. 14, fig. 3. Diagrammatic outline of cranidium.

Bynumia differs from *Ucebia* and *Kingstonia* in the deeper dorsal furrow and prolonged frontal limb.

Genotype.—*B. cumus*, new species.

Range.—Upper Cambrian, British Columbia.

CEDARIA new species

Pl. 10, fig. 6. (Nat. size.) Diagrammatic outline of the type species.

Cedaria is characterized by the proparian-like course of the facial suture. The free cheeks commonly have long genal spines and are often attached sufficiently strongly to remain a unit with the cranium.

Genotype.—*C. prolifica* new species.

Range.—Upper Cambrian, Appalachians, Wisconsin.

CHANCIA new genus

Pl. 10, fig. 4. (Nat. size.) Diagrammatic outline of the type species.

Chancia differs from *Elrathia* in its wider fixed cheeks and wider rim, but more particularly in its small pygidium. It differs from *Amecephalus* in the frontal rim, wide fixed cheeks and occipital furrow.

Genotype.—*C. ebdome* new species.

Range.—Middle Cambrian, Rocky Mountains in Idaho.

CORBINIA new genus

Pl. 10, fig. 5. (Nat. size.) Outline drawing of the cranium and associated pygidium.

Corbinia resembles *Eurekia* in several characteristics but differs in the absence of glabellar furrows, the structure of the frontal limb and size and position of the eyes.

Genotype.—*C. horatio* new species.

Range.—Ozarkian. Mons formation, Alberta.

CRUSOIA new genus

Pl. 10, fig. 7. ($\times 1\frac{1}{2}$.) Diagrammatic outline of the type species.

Crusoa is characterized by the peculiar upturned front of the cephalon, the small eyes situated far forward, and the minute pygidium.

Genotype.—*C. cebes* new species.

Range.—Middle Cambrian. Woolsey shale, Montana.

DOKIMOCEPHALUS new genus

Pl. 11, fig. 1. ($\times \frac{1}{2}$.) Restoration of the cephalon of the type species.

Dokimocephalus is characterized by the long, pointed frontal limb, the deep dorsal and glabellar furrows and the elaborate surface ornamentation. Thorax and pygidium as yet unknown, but possibly represented in the extensive unworked collections from the type localities.

Genotype.—*Ptychoparia pernasuta* Walcott (Mon. U. S. Geol. Surv., 8, 1884, p. 49, pl. 10, fig. 8).

Range.—Upper Cambrian. Nevada and Missouri.

DUNDERBERGIA new genus

Pl. 11, fig. 2. (Nat. size.) Outline drawings of cranidium and pygidium.

Dunderbergia includes a number of forms which have formerly been assigned to *Ptychoparia* (unrestricted). This genus is characterized by the absence of glabellar furrows and the rounded, bordered pygidium. It differs from *Modocia* in its narrower fixed cheeks and the direction of the facial suture.

Genotype.—*Crepicephalus* (*Loganellus*) *nitidus* Hall and Whitfield (Geol. Expl. 40th Parallel, vol. 4, 1877, p. 212, pl. 2, figs. 8-10).

Range.—Upper Cambrian. Rocky Mountains and Basin Ranges.

ELKIA new genus

Pl. 10, fig. 8. (Nat. size.) Diagrammatic restoration of the cranidium.

Elkia is characterized by the extended frontal rim and very narrow fixed cheeks. The palpebral lobes appear to be considerably elevated. Other parts of the trilobite unknown.

Genotype.—*Dicelloccephalus* *nasutus* Walcott (Mon. U. S. Geol. Surv., 8, 1884, p. 40, pl. 10, fig. 15).

Range.—Upper Cambrian. Eureka District, Nevada.

ELRATHIA new genus

Pl. 11, fig. 4. (Nat. size.) Outline drawing of the type species. Pl. 11, fig. 5 (medium sized specimen) diagrammatic outline of *Ptychoparia striata* (Corda), the type of the genus, introduced for comparison.

Elrathia is erected to include many forms hitherto assigned to *Ptychoparia*. It is characterized by the wide frontal limb, the wide fixed cheeks and the large, flat, furrowed pygidium.

Genotype.—*Conocoryphe* (*Conocephalites*) *kingii* Meek (Proc. Acad. Nat. Sci. Philadelphia, 1870, p. 63).

Range.—Middle Cambrian, mainly. Cordilleran area and possibly elsewhere.

ELVINIA new genus

Pl. 11, fig. 3. (Nat. size.) Restoration of cephalon and pygidium of the type species.

Elvinia includes many species widely distributed, formerly referred to *Ptychoparia*. This genus is characterized by the first pair of glabellar furrows which distinguishes it from similar forms.

Genotype.—*Dikeloccephalus* *roemeri* Shumard (Amer. Jour. Sci., 2d ser., vol. 32, 1861, p. 220).

