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LOWER MIDDLE DEVONIAN PHACOPID
TRILOBITES FROM MICHIGAN, SOUTHWESTERN
ONTARIO, AND THE OHIO VALLEY

BY

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Erwin C. Stumm

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INTRODUCTION

THIS paper deals with trilobites that occur in lower Middle Devonian limestones and dolomites of Michigan, southwestern Ontario, and the Ohio Valley. A prior study (Stumm, 1953*b*, pp. 11-31) described the proetid trilobites that occur in these strata. The present one covers the genera and species of the families Dalmanitidae and Phacopidae that are

found in the Onondaga limestone of southwestern Ontario, the Bois Blanc formation of Michigan, the Detroit River group of southeastern Michigan, the Columbus limestone of Ohio, the Jeffersonville limestone of southern Indiana and northern Kentucky, the Delaware limestone of Ohio, and the Dundee limestone of southeastern Michigan and northwestern Ohio. The stratigraphic range and geographic distribution of the species discussed is tabulated (Table I), together with that of certain other trilobites of the superfamily Phacopidae that are known only from the Onondaga limestone of New York.

Acknowledgments

I wish to thank Dr. G. A. Cooper of the United States National Museum for the loan of many phacopid trilobites in the museum's collections. I am also indebted to Mr. Frederick Hall of the Buffalo Museum of Science, for lending many specimens from that museum, and to Mr. C. F. Kilfoyle of the New York State Museum, for the use of the nearly complete hypotype of *Coronura aspectans* (Conrad).

Previous Work

The earlier workers Meek and Worthen (1868, pp. 416-18) assigned Middle Devonian specimens from southwestern Illinois to *Odontocephalus*. Meek (1871, p. 91, and 1873, pp. 234-36) described *Dalmanites ohioensis*, from the Columbus limestone of Ohio, a species that is conspecific with *Coronura aspectans* (Conrad) 1841. Hall (1876) illustrated specimens of *Phacops cristata*, from southwestern Ontario; of *Trypaulites calypso*, from the Jeffersonville limestone of the Falls of the Ohio; and of *Coronura aspectans* and *C. helena*, from the Columbus limestone of Columbus, Ohio. Hall and Clarke (1888) described *Phacops pipa*, from southwestern Ontario and the Falls of the Ohio; *Anchiopsis anchiops*, from southwestern Ontario; *A. tuberculatus* (as *A. anchiops*) from the Falls of the Ohio; *Odontocephalus bifidus*, *Coronura aspectans*, *C. helena* (as *C. aspectans*), and *Trypaulites calypso*, from the Columbus limestone of Ohio.

Greenops comis, included in Table I, was described by Hall and Clarke from the Onondaga limestone of Cayuga, Ontario. But their species was erected on the basis of a single pygidium and no additional material has since been found. This is the only member of the genus reported from strata earlier than Skaneateles age. *Greenops pleione* Hall and Clarke, 1888, which came from the Falls of the Ohio, was found in the Silver

TABLE I

DISTRIBUTION OF TRILOBITES (SUPERFAMILY PHACOPIDACEA) IN THE LOWER MIDDLE DEVONIAN LIMESTONES OF MICHIGAN, SOUTHWESTERN ONTARIO, THE OHIO VALLEY, AND NEW YORK

SPECIES	Lower Onondaga ls, N. Y.	Lower Onondaga ls, SW. Ont.	Bois Blanc fm, Mich.	Detroit River group, SE. Mich.	Upper Onondaga ls, N. Y.	Columbus ls, Ohio	Jeffersonville ls, Ind., Ky.	Dundee ls, NW. Ohio, SE. Mich.	Delaware ls, Ohio
Family Dalmanitidae									
<i>Coronura aspectans</i> (Conrad) .....	..	..	..	..	x	x	x	..	..
* <i>Coronura myrmecophorus</i> (Green)	x	..	..	..	..	..	..	..	..
<i>Coronura helena</i> (Hall) .....	..	..	..	..	x	x	x	..	..
<i>Coronura</i> sp. aff. <i>C. aspectans</i> (Conrad) .....	..	..	..	..	..	..	..	x	..
* <i>Corycephalus regalis</i> (Hall)	x	..	..	..	..	..	..	..	..
<i>Odontocephalus selenourus</i> (Eaton)	x	x	?	..	..	..	..	..	..
<i>Odontocephalus bifidus</i> (Hall) .....	..	..	..	..	x	x	x	..	..
* <i>Odontocephalus coronatus</i> (Hall)	x	..	..	..	..	..	..	..	..
* <i>Odontocephalus aegeria</i> (Hall)	x	?	..	..	..	..	..	..	..
<i>Odontocephalus magnus</i> Stumm .....	..	..	..	..	..	..	x	..	..
<i>Anchiopsis anchiops</i> (Green)	x	x	x	..	..	..	..	..	..
<i>Anchiopsis tuberculatus</i> Stumm .....	..	..	..	..	..	..	x	..	..
<i>Trypaulites calypso</i> (Hall) .....	..	..	..	..	?	x	x	..	..
<i>Trypaulites</i> sp. aff. <i>T. calypso</i> (Hall) .....	..	..	..	..	..	..	..	x	..
* <i>Trypaulites erinus</i> (Hall)	x	..	..	..	..	..	..	..	..
* <i>Trypaulites macrops</i> (Hall)	x	..	..	..	..	..	..	..	..
<i>Greenops comis</i> (Hall and Clarke) .....	..	x	..	..	..	..	..	..	..
Family Phacopidae									
<i>Phacops cristata</i> Hall	x	x	..	..	..	..	..	..	..
<i>Phacops pipa</i> Hall and Clarke	x	x	x	x	x	x	x	..	..
<i>Phacops rana</i> (Green) .....	..	..	..	..	..	..	..	..	x
<i>Phacops ohioensis</i> Stumm .....	..	..	..	..	..	..	..	x	..
<i>Phacops canadensis</i> Stumm .....	..	x	..	..	..	..	..	..	..
<i>Phacops nasutus</i> Stumm .....	..	..	..	..	..	..	x	..	..

* Known only from the Onondaga ls of New York.

Creek limestone of Skaneateles age and *G. kindlei*, described by Delo (1940, pp. 89–90), is from the Logansport limestone of Indiana, which is of Centerfield age.

SYSTEMATIC DESCRIPTIONS

Phylum ARTHROPODA

Class TRILOBITOMORPHA

Order PROPARIA

Superfamily Phacopidacea

Family Dalmanitidae Delo, 1935

Genus *Coronura* Hall and Clarke

Coronura, Hall and Clarke, 1888, p. 33.

Type species.—By subsequent designation of Vogdes, 1890, p. 83, *Asaphus aspectans* Conrad, 1841, p. 49.

Diagnosis.—Dalmanitidae with cephalon having a glabella with greatly expanded, subcircular frontal lobe, broad brim and preglabellar fields, greatly elevated eyes, and free cheeks extended to form short genal spines. Thorax with narrow, low-convex axis and wide, furrowed pleurae. Pygidium with short or long lateral spines and two prominent posterolateral terminal spines, which may be bifid or trifid. Entire test covered with prominent or weakly developed tubercles.

