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LOWER MIDDLE DEVONIAN PROETID TRILOBITES FROM MICHIGAN, SOUTHWESTERN ONTARIO, AND NORTHERN OHIO

BY

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CONTENTS

INTRODUCTION

THIS paper contains the results of a study of the proetid trilobites from the lower Middle Devonian limestones and dolomites of Michigan, northern Ohio, and southwestern Ontario. Trilobites, including members of this family, from the upper Middle Devonian of Michigan and adjacent

beds have already been described (Stumm, 1953, pp. 101–57). Other lower Middle Devonian trilobites from these regions will be described later. The formations from which the proetid trilobites described were collected include the Onondaga limestone of southwestern Ontario, the Bois Blanc formation of Michigan, the Detroit River group of southeastern Michigan and northwestern Ohio, the Columbus limestone of north-central Ohio, the Dundee limestone of northwestern Ohio and southeastern Michigan, and the Rogers City limestone of Michigan. Specimens from the Onondaga limestone of western New York, the Jeffersonville limestone of southern Indiana and northern Kentucky, and the Marcellus formation of Western New York are illustrated for comparison. Three new species and two new subspecies are described and ten previously known species are redescribed on the basis of additional specimens. Table I lists the stratigraphic ranges.

Acknowledgments

The author wishes to thank Dr. Otto Haas, Curator of Paleozoic Invertebrates in the American Museum of Natural History, for the loan of the types of *Proetus (Crassiproetus) crassimarginatus* (Hall), *Dechenella (Dechenella) angustifrons* (Hall), and *Dechenella (Basidechenella) canaliculata* (Hall). He is also indebted for the loan of specimens: to Dr. G. A. Cooper, Curator of Paleontology and Paleobotany of the United States National Museum, for those of *Dechenella (Basidechenella) clara* (Hall) and *Proetus (Crassiproetus) crassimarginatus* (Hall); to Mr. John D. Sargent, Curator of Geology of the Buffalo Museum of Science, for those of *Proetus (Crassiproetus) crassimarginatus* (Hall) and *Proetus (Proetus) folliceps* Hall and Clarke; and to Professor Fred Foreman, Department of Geology and Geography at Oberlin College, for the types of *Dechenella (Basidechenella) eriensis* Stumm and *Dechenella (Basidechenella) rowi sanduskiensis* Stumm.

Previous Work

Meek (1871, p. 89; 1873, p. 233) described *Proetus planimarginatus* on the basis of a pygidium in the Dundee limestone, near Silica, Lucas County, Ohio. Hall (1861, pp. 72–73; 1876, Pl. 20) described and illustrated *Proetus crassimarginatus* and *Proetus canaliculatus* from the Jeffersonville limestone of the Falls of the Ohio region. Hall and Clarke (1888, pp. 99–113) described *Proetus crassimarginatus* from the Columbus limestone of Sandusky, Ohio; *Proetus clarus* and *Proetus canaliculatus* from the Jeffersonville limestone of the Falls of the Ohio River region; *Proetus delphinulus* and *Proetus tumidus* from the Onondaga limestone of south-