Range.—Upper Cambrian and Ozarkian, New York, Pennsylvania, and generally west of the Mississippi River.

EUREKIA new genus

Pl. 12, fig. 1. (Nat. size.) Diagrammatic restoration of the cephalon and pygidium of the type species.

Eurekia is characterized by the upturned, frontal limb, the moderately large eyes situated far back, narrow fixed cheeks and the high

axis of the pygidium. Pygidium with spines sometimes long and slender, at other times with peculiar hook-like blunt ends.

Genotype.—*E. granulosa*, new species.

Range.—Upper Cambrian, Great Basin, Rocky Mountains, Mississippi Valley.

HARDYIA new genus

Pl. 12, fig. 5. ($\times 2$.) Outline drawing of type cranidium.

Hardyia is a small trilobite with wide fixed cheeks, narrowing rapidly forward, with large occipital ring and very short, faintly indicated glabellar furrows.

Genotype.—*H. metion* new species.

Range.—Ozarkian. Canadian Rockies.

HOLTERIA new genus

Pl. 13, fig. 7. (Nat. size.) Diagrammatic restoration of the cranidium and pygidium of the type species.

The genus *Holteria* is based primarily on the unusual pygidium. The associated cranidium is indistinguishable generically from that of *Neolenus inflatus* Walcott. The pygidium, however, is radically different because of the fusion of the pleura and the reduction of the number of spines.

Genotype.—*Ogygia ? problematica* Walcott (Mon. U. S. Geol. Surv., 8, 1884, p. 63, pl. 10, fig. 2).

Range.—Upper Cambrian, Great Basin.

HOUSIA (Walcott)

Pl. 12, fig. 4. (Nat. size.) Outline drawing of the type species.

Housia was first described as a subgenus of *Dolichometopus*, due to a portion of the specimen being obscured by the matrix and thus overlooked in making the illustration. The generic name *Sodalitia* (Smithsonian Misc. Coll., 67, 1922, p. 471) was proposed for forms belonging to this genus.

Housia is characterized by the absence of the dorsal furrow and the large frontal limb. The pygidium of the British Columbia forms was first referred to *Ceratopyge* because of the marginal spines. It differs, however, from *Ceratopyge* in that the spines of *Housia* are simply the ends of a thoracic segment attached to the posterior smooth portion of the pygidium.

Genotype.—*Dolichometopus (Housia) varro* Walcott (Smithsonian Misc. Coll., 64, 1916, p. 374, pl. 65, fig. 1).

Range.—Ozarkian. British Columbia and Great Basin.

IDAHOIA new genus

Pl. 14 fig. 1. (Nat. size.) Outline drawing of the type cephalon and associated pygidium.

Idahoia is characterized by the broad frontal limb, which is composed of a border, a wide rim and the rim of the free cheeks. Suture entirely intramarginal. Occipital furrow absent. Pygidium concave on the pleural portions.

Genotype.—*I. serapio* new species.

Range.—Upper Cambrian. Idaho.

IDDINGSIA new genus

Pl. 12, fig. 6. (Nat. size.) Outline of the cranidium.

Iddingsia is represented by the cranidium only, although other parts may be present in the extensive collections.

Genotype.—*Ptychoporia similis* Walcott (Mon. U. S. Geol. Surv., 8, 1884, p. 52, pl. 10, fig. 10).

Range.—Upper Cambrian. Eureka District.

IRVINGELLA Ulrich and Resser MSS new genus

Pl. 10, fig. 3. (Large specimen.) Diagrammatic drawing of the type cranidium.

Irvingella is characterized by its very large eyes, narrow fixed cheeks and exceedingly narrow free cheeks. It is a very large genus.

Genotype.—*I. major* Ulrich and Resser MSS.

Range.—Upper Cambrian and Ozarkian. Appalachians, Mississippi Valley, Rocky Mountains and Nova Zemlya.

ISOTELOIDES Raymond

Pl. 13, fig. 6. (Nat. size.) Outline drawing of the genotype, *I. whitfieldi* Raymond.

The genus *Isoteloides* is represented in many of the Upper Ozarkian and Canadian collections of the Rocky Mountains.

KINGSTONIA new genus

Pl. 14, fig. 2. (×4.) Outline drawing of the genotype.

Kingstonia is a small trilobite characterized by the practical absence of the dorsal furrow. Many undescribed species belonging to this genus are in our collections. It resembles in certain features *Illacnurus* Hall (pl. 14, fig. 7), *Symphysurina* Ulrich (Smithsonian Misc. Coll., Vol. 75, No. 1, 1924, p. 37) and *Tsinania* (pl. 14, fig. 6).

Genotype.—*Kingstonia apion* new genus.

Range.—Upper Cambrian, Appalachians, Missouri, Oklahoma. Cordillera of Canada and United States.

MALADIA new genus

Pl. 12, fig. 2. (Nat. size.) Outline drawing of the type cephalon and associated pygidium.