Coronura aspectans (Conrad)

(Pl. I, Fig. 1; Pl. II, Figs. 1–2)

?*Asaphus diurus* Green, 1839, p. 40.

Asaphus aspectans Conrad, 1841, p. 49.

Dalmania adspectans Hall, 1861, p. 60; 1862, p. 88.

Dalmanites aspectans Hall, 1876, Pl. 13, Figs. 6–8.

Dalmanites ohioensis Meek, 1873, pp. 234–36, Pl. 23, Fig. 1.

Dalmanites helena Hall, 1876, *partim*, Pl. 13, Figs. 11, 14.

Dalmanites (Coronura) aspectans Hall and Clarke, 1888, *partim*, pp. 33–34, Pl. 13, Figs. 1–6, 10–11, ?13.

Dalmanites (Coronura) myrmecophorus Hall and Clarke, 1888, *partim*, Pl. 13, Fig. 12.

Coronura diurus Clarke, 1892, pp. 105–9, Pl. 4, Fig. 1.

Coronura aspectans Delo, 1940, pp. 70–71, Pl. 8, Fig. 1.

Remarks.—A complete redescription of this species is not necessary. Characteristic pygidia are common in the Columbus and Jeffersonville limestones. The terminal spines of the pygidium are trifid with the three prongs in vertical series. Excavation along the side of the terminal spines is necessary to reveal this arrangement. In Clarke's restoration (1892, Pl. 4, Fig. 1) the terminal spines are drawn as if they were horizontally disposed

and a fourth is added. *C. aspectans* may be conspecific with *Asaphus diurus* Green, but it cannot be proved. Green's species was never illustrated, the types are lost, and the locality given (near Xenia, Greene County, Ohio) may be an error, for the region is one in which rocks of Ordovician age are present. Green's specimen, moreover, may have been collected from the drift.

Occurrence.—Middle Devonian: Upper Onondaga limestone, western New York; Columbus limestone, Ohio; Jeffersonville limestone, southern Indiana and northern Kentucky.

Types.—Holotype No. 4065/1, American Museum of Natural History. Illustrated hypotypes No. 13375/5, New York State Museum; No. 26357, United States National Museum; and No. 31297, Museum of Paleontology, University of Michigan.

Coronura helena (Hall)

(Pl. II, Fig. 4)

Dalmania helena Hall, 1861, p. 61; 1862, p. 89.

Dalmanites helena Hall, 1876, *partim*, Pl. 13, Figs. 12–13.

Dalmanites (Coronura) aspectans Hall and Clarke, 1888, *partim*, Pl. 13, Figs. 7–9.

Remarks.—In 1861 Hall established this species, under the name *Dalmania helena*, on the basis of an incomplete pygidium from which the lateral and terminal spines were missing. In 1876 (Pl. 13) he illustrated the original type specimen (Fig. 12) along with three additional pygidia (Figs. 11, 13, 14). Figures 11 and 14 are probably specimens of *Coronura aspectans* (Conrad), for like typical *C. aspectans* they have vertically trifid terminal spines. But the specimen in Figure 13 is a pygidium bearing long, thin lateral spines and horizontally bifid terminal spines. Hall and Clarke (1888, Pl. 13) also refigured the type of *C. helena* (Fig. 7) and two other pygidia with horizontally bifid terminal spines (Figs. 8–9). All three of these pygidia were assigned by them to *C. aspectans*. Although the terminal spines are not preserved on the type of *C. helena*, its weakly developed ornamentation is identical with that of the two pygidia in which the spines are prominently developed. I believe that the type was originally constructed in the same manner and, therefore, restore *C. helena* as a valid species for those forms with weak to obsolete tuberculation, long, slender lateral pygidial spines, and horizontally bifid terminal pygidial spines.

Occurrence.—Middle Devonian: Upper Onondaga limestone, New York; Columbus limestone, Ohio; Jeffersonville limestone, southern Indiana and northern Kentucky.

Types.—Holotype No. 4250/1, American Museum of Natural History. Illustrated hypotype No. 42482, United States National Museum.

Coronura sp. aff. *C. aspectans* (Conrad)
(Pl. II, Fig. 3)

Remarks.—A single pygidium from the Dundee limestone of Michigan is very similar to those typical of *C. aspectans*, but the axial lobe is proportionally narrower and the tuberculation of the test finer. The specimen is a poorly preserved external mold. More definite assignment must await better-preserved material.

Occurrence.—Middle Devonian: Dundee limestone, southeastern Michigan.

Figured specimen.—No. 15131, Museum of Paleontology, University of Michigan.

Genus *Odontocephalus* Conrad

Odontocephalus Conrad, 1840, p. 204.

Type species.—By subsequent designation of Vogdes, 1925, p. 106, *Asaphus selenourus* Eaton, 1832, pp. 31–32, Pl. 1, Fig. 1.

Diagnosis (Delo, 1940, pp. 73–74).—

Synphoriinae in which the anterior cephalic border bears a series of denticles, wider and coalesced distally, narrower and separated proximally; pygidium with a crescent-shaped terminus of two spines.

Odontocephalus selenourus (Eaton)

(Pl. II, Figs. 5–6)

Remarks.—It is unnecessary to give the involved synonymy of this species or to repeat the detailed description of Hall and Clarke (1888, pp. 49–52). One specimen, a well-preserved cephalon (Pl. II, Fig. 5), was found by Carl Rominger in the drift in the vicinity of Ann Arbor, Michigan. Two other specimens were reported by Stauffer (1915) from the Lower Onondaga limestone of southwestern Ontario. These are the only three specimens recorded outside of New York, unless the specimens from the Middle Devonian of Illinois described by Meek and Worthen (1868, pp. 416–17, Pl. 9, Fig. 10) are conspecific. Meek and Worthen proposed the name *Dalmanites (Odontocephalus) arenarius* for the Illinois material in case it turned out to be specifically distinct from *O. selenourus*. But their illustrated material is too incomplete for me to make such a decision.

The type species is easily distinguished from *O. aegeria* (Hall), the only other species known from the Lower Onondaga limestone. *O. selenourus* has nine denticles on the brim, while *O. aegeria* has eleven. *O. aegeria* has not been found outside of New York.

Occurrence.—Middle Devonian: Lower Onondaga limestone, New York and southwestern Ontario; ? Bois Blanc formation, Michigan.

Types.—Eaton's holotype is lost. Illustrated hypotypes Nos. 31330, 31331, Museum of Paleontology, University of Michigan.

Odontocephalus bifidus (Hall)

(Pl. II, Fig. 7)

Dalmania bifida Hall, 1861, p. 63; 1862, p. 9.

Dalmanites (Odontocephalus) aegeria Meek and Worthen, 1868, (*non* Hall, 1861), p. 417, Pl. 10, Figs. 4a-c.