TABLE I

OCCURRENCE OF TRILOBITES OF FAMILY PROETIDAE

Species	Lower Onondaga ls, New York and SW. Ontario	Bois Blanc fm, Michigan	Detroit River group, S.E. Michigan	Upper Onondaga ls, New York	Columbus ls, North-central Ohio	Jeffersonville ls, S. Indiana, N. Kentucky	Delaware ls, North-central Ohio	Dundee ls, NW. Ohio, SE. Michigan	Rogers City ls, Michigan	Marcellus fm, W. New York
Subfamily Proetinae										
Proetus (Proetus)										
Proetus (Proetus) folliceps	X	X	....	?	?	X	....	....	....	....
Proetus (Proetus) stenopyge	X	X	....	....	....	....	....	....	....	....
Proetus (Crassiproetus)										
Proetus (Crassiproetus) crassimarginatus	X	X	....	X	X	X	....	....	....	....
Proetus (Crassiproetus) crassimarginatus glabrus	?	....	....	....	X	X	....	....	....	....
Proetus (Crassiproetus) sp. aff. *P. (C.) crassimarginatus*	....	....	X	....	....	....	....	....	....	....
Proetus (Crassiproetus) sibleyense	....	....	....	....	....	....	....	X	....	....
Subfamily Dechenellinae										
Dechenella (Dechenella)										
Dechenella (Dechenella) ? angustifrons	X	....	....	....	....	....	....	....	....	....
Dechenella (Dechenella) delphinula	X	....	....	....	....	....	....	....	....	....
Dechenella (Dechenella) ? halli	X	....	....	....	....	....	....	....	....	....
Dechenella (Dechenella) planimarginata	....	....	....	....	....	....	....	X	....	....
Dechenella (Dechenella) valentini	....	....	....	....	....	....	....	....	X	....
Dechenella (Dechenella) welleri	....	....	....	....	X	....	....	....	....	....
Dechenella (Basidechenella)										
Dechenella (Basidechenella) canaliculata	....	....	....	....	X	X	....	....	....	....
Dechenella (Basidechenella) clara	X	X	X	X	X	X	....	....	....	....
Dechenella (Basidechenella) eriensis	....	....	....	....	....	....	X	....	....	....
Dechenella (Basidechenella) rowi	....	....	....	....	....	....	....	....	....	X
Dechenella (Basidechenella) rowi sanduskiensis	....	....	....	....	....	....	X	....	....	....
Dechenella (Basidechenella) tumida	X	....	....	....	....	....	....	....	....	....

western Ontario; and *Proetus folliceps* from the Onondaga limestone of New York and from the drift, Ann Arbor, Michigan. Stauffer (1909, pp. 195–96) described *Proetus welleri* from the Columbus limestone of the Sandusky, Ohio, region. Bassett (1935, pp. 453–54) illustrated a cephalon of *Proetus planimarginatus* as well as specimens of *Proetus* which now form the syntypes of *Proetus (Crassiproetus) sibleyensis.*

Unless otherwise designated specimens are catalogued and deposited in the Museum of Paleontology of the University of Michigan.

SYSTEMATIC DESCRIPTIONS

Phylum ARTHROPODA
Class TRILOBITA
Order OPISTHOPARIA
Superfamily Proetacea
Family Proetidae

Proetidae Salter, 1864, p. 2 (see Richter and Richter, 1950, p. 152).

Diagnosis.—See Stumm, 1953, p. 107.

Subfamily Proetinae

Diagnosis.—See Stumm, 1953, p. 110.

Genus *Proetus* Steininger

Proetus Steininger, 1831, p. 355.

Genotype.—By original designation, *Calymene concinna* Dalman, 1827, p. 149 (see Richter and Richter, 1923, p. 340).

Diagnosis.—See Stumm, 1953, p. 110.

Proetus (Proetus) Steininger

Diagnosis.—See Stumm, 1953, p. 110.

Proetus (Proetus) stenopyge Hall and Clarke

(Pl. I, Fig. 1)

Proetus stenopyge Hall and Clarke, 1888, p. 110, Pl. 22, Fig. 27.

Remarks.—Known only from pygidia. The short, wide, low-convex pygidia with wide, rapidly tapering axis are typical of *Proetus (Proetus)* and resemble that of *P. (P.) cuvieri* from the Middle Devonian of the Eifel region.

Occurrence.—Middle Devonian: (lower Onondaga limestone), western New York and southwestern Ontario; (Bois Blanc formation), shore of Garden Island, Lake Michigan, sec. 7, T. 39 N., R. 9 W., Charlevoix County, Michigan.

Types.—Holotype No. 14004/1, New York State Museum; hypotype No. 29518, Museum of Paleontology, University of Michigan.

Proetus (Proetus) folliceps Hall and Clarke

(Pl. II, Figs. 1–2, 7–8)

Proetus crassimarginatus Hall, *partim,* 1876, Pl. 20, Fig. 20; Hall and Clarke, *partim,* 1888, Pl. 20, Fig. 20.