Maladia exhibits certain relationships to *Eureka* but differs in the course of the facial suture and structure of the pygidium.

Genotype.—*M. americana* new species.

Range.—Upper Cambrian or Ozarkian, Idaho and Grand Canyon.

MODOCIA new genus

Pl. 12, fig. 7. (Nat. size.) Outline drawing of the type cranium.

The genus *Modocia* is established to include species with wide fixed cheeks which were formerly referred to six different genera.

Genotype.—*Arionellus (Crepicephalus) oweni* Meek and Hayden (Proc. Acad. Nat. Sci., Phila., 1861, p. 436).

Range.—Upper Cambrian, Black Hills, Rocky Mountains.

MOOSIA new genus

Pl. 14, fig. 9. (Nat. size.) Outline drawing of the type species.

Moosia resembles *Olenus* but differs in the course of the facial suture and backward direction of the eye lines.

Genotype.—*M. grandis* new species.

Range.—Ozarkian, Rocky Mountains.

MOXOMIA new genus

Pl. 12, fig. 3. ($\times 3$.) Outline drawing of dorsal and side views of type cranium.

Moxomia is characterized by the quadrate glabella and cranium and the small eyes situated far forward

Genotype.—*M. hecuba* new species.

Range.—Ozarkian. British Columbia.

TAENICEPHALUS Ulrich and Resser MSS. new genus

Pl. 13, fig. 1. (Nat. size.) Diagrammatic drawing of type cephalon and associated pygidium.

Taenicephalus includes those forms assigned by Hall to *Conaspis*, which are congeneric with *C. shumardi*.

Genotype.—*Conocephalites shumardi* Hall (16th Ann. Rept. New York State Cabinet Nat. Hist., 1863, p. 154, p. 7, figs. 1, 2).

Range.—Upper Cambrian. Mississippi Valley and Rocky Mountains.

TOSTONIA new genus

Pl. 13, fig. 2. ($\times 2$.) Outline drawings of type cranium and associated pygidium.

Tostomia is another of the forms which resembles *Olenus* and *Triarthropsis*. It differs in width of the fixed cheeks and course of the facial suture and in the spinose pygidium.

Genotype.—*Dicelloccephalus iole* Walcott (Mon. U. S. Geol. Surv., 8, 1884, p. 43, pl. 10, fig. 19).

Range.—Upper Cambrian. Eureka District, Nevada.

UCEBIA new genus

Pl. 14, fig. 4. (×3. Outline drawing of type species.

Ucebia is closely allied to *Kingstonia*, but differs by having a shallow dorsal furrow.

Genotype.—*U. ara* new species.

Range.—Upper Cambrian. Appalachians, Rocky Mountains.

UTIA new genus

Pl. 13, fig. 3. (×2.) Restoration of type cranidium.

Utia is a very curious trilobite in which the frontal limb stands vertically, with wide fixed cheeks, furrowed by peculiar longitudinal depressions. Specimens with a portion of thorax in the collections.

Genotype.—*U. curio* new species.

Range.—Middle Cambrian. Spence shale, Idaho.

WILBERNIA new genus

Pl. 13, fig. 4. (Nat. size.) Outline drawings of dorsal and side views of the type cranidium.

Wilbernia includes among its numerous species the well-known *Ptychoparia diademata* (Hall).

Genotype.—*P. pero* Walcott (Proc. U. S. Nat. Mus., 13, 1890, p. 274, pl. 21, fig. 6).

Range.—Upper Cambrian. Mississippi Valley and Rocky Mountains.

XENOSTEGIUM new genus

Pl. 13, fig. 5. (Nat. size.) Outline drawing of the type species.

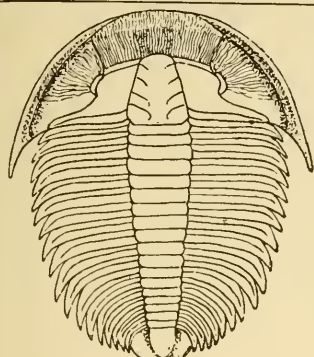
Xenostegium contains many species, some of which were formerly referred to *Megalapis*. It is characterized by the spined pygidium.

Genotype.—*Asaphus* (*Megalapis* ?) *goniocercus*, Meek (6th Ann. Rept., U. S. Geol. Surv. Territories, 1873, p. 480).

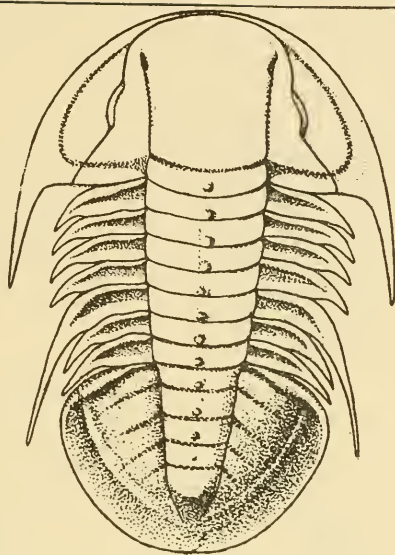
Range.—Upper Ozarkian and possibly Canadian, Cordilleran region.