Dalmanites (Odontocephalus) bifidus Hall and Clarke, 1888, p. 53, Pl. 11B, Figs. 22-25.

Odontocephalus bifidus Delo, 1940, pp. 75-76, Pl. 8, Figs. 18-19.

Description.—Cephalon with a relatively wide brim, divided anterior to the glabella into eleven toothlike extensions. Extensions attenuate posteriorly, expanded at anterior ends and lying in contact. Frontal lobe of glabella large, transversely oval in outline, low convex. Anterior pair of glabellar furrows deeply impressed, extending from the brim in an arcuate curve posteriorly and axially almost to the axis. Medial and posterior glabellar lobes small, transversely subrectangular. Medial and posterior glabellar furrows horizontally directed, short, weakly impressed. Occipital furrow narrow, relatively deep. Occipital ring broad, smooth, low convex. Eyes and palpebral lobes not preserved on specimen illustrated (Pl. II, Fig. 7); in Meek and Worthen's figure (1868) eyes prominent, reniform, with 25 lenses in a row around the lower margin. Ocular platforms smooth, moderately inclined toward the brim. Genal spines not preserved on specimen illustrated. On cephalon figured by Meek and Worthen (1868) the genal spines are relatively narrow, tapering posteriorly and extending to the third or fourth thoracic segment.

Thorax with axis occupying central third, of medium convexity, composed of smooth, relatively flat-topped segments. Pleurae with low-convex segments each bearing a prominent medial groove.

Pygidium with a relatively narrow axis, tapering posteriorly, bearing eight segments. Pleurae with 7 to 8 broad, flat, unfurrowed segments. Terminal spines blunt, wide, parallel, closely set.

Entire test coarsely punctate.

Remarks.—This species was originally described by Hall (1861) from a single pygidium. Seven years later a cephalon was described by Meek and Worthen, who assigned it to *O. aegeria*. The present description is based on a nearly complete specimen in the collections of the United States National Museum and on certain cephalic features better preserved on Meek and Worthen's specimen.

Occurrence.—Middle Devonian: Upper Onondaga limestone, New York; Columbus limestone, Ohio; Jeffersonville limestone, southern Indiana and northern Kentucky; Grand Tower limestone, southwestern Illinois.

Types.—Syntypes Nos. 13366/1 and 13366/2, New York State Museum. Hypotype No. 79161, United States National Museum.

***Odontocephalus magnus* Stumm, sp. nov.**

(Pl. II, Fig. 8)

Description.—Cephalon and thorax unknown.

Pygidium large, subtrigonal in outline, without a well-defined brim. Axis relatively narrow, tapering posteriorly, composed of 18 low-convex segments. Posterior segment thickened, much wider, and rounded posteriorly. Pleurae with 14 flat-topped segments bearing distinct medial grooves and separated by wide, shallow furrows. Twelfth to fourteenth segments coalesced at peripheral ends and extended to form pygidial spines on each side of posterior of axis. Spines widely separated by broad, flat platform posterior to last axial segment. Spines directed obliquely outward, length unknown. Entire surface covered with very low, inconspicuous tubercles.

Remarks.—The large size of this pygidium and the large number of axial and pleural segments make this species easy to distinguish from any other species of *Odontocephalus*.

Occurrence.—Middle Devonian: Jeffersonville limestone, southern Indiana and northern Kentucky.

Type.—Holotype No. 53163, United States National Museum.

Genus *Trypaulites* Delo

Trypaulites Delo, 1935, pp. 412–13; 1940, p. 85.

Type species.—By original designation, *Dalmania calypso* Hall, 1861, p. 61.

Diagnosis (Delo, 1940, p. 85).—

Synphoriinae with coalescence of all three pairs of glabellar lobes advanced; frontal lobe small, transversely elliptical; medial portion of glabella between first and second lobes depressed; second and third glabellar furrows reduced to shallow pits; dorsal furrows much reduced and elevated opposite eyes; eyes large with elevated palpebral lobes; short genal spines; broad uninterrupted cephalic border.

Pygidium rounded behind, moderately convex, with well defined border; pygo-rachis of less than 15 annulations, continuing to posterior margin; pleural ribs flat, broad, indistinctly furrowed.

Remarks.—The following observations may be added to this diagnosis: Thorax with broadly convex, unornamented axis occupying medial third; pleurae with well-developed, narrow, deep medial grooves.

Trypaulites calypso (Hall)

(Pl. III, Figs. 1-2)

Dalmania calypso Hall, 1861, pp. 61-62; 1862, p. 89.*Dalmanites calypso* Hall, 1876, Pl. 13, Figs. 1-2.*Dalmanites (Chasmops) calypso* Hall and Clarke, 1888, pp. 64-66.*Trypaulites calypso* Delo, 1935, pp. 412-13; 1940, p. 85.

Remarks.—The detailed description of Hall and Clarke (1888, pp. 64-66) need not be repeated. The species was originally based on a pygidium collected from the Jeffersonville limestone of southern Indiana. At a later date an external mold of a complete specimen was found in the Columbus limestone in the vicinity of Sandusky, Ohio. A cast of this mold (Pl. III, Fig. 1) shows all the essential features of the species.

Occurrence.—Middle Devonian: Columbus limestone, Ohio; Jeffersonville limestone, southern Indiana and northern Kentucky.

Types.—Holotype No. 4249, American Museum of Natural History. Hypotypes No. 13370/1, New York State Museum, an external mold of only nearly complete specimen, (plaster cast No. 31316, Museum of Paleontology, University of Michigan) and No. 31332, Museum of Paleontology, University of Michigan.

Trypaulites sp. aff. *T. calypso* (Hall)

(Pl. III, Fig. 3)

Description.—Cephalon and thorax unknown.

Pygidium measuring 3 cm. in maximum diameter and 3.2 cm. in length, subtrigonal, with a rounded margin. Axis with 13 segments, each bearing a blunt medial spine. Pleurae with 12 segments, each with a distinct medial groove. Brim relatively narrow, sloping gently toward the periphery.

Remarks.—Except for the greater proportional width and larger number of axial and pleural segments, this pygidium is similar to typical *T. calypso*. As only one incomplete pygidium is known further description must await the discovery of additional material.

Occurrence.—Middle Devonian: Dundee limestone, southeastern Michigan.

Figured specimen.—No. 15132, Museum of Paleontology, University of Michigan.

Genus *Anchiopsis* Delo*Anchiopsis* Delo, 1935, p. 412.

Type species.—By original designation and monotypy, *Calymene anchiops* Green, 1832, p. 35, cast No. 7.

Diagnosis (Delo, 1935, p. 412).—

Cephalon short and wide; glabellar lobes confluent and highly elevated distally; second and third pairs of lateral furrows represented by rounded pits separated by rounded depressed median ridge; dorsal furrows continuous, but less deeply impressed than first lateral pair, which tend to join the sub-mesial pits and divide posterior portion of glabella into three linear ridges; nuchal and genal spines may be present. Pygidium triangular, with short, triangular upturned spine; pygorachis short, bluntly terminated, consisting of less than 15 annulations; pleural ribs show only faint distal furrowing, absent on casts.