Proetus folliceps Hall and Clarke, 1888, pp. 101–4, Pl. 23, Figs. 3–8.

Remarks.—A well-preserved cast of the cranidium, from the lower Onondaga of Ontario, shows the smooth, moderately arched, conical glabella, and the broad, slightly concave brim characteristic of this species. A pygidium, from the Bois Blanc formation of Michigan, referred here, shows the characteristic 8 unfurrowed pleural ribs. The cranidium from the Jeffersonville limestone of the Falls of the Ohio River region near Louisville, Kentucky, which was figured by Hall (1876, Pl. 20, Fig. 20) and by Hall and Clarke (1888, Pl. 20, Fig. 20), has the typical conical glabella of *P. (P.) folliceps* (see Pl. II, Figs. 7–8).

Occurrence.—Middle Devonian: (lower Onondaga limestone), New York and southwestern Ontario; (Bois Blanc formation), south side of Trout Island, Lake Michigan, a short distance west of the southeast point of the island, Charlevoix County, Michigan; (upper Onondaga limestone), western New York; (Columbus limestone), north-central Ohio; (Jeffersonville limestone), Falls of the Ohio River, near Louisville, Kentucky.

Types.—Syntypes Nos. 13989/1, 13989/2, 13989/3, New York State Museum; hypotype No. 2897/6 (cranidium), American Museum of Natural History; hypotype No. E11987, Buffalo Museum of Science; hypotype No. 29519, Museum of Paleontology, University of Michigan.

Proetus (Crassiproetus) Stumm

Crassiproetus Stumm, 1953, p. 110.

Subgenotype.—By original designation, *Proetus (Crassiproetus) traversensis* Stumm, 1953, p. 110.

Diagnosis.—See Stumm, 1953, p. 110.

Proetus (Crassiproetus) crassimarginatus (Hall)

(Pl. I, Figs. 2–13; Pl. II, Figs. 9–10)

Calymene crassimarginata Hall, 1843, p. 172, Fig. 5.

Proetus crassimarginatus Hall, 1859, p. 88.

Phillipsia crassimarginata Billings, 1861, p. 362.

Proetus crassimarginatus Hall, 1861, p. 72; 1862, p. 100; 1876, Pl. 20, Figs. 21–23, 26–31; *non* Figs. 20, 23–24.

Proetus crassimarginatus Hall and Clarke, 1888, pp. 99–101, Pl. 20, Figs. 21–22, 26–31; Pl. 22, Figs. 20–23, 26, possibly Figs. 24–25; *non* Pl. 20, Figs. 6–8, 20, 23–24.

Description.—Cephalon semicircular with a relatively broad, flat brim, becoming low convex opposite the ocular platforms and having a longitudinally striated border. Glabella moderately convex, subquadrate, tapering very slightly anteriorly, with a rounded anterior margin. Glabellar furrows lacking on test, very faintly indicated on internal molds. Anterior and medial pairs slightly convex anteriorly, directed posterolaterally, extending about two thirds the distance to the axis. Posterior pair directed laterally for about one third their length, then becoming deflected posteriorly, extending one half the distance between the point of deflection and the occipital furrow. Occipital lobes subtrigonal, relatively large but low and inconspicuous. Occipital furrow relatively narrow, well impressed. Occipital ring smooth, relatively wide and low convex posterior to glabella, becoming thinner posterior to ocular platforms. Anterolateral preglabellar fields subtrigonal, low convex. Palpebral lobes very small, subtrigonal, with a rounded peripheral angle. Eyes relatively small, elongate, reniform, not as high as crest of glabella. Free cheeks with gently arched ocular platforms, slightly convex brims, and rounded genal angles.

Thorax with moderately convex axis composed of smooth, flat-topped or low-convex segments. Pleurae with low-convex segments bearing deeply incised medial grooves. Grooves becoming obsolete peripherally.

Pygidium highly convex with a low-convex, peripherally sloping brim. Axis of higher convexity than pleurae, composed of about 16 smooth, low-convex segments. Pleurae sloping steeply peripherally, composed of about 14 segments. Segments faintly developed posteriorly.