PLATYPELTIS Calloway. PSILOCEPHALUS Salter

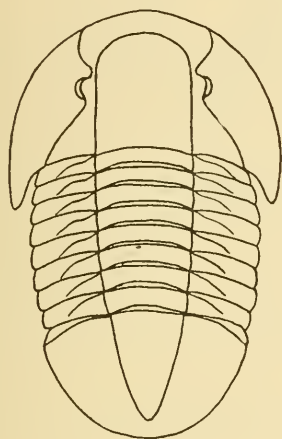
Pl. 14, figs. 5 and 8. Outline drawings of the genotypes. *Platypeltis croftii* and *Psiloccephalus innotatus* were introduced for comparison with *Symphysurina*. (Smith. Misc. Coll., vol. 75, no. 1, 1924, p. 38.)



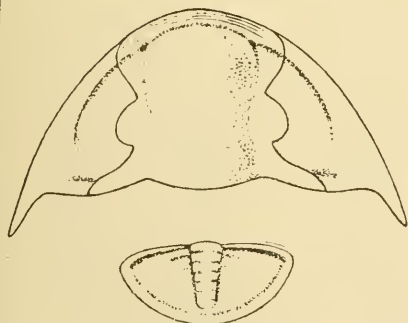
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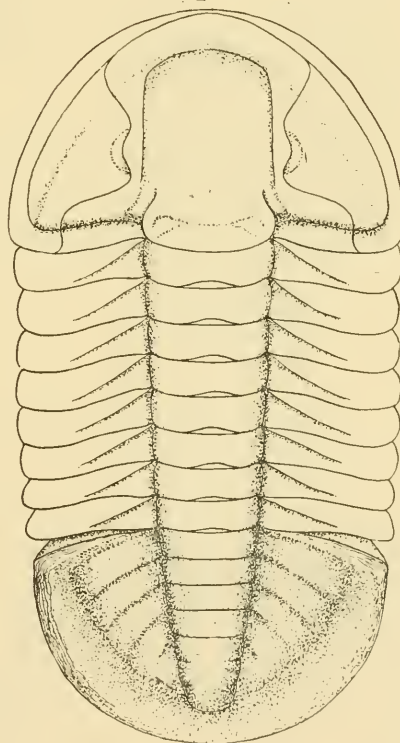
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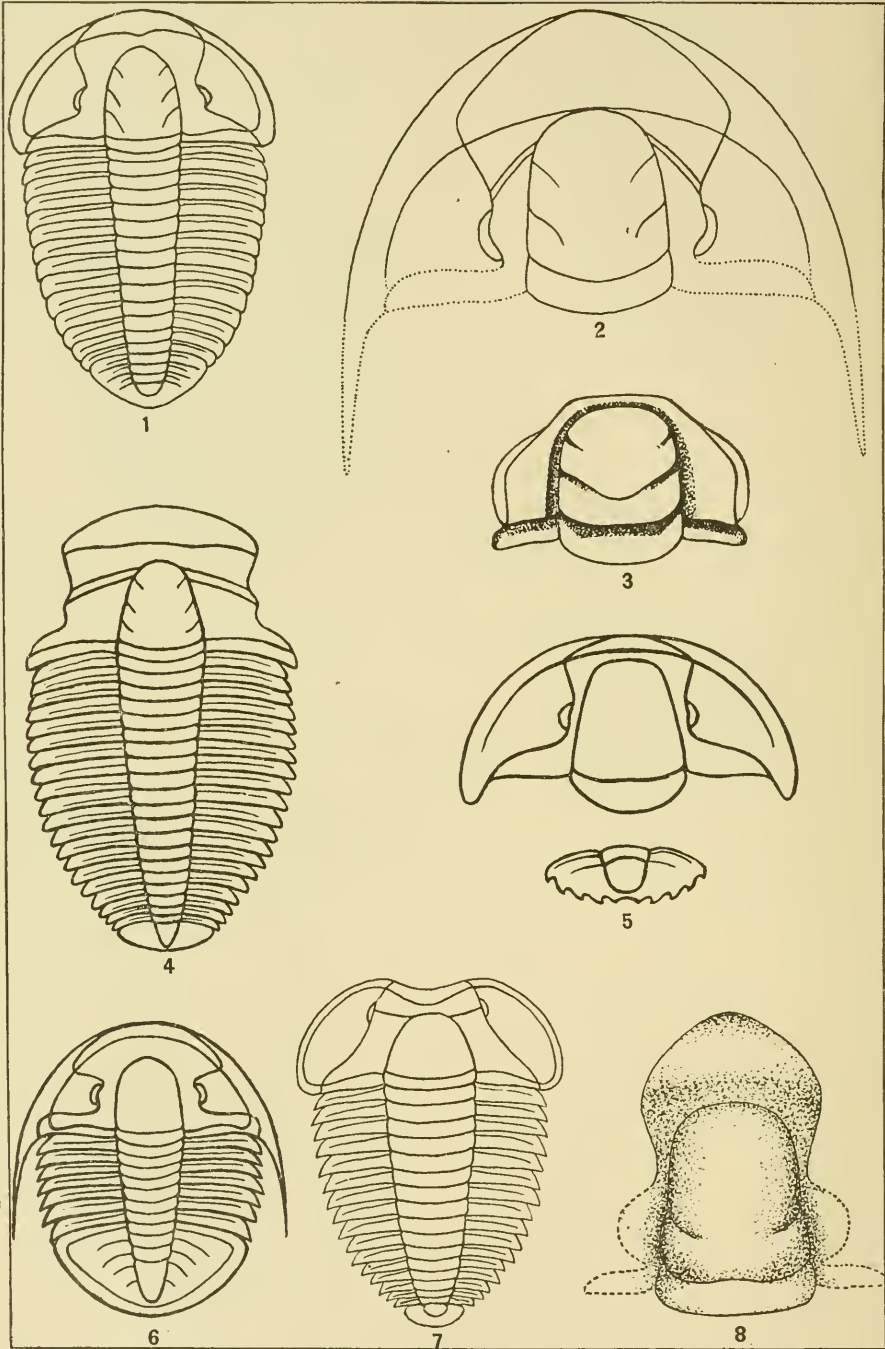