Remarks.—Richter (1942, p. 174) considered that Reed (1907, p. 169) had designated *Calymene anchiops* Green as the type species of his genus *Anchiopella*. Reed's discussion, however, is ambiguous. After describing the major structures of five species of trilobites from the Devonian Bokkeveld series of South Africa, Reed (1907, p. 169) makes the following statements:

I would refer this whole set of species to a special subgroup of *D. anchiops* characterized (1) by fewer (typically 8) segments in the pygidium, and only 5 pairs of ribs being present as a rule on the lateral lobes; (2) by the presence of median spines on the axis of thorax and pygidium; (3) by small, instead of stout and long, genal spines (in *D. anchiops* var. *armatus*, Hall (6, p. 62, pl. ix, figs. 7–9), the genal spines are inconspicuous or obsolete); (4) by less pronounced coalescence of first and second lateral lobes of glabella. (Nom. prop. *Anchiopella*).

Since by "this whole set of species" Reed refers to the five species from the Bokkeveld series, which he distinguishes by four major differences from typical *D. anchiops*, he evidently meant his "Nom. prop. *Anchiopella*" to apply to them. But under this interpretation *D. anchiops* is not a genosytype of *Anchiopella*. Pending a decision on this matter, I shall retain *Anchiopsis* as a valid genus.

Anchiopsis anchiops (Green)

(Pl. III, Figs. 4–5)

Calymene anchiops Green, 1832, p. 35, cast No. 7.*Asaphus laticostatus* Green, 1832, p. 45, cast No. 13*Phacops anchiops* Burmeister, 1846, p. 90.*Dalmania anchiops* Hall, 1861, p. 55; 1862, p. 83.*Dalmanites anchiops* Hall, 1876, Pl. 9, Figs. 1, 3–6, 10, 12–13; Pl. 10, Figs. 6–14.*Dalmanites (Chasmops) anchiops* Hall and Clarke, 1888, p. 59–61.*Anchiopsis anchiops* Delo, 1935, p. 412; 1940, p. 83.

Remarks.—The detailed description (Hall and Clarke, 1888, pp. 59–61) of this well-known species need not be repeated. Several complete specimens are known from the Lower Onondaga limestone of New York and isolated cephalons and pygidia are common in southwest Ontario and the Bois Blanc formation of Michigan.

Occurrence.—Middle Devonian: Lower Onondaga limestone, New York and southwestern Ontario; Bois Blanc formation, Mackinac Straits region, Michigan. The reported occurrence of this species from the Oriskany sandstone, Walpole, Ontario, is in error. The formation in which it is present there is the basal Springvale sandstone member of the Lower Onondaga limestone.

Types.—Holotype No. 13362/4, New York State Museum. Illustrated hypotypes Nos. 23596 and 31317, Museum of Paleontology, University of Michigan.

***Anchiopsis tuberculatus* Stumm, sp. nov.**

(Pl. III, Figs. 6–10)

Anchiopsis anchiops (Hall and Clarke), 1888, *partim*, Pl. 10, Fig. 1 only.

Description.—Cephalon large, highly convex. Glabella with frontal lobe one and one-half times as wide as long; lozenge-shaped, greatly elevated posteriorly, covered with coarse, rounded tubercles. Anterior pair of glabellar furrows arcuate, directed axially and posteriorly. Anterior pair of lateral glabellar lobes large, rounded, highly convex, continuing posteriorly into medial pair without a noticeable depression. Medial pair of glabellar furrows represented by rounded pits; posterior pair by horizontal grooves. Posterior pair of glabellar lobes relatively narrow and transversely elongate. Occipital furrow relatively narrow and deeply impressed. Occipital ring relatively wide and low convex. Ocular platforms almost vertically inclined, covered with coarse, rounded, low-convex tubercles. Eyes and posterior parts of free cheeks not preserved.

Thorax unknown.

Pygidium triangular in outline. Axis relatively narrow, tapering posteriorly, with about 12 low-convex segments. Each segment with a pair of very low, inconspicuous nodes. Pleurae with 10 low-convex, wide segments bearing very faint medial grooves. Segments very finely tuberculate peripherally and bearing a few very low and inconspicuous nodes. Terminal spine wide, short, rapidly tapering posteriorly, moderately upturned.

Remarks.—This species differs from *Anchiopsis anchiops* (Green) in the much greater convexity of the cephalon, the greater size and higher convexity of the anterior lateral glabellar lobes, and the coarser tuberculation on the frontal lobe of the glabella and ocular platforms. In addition, *A. tuberculatus* has a larger number of pygidial pleural segments and a shorter, wider terminal spine.

Occurrence.—Middle Devonian: Jeffersonville limestone, Falls of the Ohio River, near Louisville, Kentucky.

Types.—Holotype and paratypes No. 79062, United States National Museum.

Family Phacopidae Hawle and Corda, 1847
Genus *Phacops* Emmrich

Phacops Emmrich, 1839, p. 18.

Type species.—By subsequent designation of Barrande, 1852, p. 498, *Calymene latifrons* Bronn, 1825, p. 317.

Diagnosis (Delo, 1940, p. 15).—

Typical phacopinae with rounded genal angles (short spines in a few species); glabella inflated, protuberant; subcranial furrow continuous, separated from facial suture by a narrow marginal ridge; hinder end of furrow sharp, the higher; cephalic doublure slightly convex.

Phacops cristata Hall

(Pl. IV, Figs. 8, 10)

Phacops cristata Hall, 1861, p. 67; 1862, p. 95, 1876, Pl. 6.

Phacops bombifrons Hall, 1861, p. 67; 1862, p. 95, 1876, Pl. 6.

Phacops cristata Hall and Clarke, 1888, pp. 14–18.

Phacops cristata Delo, 1940, pp. 16–17.

Description (Delo, 1940, p. 16).—

Glabella convex, protuberant, broadly rounded in front. Dorsal furrows straight; genal spines somewhat upturned, stout. First and second lateral furrows and lobes normal for the genus, third lateral and nuchal furrows deep distally and coalesced mesally in a broad sulcus; third lobe obsolete mesally. Nuchal ring elevated, spinose. Genal area large. Eyes with about 60 facets, reach glabellar level, rather short. Posterior cephalic margin rather strongly curved. Glabellar ornamentation consists of low, blunt tubercles which are somewhat separated; usually not apparent on casts. Lateral margins indistinctly pustulose.

Thororachis rather narrow. Each annulation bears a short median spine, represented by nodes on immature individuals.

Pygidium very broadly rounded, convex, rachis moderately arched, indistinct terminally, composed of six distinct and two indistinct annulations. There are four or five furrowed ribs which curve uniformly to the border. Grooves deep, furrows only moderately distinct, on casts visible only on first and second ribs. Surface smooth.