Remarks.—This widespread species had been consistently misidentified, because Hall (1876, Pl. 20, Figs. 23–24) and Hall and Clarke (1888, Pl. 20, Figs. 23–24) figured among the hypotypes a free cheek with a genal spine. This specimen belongs to a species of *Dechenella,* for structure of a complete specimen from the type locality (Pl. I, Figs. 4–6) shows that the free cheek of *Proetus (Crassiproetus) crassimarginatus* has a rounded genal angle.

The cranidium illustrated by Hall (1876, Pl. 20, Fig. 22) and Hall and Clarke (1888, Pl. 20, Fig. 22) is refigured here (Pl. I, Fig. 2). It does not possess the kind of brim indicated in Hall's and Hall and Clarke's figure. The restoration of the brim in their figures is much too narrow.

Occurrence.—Middle Devonian: (Onondaga limestone), New York and southwestern Ontario; (Bois Blanc formation), Michigan; (Columbus limestone), central and north-central Ohio; (Jeffersonville limestone), southern Indiana and northern Kentucky.

Types.—Holotype No. 2897/3; refigured hypotypes Nos. 2897/4 and

2897/6 (pygidium), American Museum of Natural History. Hypotypes Nos. E12345 and E12896, Buffalo Museum of Science. Hypotypes Nos. 29536, 29537, 29538, 29539, 29540, 29541, and 29546, Museum of Paleontology, University of Michigan.

Proetus (Crassiproetus) crassimarginatus glabrus Stumm, subsp. nov.

(Pl. II, Fig. 11)

? *Proetus conradi* Hall, *partim*, 1876, Pl. 20, Figs. 8–9.
? *Proetus crassimarginatus* Hall and Clarke, *partim*, 1888, Pl. 20, Figs. 6–8.

Description.—Cephalon and thorax unknown.

Pygidium strongly arched, as typical in *Proetus (Crassiproetus) crassimarginatus*, with a low-convex, steeply inclined brim. Axis more convex than pleurae, tapering posteriorly, terminating just anterior to brim, composed of about 16 segments. Anterior 2 segments distinct, moderately convex, remainder very faint, becoming relatively indistinguishable posteriorly. Pleurae low convex, inclined steeply peripherally, composed of 6 to 8 segments. Anterior 2 or 3 segments moderately convex, separated by distinct furrows. Remainder of segments very indistinct, becoming obsolete on posterior half of pleurae.

Remarks.—This distinctive pygidium is common in the Columbus and Jeffersonville limestones. Closely similar to that of a typical *P. (C.) crassimarginatus*, it is sufficiently distinct to merit a different name, even though the cephalon and thorax are unknown.

Occurrence.—Middle Devonian: (Jeffersonville limestone), Falls of the Ohio River, near Louisville, Kentucky; (Columbus limestone); central and north-central Ohio. (Hall's specimens from the Schoharie grit of the lower Onondaga limestone, here questionably included in this species, appear to have even the anterior pygidial segments obsolete.)

Type.—Holotype No. 4897, Museum of Paleontology, University of Michigan.

Proetus (Crassiproetus) sp. aff. *P. (C.) crassimarginatus* (Hall)

(Pl. II, Figs. 3–6)

Remarks.—Some fragmentary specimens from the Detroit River group of southeastern Michigan resemble *Proetus (Crassiproetus) crassimarginatus* (Hall) with minor differences. The glabella is proportionally wider, more globose, and less tapering anteriorly. The pygidium has a proportionally smaller and less convex axis. The specimens are not sufficiently well preserved for complete description.

Occurrence.—Middle Devonian (Detroit River group, Amherstburg

formation): abandoned Cummin's quarry, 6 mi. S. and 1¾ mile E. of Petersburg, SE.¼ SE.¼ sec 2, T. 8 S., R. 6 E., Monroe County Michigan.

Figured specimens.—Nos. 29543, 29544, and 29545, Museum of Paleontology, University of Michigan.