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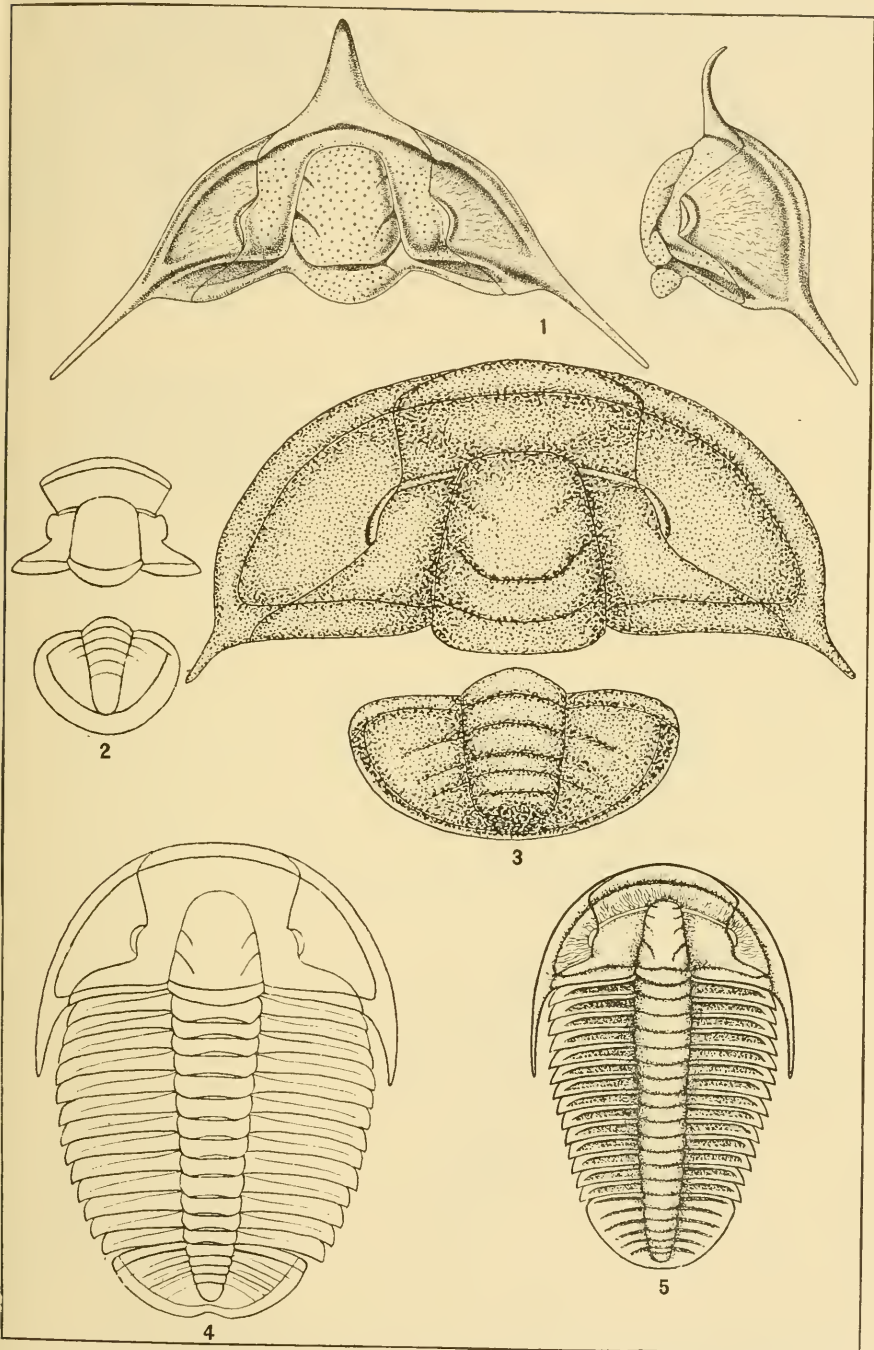
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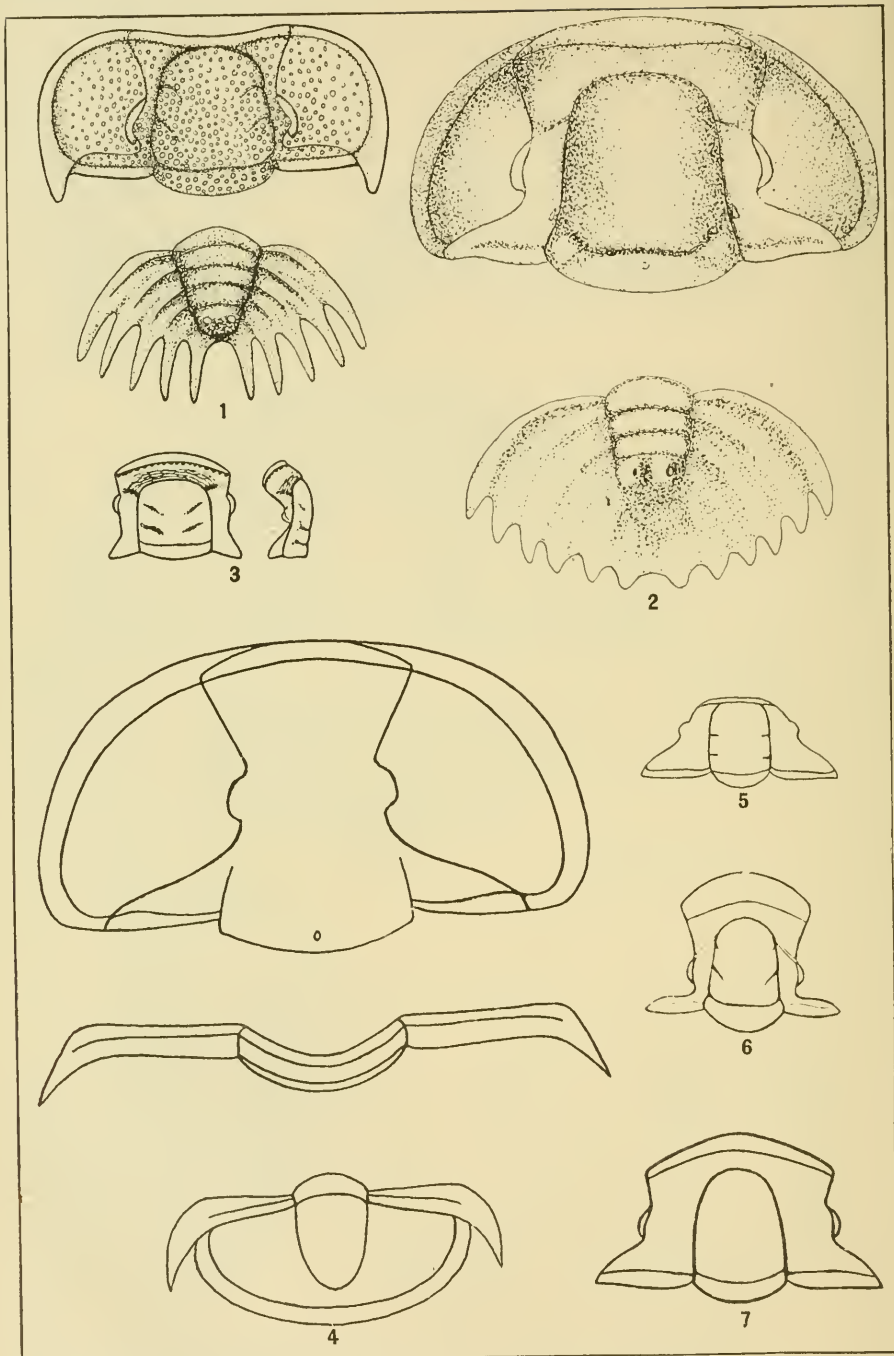
1. *Amecephalus plochensis* (Walcott)3. *Bellefontia collieana* (Raymond)2. *Anorla tontoensis* (Walcott)4. *Hemigraspls affinis* (McCoy)5. *Niobe frontalis* (Dalman)