Occurrence.—Middle Devonian: Lower Onondaga limestone, New York and southwestern Ontario. I have seen no specimens of this species in Michigan, Ohio, or Indiana, as has previously been reported by earlier authors. The reported occurrence of *P. cristata* from the Oriskany sandstone of Ontario is in error. The formation from which these specimens were collected there is the basal Springvale sandstone member of the Lower Onondaga limestone.

Types.—Syntypes Nos. 13883/1, 13883/8, 13883/11, 13883/13, New York State Museum. Illustrated hypotype No. 31320, Museum of Paleontology, University of Michigan.

Phacops pipa Hall and Clarke

(Pl. IV, Figs. 1-6, 9, 11)

Phacops cristata var. *pipa* Hall and Clarke, 1888, pp. 18-19.

Phacops cristata var. *pipa* Delo, 1940, p. 17.

Description (Delo, 1940, p. 17).—

Glabella as in *P. cristata*, but with ornamentation somewhat more scattered and usually visible on casts. Third lobes obsolete; nuchal and third lateral furrows coalesced mesally. Nuchal lobe elevated, with a row of low tubercles. Eyes rather short, not attaining glabellar level, fewer than 45 facets, set well forward, leaving a considerable space between them and the postmarginal furrow. Genal spines short, rather blunt. Posterior cephalic margin rather straight.

Thororachis nonspinose; otherwise as in *P. cristata*.

Pygidium relatively wider than in *P. cristata*, otherwise essentially the same except that the ribs describe an abrupt bend near the dorsal furrow, thence extending uniformly to the margin.

Remarks.—The number of lenses in the eyes ranges from 35 to 54 in a suite of specimens examined. Hall and Clarke (1888, p. 18) cited 23 as the lowest number of facets. Their specimens included some here placed in *P. canadensis*, sp. nov. *Phacops pipa* has so many distinctive characters that it is here elevated to full specific rank. The species is widespread, its occurrence extends all the way through the sequence of formations between the Oriskany sandstone and the Hamilton group.

Occurrence.—Middle Devonian: Onondaga limestone, New York and southwestern Ontario; Bois Blanc formation, Mackinac Straits region, Michigan; Detroit River group—Amherstburg dolomite, southeastern Michigan; Columbus limestone, Ohio; Jeffersonville limestone, southern Indiana and northern Kentucky.

Types.—Syntypes Nos. 13384/1 to 13384/8, New York State Museum. Illustrated hypotypes No. E7954, Buffalo Museum of Science; Nos. 31321, 31322, 31323, 31324, 31325, 31326, Museum of Paleontology, University of Michigan.

Phacops canadensis Stumm, sp. nov.

(Pl. IV, Figs. 7, 15, 18)

Description.—Cephalon lunate, about twice as wide as long. Glabella short, about twice as wide as long, with a very steep, convex frontal margin extending slightly over the brim. Posterior lobes and furrows as in

P. pipa. Palpebral lobes very small and inconspicuous. Eyes small, much lower than glabella, subquadrate in outline, composed of 20 to 25 facets in vertical rows of two or three. Preglabellar fields smooth, steeply inclined toward periphery. Free cheeks extended posteriorly to form a narrow, sharp genal spine which is directed obliquely upward. Glabella covered with low, rounded tubercles.

Thorax and pygidium unknown.

Remarks.—This species is similar to *P. pipa* but differs from it in having much shorter and wider glabella, smaller eyes with much fewer lenses, and relatively long, slender genal spines.

Occurrence.—Middle Devonian: Lower Onondaga limestone, southwestern Ontario.

Types.—Holotype No. 31327; paratype No. 31328, Museum of Paleontology, University of Michigan.

Phacops nasutus Stumm, sp. nov.

(Pl. IV, Figs. 12–13, 16)

Description.—Cephalon subtriangular with a rounded anterior margin. Glabella subtrigonal with a relatively flat dorsal surface sloping anteriorly, about two-thirds as long as wide, and with the anterior one-half projecting beyond the brim. Posterior lobes and furrows and occipital ring not preserved. Palpebral lobes small. Eyes relatively large, slightly higher than glabella, with 50 to 60 lenses in, on an average, 5 vertical rows. Preglabellar fields smooth, moderately inclined peripherally, becoming relatively flat near peripheral edges. Posterior of free cheeks extended to form a short, nodose genal spine.

Thorax and pygidium unknown.

Remarks.—This species, known only from the holotype, is similar to *P. pipa* but can be distinguished from it by the triangular-shaped glabella which extends much farther anteriorly over the brim than in that form.

Occurrence.—Middle Devonian: Jeffersonville limestone; Falls of the Ohio River, near Louisville, Kentucky.

Type.—Holotype No. 31329, Museum of Paleontology, University of Michigan.

Phacops ohioensis Stumm, sp. nov.

(Pl. IV, Figs. 14, 17)

Description.—Cephalon and thorax unknown.

Pygidium almost twice as wide as long, with a highly convex axis, moderately convex pleurae, and a prominent, peripherally inclined, slightly

convex brim. Axis sharply elevated both laterally and proximally, composed of about 10 relatively smooth, low-convex segments, separated by wide, shallow, furrows. Pleurae with 8 distinct segments separated by very wide, shallow furrows. Segments with distinct medial grooves. Grooves increasing slightly in diameter as they approach the brim. A row of low tubercles present along either side of medial grooves.

Remarks.—This species is very distinct from other species of *Phacops* in many structures of the pygidium. From *P. rana* it can be distinguished by the prominent brim, highly convex axis, and medial grooves on the pleurae. None of the Onondaga species of *Phacops* has such a prominent brim and divergent medial grooves on the pleural segments.

Occurrence.—Middle Devonian: Dundee limestone, southeastern Michigan and northwestern Ohio.

Types.—Holotype No. 31333. Paratype No. 15172, Museum of Paleontology, University of Michigan.

Phacops rana (Green)

(Pl. IV, Figs. 19–20)

Remarks.—A review of this species and description of several new subspecies were recently published (Stumm, 1953*a*, pp. 135–40). A complete specimen that is identical with those from the Hamilton group of New York has been found in the Delaware limestone of Ohio. It is the only complete individual of this species known from this formation.

Occurrence.—Middle Devonian: Delaware limestone, Columbus, Ohio.

Type.—Hypotype No. 42494, United States National Museum.

LITERATURE CITED

- BARRANDE, J. 1852 *Système Silurien du centre de la Bohême*. Pt. 1: Recherches paléontologiques. 1. Crustacés: Trilobites. Prague and Paris.
- BRONN, H. 1825. Ueber zwei neue Trilobiten-Arten. *Zeits. für Mineral.*, Vol. 1, Pt. 1.
- BURMEISTER, H. 1843. *Die Organization der Trilobiten*. English ed.; London: Ray Society, 1846.
- CLARKE, J. M. 1892. Note on *Coronura aspectans*, Conrad (sp.). N. Y. State Geologist, 10th Ann. Rept., for 1890.
- CONRAD, T. A. 1840. Third Annual Report of the Paleontological Department (of New York). Fourth Ann. Rept. N. Y. Geol. Surv.
- 1841. Description of New Genera and Species of Organic Remains, Crustacea. Fifth Ann. Rept., *ibid.*
- DELO, D. M. 1935. A Revision of the Phacopid trilobites. *Journ. Paleontol.*, Vol. 9, No. 5.