Proetus (Crassiproetus) sibleyensis Stumm, sp. nov.
(Pl. II, Figs. 12–16)

Proetus crassimarginatus Bassett, 1935, p. 453, Pl. 38, Figs. 12–17.

Description.—Cephalon semicircular with a very short, concave brim and a thick, longitudinally striated, sharply elevated border. Glabella globose, subquadrate, with parallel sides and a rounded anterior margin. No trace of glabellar furrows present. Anterolateral preglabellar fields small, low convex, subtrigonal. Occipital lobes of medium size, subtrigonal, moderately convex. Occipital furrow deeply incised. Occipital ring smooth, relatively wide, low convex. Palpebral lobes of medium size, low convex. Free cheeks with moderately convex ocular platforms separated from brim by broad, shallow furrows. Eyes not preserved. Genal angles rounded as in *P. (C.) crassimarginatus* (Hall).

Thorax unknown.

Pygidium highly convex with axis occupying about one third of width. Axis more arched than pleurae, composed of about 15 moderately convex segments, separated by narrow, well-incised furrows. Pleurae composed of about 11 moderately convex segments, separated by relatively wide, shallow furrows.

Remarks.—This species resembles *P. (C.) crassimarginatus* (Hall), but may readily be distinguished from it by the narrow, concave cephalic brim with its elevated border and by the more nearly subquadrate glabella.

Occurrence.—Middle Devonian: (Dundee limestone), abandoned quarry of the Solvay Process Company at Sibley, 2 miles north of Trenton, Wayne County, Michigan.

Types.—Holotype No. 15130; paratypes Nos. 15127, 15128, 15129, 15175, Museum of Paleontology, University of Michigan.

Subfamily Dechenellinae Pfibyl

Dechenellinae Pfibyl, 1946, p. 121.

Diagnosis.—See Stumm, 1953, p. 115.

Genus *Dechenella* Kayser

Dechenella Kayser, 1880, p. 705.

Genotype.—By subsequent designation of Vogdes, 1890, p. 83, *Phillipsia verneuili* Barrande, 1852, p. 478.

Diagnosis.—See Stumm, 1953, p. 116.

Dechenella (Dechenella) Kayser

Diagnosis.—See Stumm, 1953, p. 116.

Dechenella (Dechenella) valentini Stumm, sp. nov.

(Pl. III, Figs. 1–2)

Description.—Cephalon semicircular, width slightly exceeding the length, gibbous anteriorly, with a relatively broad, moderately convex, longitudinally striated brim. Glabella short, triareal, separated from the brim by a flat preglabellar field approximately equal in width to the brim. Anterior glabellar lobe short, low convex. Anterior pair of glabellar furrows faintly impressed, short, reaching about one half the distance to the axis, directed axially and slightly posteriorly. Anterior pair of lateral glabellar lobes narrow, relatively flat. Medial pair of glabellar furrows faint, parallel to and slightly longer than anterior pair. Medial pair of lateral glabellar lobes faint, subtrigonal. Posterior pair of glabellar furrows distinct, extending posterolaterally from the lateral margins of the glabella to the occipital furrow. Posterior lateral glabellar lobes moderately convex, subtrigonal to subovate. Occipital furrow relatively wide and well impressed posterior to glabella, narrower posterior to the cheeks. Occipital lobes small, subcircular. Occipital ring incompletely preserved, moderately wide, low convex, apparently without axial node. Palpebral lobes relatively flat, elongate reniform. Eyes reniform, elongate, of about glabellar height. Free cheeks with broad, peripherally sloping, low-convex ocular platforms and relatively broad, convex brims terminating in short, acicular genal spines extending to about the fourth thoracic segment.

Thorax incompletely known. Anterior 5 segments with relatively flat, unornamented axial portions and flat-topped pleural portions bearing distinct medial furrows.

Pygidium moderately convex, about as wide as long, with a moderately wide, low-convex brim. Axis about one fourth width of pygidium, moderately convex, tapering posteriorly, terminating at the brim, composed of about 16 smooth, low-convex segments. Pleurae with about 10 very low-convex segments, each bearing a faintly impressed medial furrow.