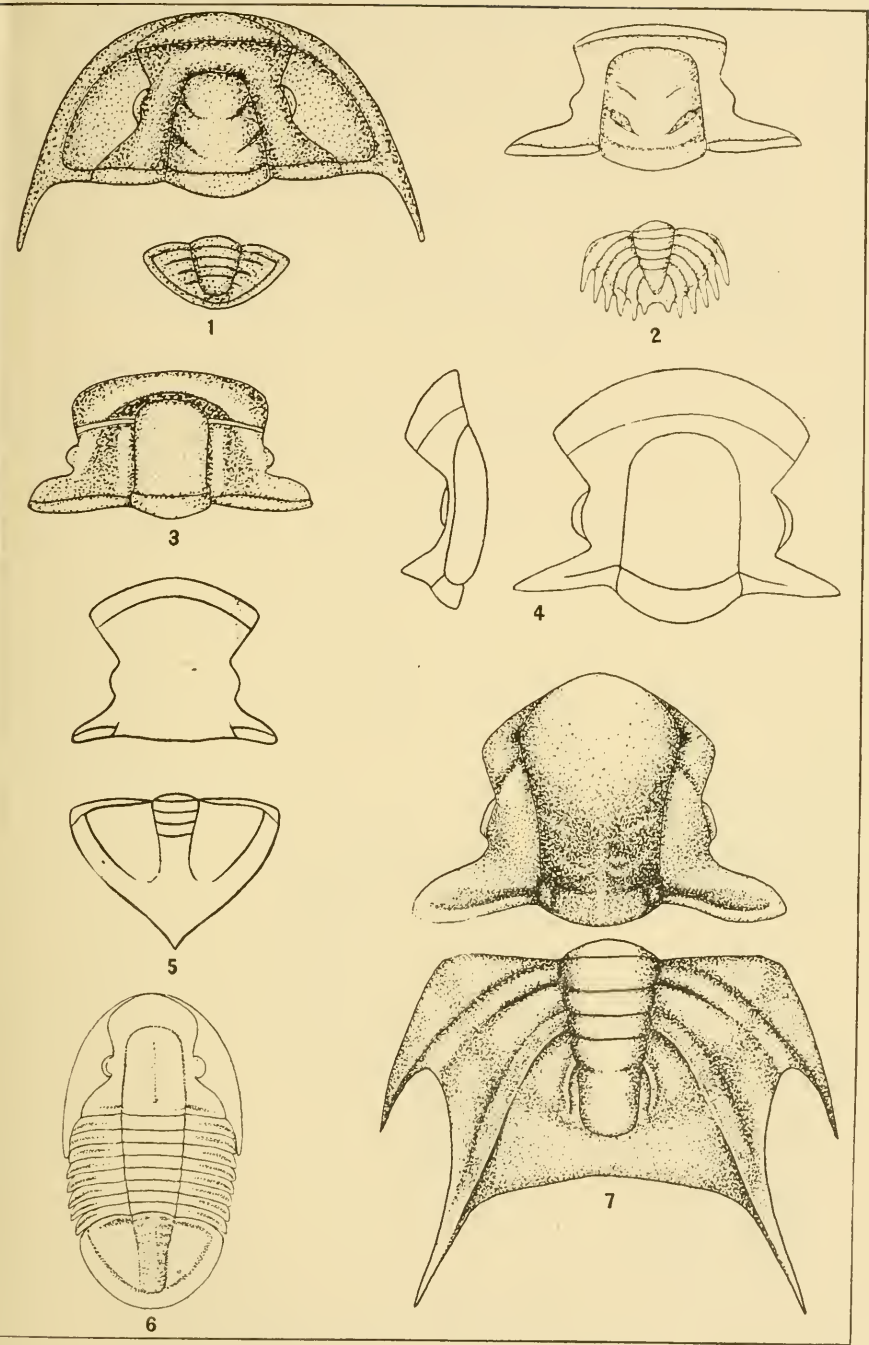
1. *Armonia pelops* Walcott
 2. *Burnetia urania* (Walcott)
 3. *Iringella major* Ulrich and Resser
 4. *Chancia ebdome* Walcott