- 1940. Phacopid Trilobites of North America. Geol. Soc. Amer. Special Paper, No. 29.
- EATON, A. 1832. Geological Textbook Aiding the Study of North American Geology. 2d. ed.; Albany, N. Y.
- EMMRICH, H. F. 1839. De Trilobitis. Dissertatio petrefactologica quam consensu et auctoritate amplissimi philosophorum ordinis. Berlin.
- GREEN, J. 1832. A Monograph of the Trilobites of North America. Philadelphia.
- 1837. Description of Several New Trilobites. Amer. Journ. Sci., 1st Ser., Vol. 32.
- 1839. Description of a New Trilobite. Amer. Journ. Sci., 1st. ser., Vol. 37.
- HALL, J. 1861. Descriptions of New Species of Fossils from the Upper Helderberg, Hamilton, and Chemung Groups. N. Y. State Cabinet Nat. Hist. Ann. Rept., No. 14.
- 1862. *Ibid.*, Ann. Rept., No. 15.
- 1876. Illustrations of Devonian Fossils: Gasteropoda, Pteropoda, Cephalopoda, Crustacea, and Corals of the Upper Helderberg, Hamilton, and Chemung Groups. Albany.
- and CLARKE, J. M. 1888. Descriptions of the Trilobites and Other Crustacea of the Oriskany, Upper Helderberg, Hamilton, Portage, Chemung, and Catskill Groups. N. Y. Geol. Surv., Paleontol. of New York, Vol. 7.
- HAWLE I., and CORDA, A. J. C. 1847. Prodröm einer Monographie der Böhmischen Trilobiten. Abh. Böhm. Gesell. Wiss., Prague, Vol. 5.
- MEEK, F. B. 1871. Descriptions of New Species of Invertebrate Fossils from the Carboniferous and Devonian Rocks of Ohio. Proc. Acad. Nat. Sci. Phila.
- 1873. Description of Invertebrate Fossils of the Devonian and Silurian Systems. Geol. Surv. Ohio, Vol. 1, Pt. 2.
- and WORTHEN, A. H. 1868. Paleontology, Ill. Geol. Surv., Vol. 3.
- REED, F. R. C. 1907. Fauna of the Bokkeveld Beds. Geol. Mag., 5th ser., Vol. 4.
- RICHTER, R. 1942. Die Trilobiten der Weismes-Schichten am Hohen Venn. Senckenbergiana, Bd. 25, No. 3.
- STAUFFER, C. R. 1909. The Middle Devonian of Ohio. Geol. Surv. Ohio, 4th Ser., Bull. 10.
- 1915. The Devonian of Southwestern Ontario. Canada Dept. Mines, Geol. Surv. Mem. 34.
- STUMM, E. C. 1953a. Trilobites of the Devonian Traverse Group of Michigan. Contrib. Mus. Paleontol. Univ. Mich., Vol. 10, No. 6.
- 1953b. Lower Middle Devonian Proetid Trilobites from Michigan, Southwestern Ontario, and Northern Ohio. *Ibid.*, Vol. 11, No. 2.
- VOGDÉS, A. W. 1890. A Bibliography of Paleozoic Crustacea. U. S. Geol. Surv. Bull., No. 63.
- 1925. Paleozoic Crustacea. Pt. 1, A Bibliography of Palaeozoic Crustacea, Pt. 2, A List of the Genera and Subgenera of the Trilobita. Trans. San Diego Soc. Nat. Hist., Vol. 4.

PLATES

All specimens unless otherwise indicated catalogued and deposited in the Museum of Paleontology, University of Michigan.

EXPLANATION OF PLATE I

	PAGE
<i>Coronura aspeicians</i> (Conrad)	204
Latex cast No. 31318 of hypotype No. 13375/5, N. Y. State Museum, an external mold and the only nearly complete specimen known. Upper Onondaga ls; quarry at Limerock, about 2 miles west of Le Roy, New York. × 1.	

PLATE I

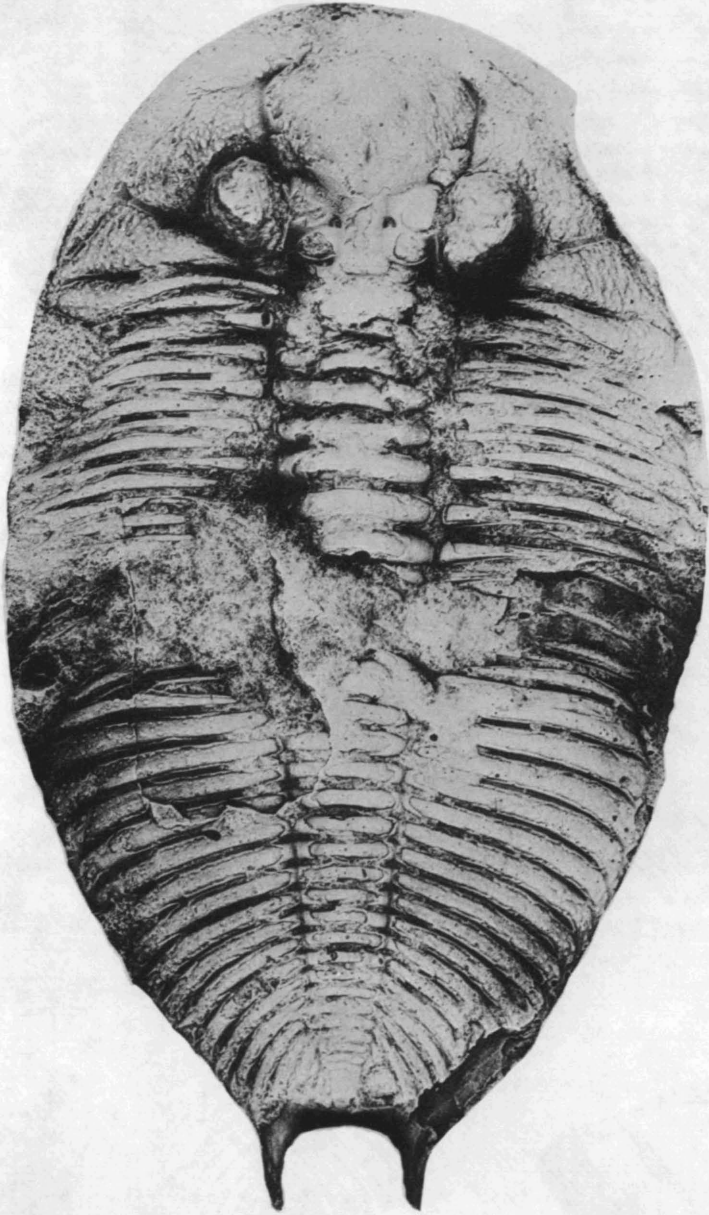
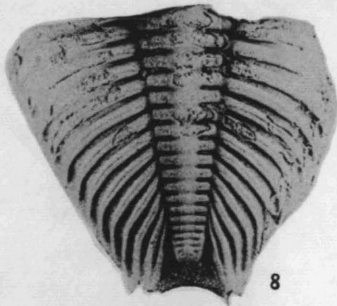
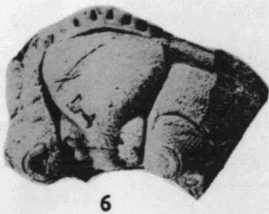
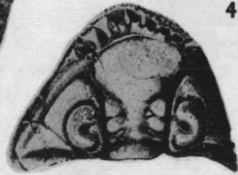
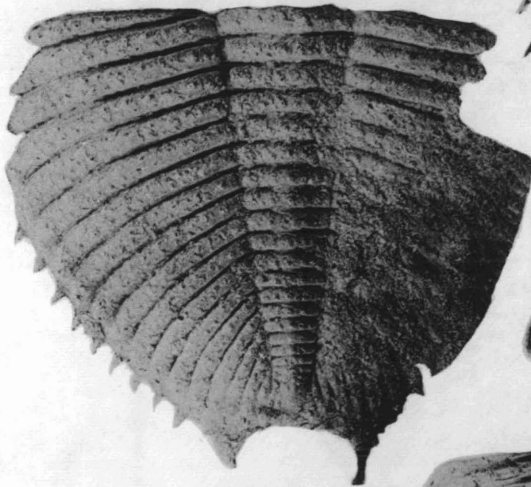
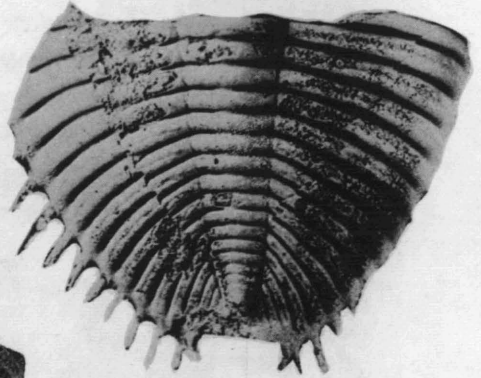
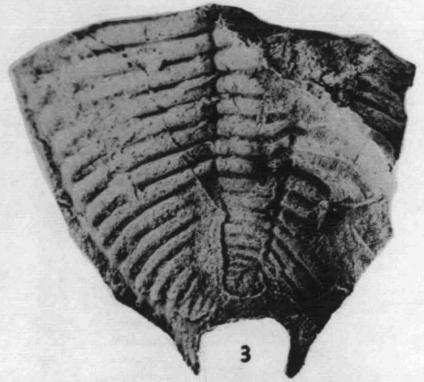
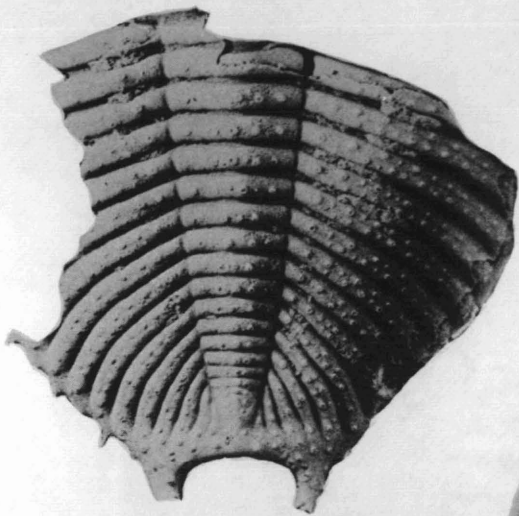


PLATE II



EXPLANATION OF PLATE II

(All figures $\times 1$)

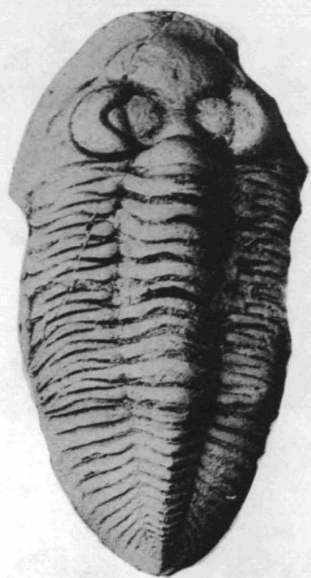
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<i>Coronura aspectans</i> (Conrad)	204
FIG. 1. Well-preserved pygidium with test and typical ornamentation. Hypotype No. 26357, U. S. National Museum. Jeffersonville ls, Falls of the Ohio, Louisville, Ky.	
FIG. 2. Latex cast of external mold of a pygidium, marginal spines well preserved. Hypotype No. 31297. Columbus ls; quarry, Marblehead Peninsula, north of Sandusky Bay, Ottawa Co., O.	
<i>Coronura</i> sp. aff. <i>C. aspectans</i> (Conrad)	206
FIG. 3. Latex cast of external mold of partly exfoliated pygidium. Figured specimen No. 15131. Dundee ls; abandoned quarry, Solvay Process Company, Sibley, 2 mi. north of Trenton, Wayne Co., Mich.	
<i>Coronura helena</i> (Hall)	205
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<i>Odontocephalus selenourus</i> (Eaton)	206
FIG. 5. Well-preserved cephalon; glabellar lobation, anteriorly expanded denticles. Hypotype No. 31330. Drift (either from Bois Blanc fm, Michigan, or Lower Onondaga ls, southwestern Ontario), Ann Arbor, Mich.	
FIG. 6. Cephalon with test (compare Fig. 5). Hypotype No. 31331. Lower Onondaga ls, abandoned Fogelsanger Quarry, Williamsville, N. Y.	
<i>Odontocephalus bifidus</i> (Hall)	207
FIG. 7. Only nearly complete specimen known; denticles, glabellar lobation, and parallel pygidial terminal spines well shown. Hypotype No. 79161, U. S. National Museum. Jeffersonville ls; Falls of the Ohio, Louisville, Ky.	
<i>Odontocephalus magnus</i> Stumm, sp. nov.	208
FIG. 8. Pygidium; well-defined segmentation, divergent terminal spines. Holotype No. 53163, U. S. National Museum. Jeffersonville ls; Falls of the Ohio, Louisville, Ky.	