5. *Corbinia horatio* Walcott
 6. *Cedaria prolifica* Walcott
 7. *Crusola cebes* Walcott
 8. *Eikla nasuta* (Walcott)

1. *Dokimocephalus pernasutus* (Walcott)2. *Dunderbergia nitida* (Hall and Whitfield)3. *Elvinia roemerii* (Shumard)4. *Elrathia kingii* (Meek)5. *Ptychoparia striata* (Corda)



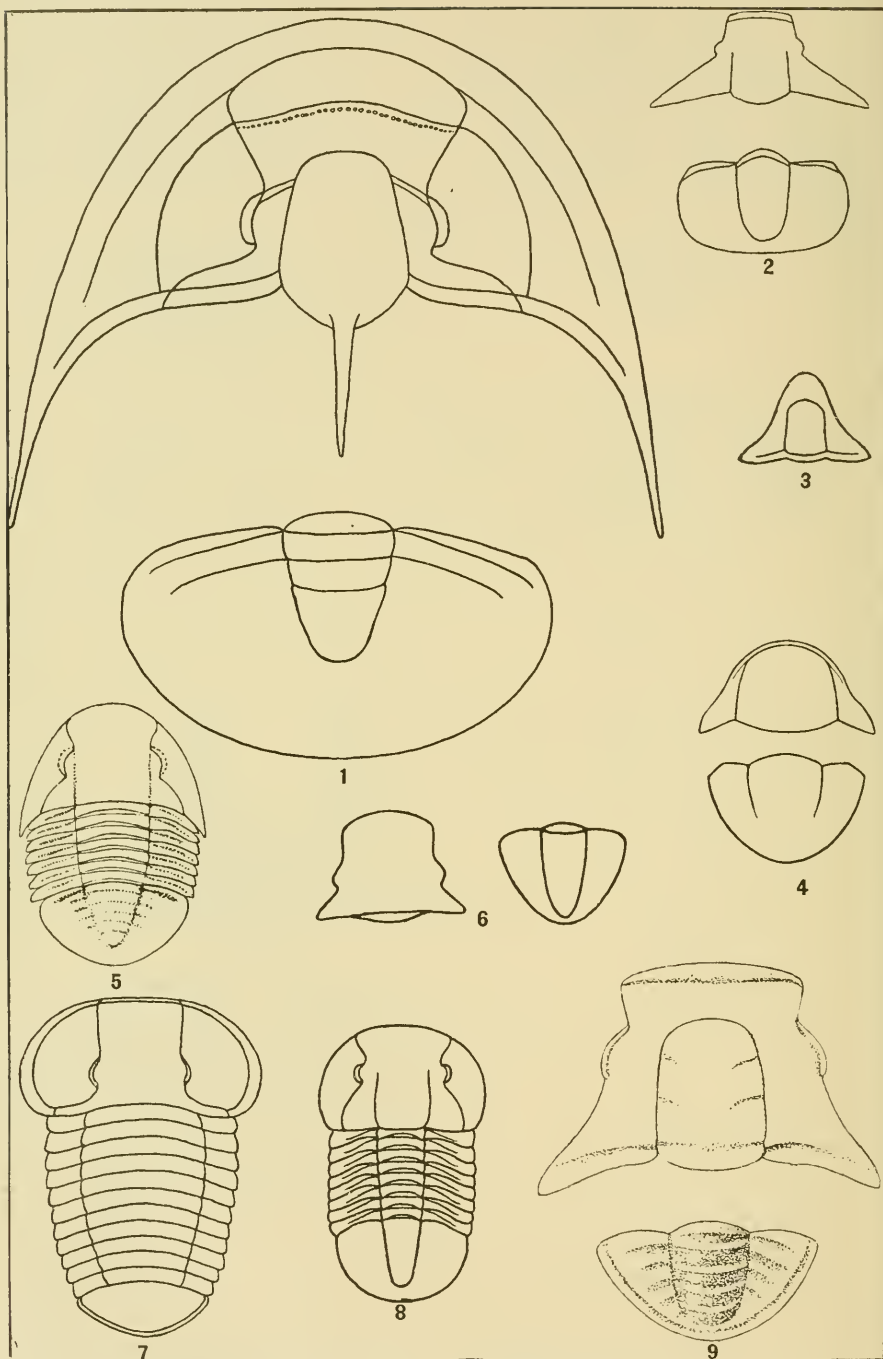
1. *Eureka granulosa* Walcott
 2. *Ma'adla americana* Walcott
 3. *Moxomla hecuba* Walcott
 4. *Housla varro* (Walcott)
 5. *Hardyla metlon* Walcott
 6. *Iddingsia similis* (Walcott)
 7. *Modocla owenl* (Meek and Hayden)



1. *Taeniocephalus shumardi* (Hall)
 2. *Tostonia iole* (Walcott)
 3. *Utla curlo* Walcott

4. *Wilbernia pero* (Walcott)
 5. *Xenostegium gonlocercum* (Meek)
 6. *Isoteloides whitfieldi* (Raymond)

7. *Holteria problematica* (Walcott)



1. <i>Idahola seraplo</i> Walcott	5. <i>Platypeltis croftii</i> (McCoy)
2. <i>Kingstonia aplon</i> Walcott	6. <i>Tsinania cleora</i> (Walcott)
3. <i>Bynumia eumus</i> Walcott	7. <i>Illiaenurus quadratus</i> (Hall)
4. <i>Ucebla ara</i> Walcott	8. <i>Psilicephalus innotatus</i> Salter
	9. <i>Moosia grandis</i> Walcott