EXPLANATION OF PLATE III

(All figures $\times 1$)

	PAGE
<i>Trypaulites calypso</i> (Hall)	209
FIG. 1. Plaster cast No. 31316 of hypotype No. 13370/1, N. Y. State Museum, an external mold, the only nearly complete specimen known. Columbus ls; Sandusky, Erie Co., Ohio.	
FIG. 2. Pygidium; medial grooves on pleurae. Hypotype No. 31332. Horizon and locality as original of Figure 1.	
<i>Trypaulites</i> sp. aff. <i>T. calypso</i> (Hall)	209
FIG. 3. Wide subtrigonal pygidium; distinctly grooved pleurae. Figured specimen No. 15132. Dundee ls; abandoned quarry, Solvay Process Company, Sibley, 2 mi. north of Trenton, Wayne Co., Michigan.	
<i>Anchiopsis anchiops</i> (Green)	210
FIG. 4. Dorsal view of well-preserved cephalon; distinctive glabellar lobation. Hypotype No. 31317. Drift (either from Bois Blanc fm, Michigan, or, Lower Onondaga ls, southwest Ontario), Ann Arbor, Mich.	
FIG. 5. Characteristic pygidium; segmentation and terminal spine. Hypotype No. 23596 Bois Blanc fm, west shore of Gull Island, Lake Michigan, about $\frac{1}{2}$ mi. south of north end, Charlevoix Co., Mich.	
<i>Anchiopsis tuberculatus</i> Stumm, sp. nov.	211
FIG. 6. Side of cephalon showing great convexity. Holotype No. 79062, U. S. National Museum. Jeffersonville ls; Falls of the Ohio, Louisville, Ky.	
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FIG. 8. Pygidium with test; distinctive segmentation. Paratype No. 79062, U. S. National Museum. Horizon and locality of holotype (Fig. 6).	
FIG. 9. Pygidium with test removed; stout, short terminal spine. Paratype No. 79062, U. S. National Museum. Horizon and locality of holotype (Fig. 6).	
FIG. 10. Dorsal view of original of Figure 9.	

PLATE III



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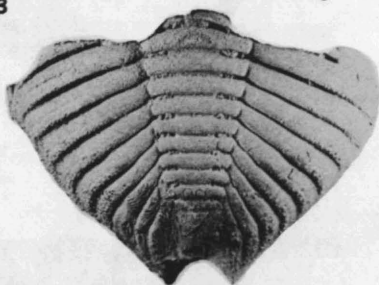
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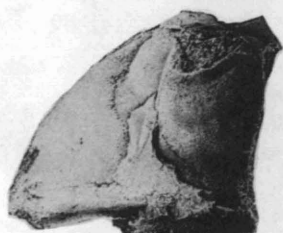
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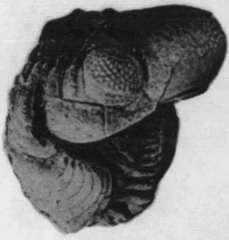


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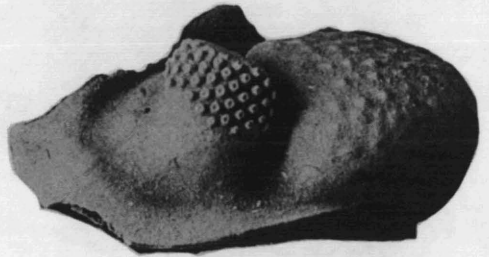
PLATE IV



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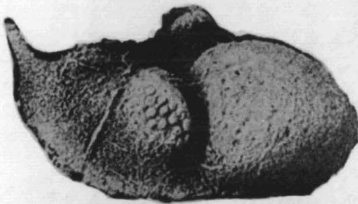
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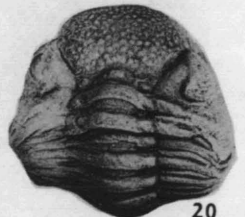
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EXPLANATION OF PLATE IV

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<i>Phacops pipa</i> Hall and Clarke	213
FIG. 1. Side of complete, partly enrolled specimen, arrangement of eye lenses. Hypotype No. E7954, Buffalo Museum Science. Lower Onondaga ls; abandoned Fogelsanger Quarry, Williamsville, N. Y. \times 1.	
FIG. 2. Incomplete exfoliated pygidium. Hypotype No. 31321. Bois Blanc fm, west of McGulpin Point, sec. 10, T. 39 N., R. 4 W., 2½ mi. west of Mackinaw City, Emmet Co., Mich. \times 1.	
FIG. 3. Side of silicified internal mold of cephalon, glabella and eye. Hypotype No. 31322. Columbus ls; abandoned Wagner Quarry 1½ mi. SW. of Castalia, Erie Co., O. \times 3.	
FIG. 4. Large pygidium with test. Hypotype No. 31323. Horizon and locality as original of Figure 2. \times 1.	
FIG. 5. Cephalon; fine glabellar tuberculation. Hypotype No. 31324. Horizon and locality as original of Figure 2. \times 1.	
FIG. 6. Dorsal view of original of Figure 3; glabellar lobation and ornamentation. \times 1.	
FIG. 9. Small incomplete glabella. Hypotype No. 31325. Detroit River Group—Amherstburg dolomite; abandoned Cummins Quarry, south side of Halfway Creek, SE. ¼ sec. 2, T. 8 S., R. 6 E., 6 mi. south and 1¾ mi. east of Petersburg, Monroe Co., Mich. \times 1.	
FIG. 11. Side of silicified glabella; eye and blunt genal spine. Hypotype No. 31326. Lower Onondaga ls; Port Colborne, Ont. \times 2.	
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FIG. 7. Dorsal view of cephalon; short wide glabella. Holotype No. 31327. Lower Onondaga ls; Port Colborne, Ont. \times 1.	
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FIG. 18. Side view of original of Figure 7, small subquadrate eye.	
<i>Phacops nasutus</i> Stumm, sp. nov.	214
FIG. 12. Side of specimen; anteriorly projected, flat-topped glabella, relatively large eye. Holotype No. 31329. Jeffersonville ls; Falls of the Ohio, Louisville, Ky. \times 1.	
FIG. 13. Eye of original of Figure 12, arrangement of facets. \times 3.	
FIG. 16. Dorsal view of original of Figure 12, subtriangular glabella. \times 1.	
<i>Phacops ohioensis</i> Stumm, sp. nov.	214
FIG. 14. Incomplete pygidium; brim and medial grooves on pleurae. Paratype No. 15172. Dundee ls, abandoned quarry, Solvay Process Company, Sibley, 2 mi. north of Trenton, Wayne Co., Mich. \times 1.	
FIG. 17. Pygidium with test except over part of axis; and showing pleurae, much divergent medial grooves, and low tubercles in single row on each side. Holotype No. 31333. Dundee ls; west quarry of France Stone Company, Silica, 1½ mi. SW. of Sylvania, Lucas Co., O. \times 1.	
<i>Phacops rana</i> (Green)	215
FIG. 19. Side of well-preserved enrolled specimen; eye, free cheek with rounded genal angle. Hypotype No. 42494, U. S. National Museum. Delaware ls, Columbus, O. \times 1.	
FIG. 20. Dorsal view of original of Figure 19; glabellar lobation and ornamentation. \times 1.	

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