Test smooth, probably punctate.

Remarks.—Dechenella (Dechenella) valentini is a very distinctive species. It is easily distinguished from *D. (D.) planimarginata* (Meek) by the much narrower cephalon and the convex cephalic brim, and is distinguished from *D. (D.) verneuili* (Barrande) by the possession of a larger preglabellar field and more faintly developed anterior and medial glabellar furrows. *D. (D.) valentini* is similar to *D. (D.) alpenensis* Stumm, but it

differs from it in having a shorter glabella, broader preglabellar field, and more convex cephalic brim. This species is named after Mr. Joseph Valentin, Operations Manager of the quarry of the Michigan Limestone Division of the United States Steel Corporation at Rogers City, Michigan, who gave the holotype to the Museum of Paleontology of the University of Michigan.

Occurrence.—Middle Devonian (Rogers City limestone): quarry of the Michigan Limestone Division of the United States Steel Corporation at Rogers City, Presque Isle County, and along shore of Lake Huron, one-half mile north of Rockport, Alpena County, Michigan.

Types.—Holotype No. 29775; paratype No. 29776, Museum of Paleontology, University of Michigan.

Dechenella (Dechenella) planimarginata (Meek)

(Pl. III, Figs. 8–13)

Proetus planimarginatus Meek, 1871, p. 89; 1873, p. 233, Pl. 23, Figs. 3*a–b*.
Proetus (?) planimarginatus Hall and Clarke, 1888, p. 112, Pl. 23, Fig. 12.
Proetus conicus Grabau, 1913, p. 361.
Proetus planimarginatus Bassett, 1935, *partim*, pp. 453–54, Pl. 39, Figs. 1–4, 8.

Description.—Cephalon lunate, about twice as wide as long, with a broad, concave brim having a moderately strongly upturned anterior border. Glabella triareal, outline similar to that of *D. (D.) valentini* but with more deeply impressed glabellar furrows and with more pronounced lateral expansions at the peripheral ends of the posterior pair of glabellar furrows. A small accessory pit present, just anterior to posterior end of each of the posterior glabellar furrows. Occipital lobes small, rounded. Occipital furrow moderately wide and deep. Occipital ring incompletely preserved, relatively narrow, moderately convex, apparently without axial node. Palpebral lobes and eyes incompletely preserved, reniform. Cheeks with broad, flat ocular platforms and very broad, concave brims with upturned borders. Genal spines narrow, about as long as those of *D. (D.) valentini.*

Thorax unknown.

Pygidium semicircular, almost twice as wide as long, with a distinct, low-convex, moderately wide brim. Axis about one fourth the width of pygidium, tapering posteriorly, terminating just anterior to brim, composed of about 12 smooth, low-convex segments. Pleurae composed of 8 to 10 smooth, flat-topped segments. Medial furrows present on pleural segments of exfoliated specimens.

Remarks.—This species is easily distinguished by the wide cephalon with its broad, concave brim, and by the relatively short, wide pygidium.

Occurrence.—Middle Devonian: (Dundee limestone), abandoned quarry of the Whitehouse Stone Company at Whitehouse, Lucas County, Ohio; quarries of the France Stone Company and the Medusa Portland

Cement Company, Silica, Lucas County, Ohio; quarry of the Solvay Process Company, Sibley, 2 miles north of Trenton, Wayne County, Michigan.

Types.—Repository of holotype unknown. Hypotypes Nos. 15122, 15125, 15126, 15133, and 29777, Museum of Paleontology, University of Michigan.

Dechenella (Dechenella) welleri (Stauffer)

(Pl. III, Figs. 3–5)

Proetus welleri Stauffer, 1909, pp. 195–96.

Description.—Cranidium with a very wide, flat brim occupying about one third the distance between occipital lobe and border, and a relatively small, subconical glabella. Glabellar lobes similar to those of *D. (D.) planimarginata* except anterior and medial pairs extending closer to axis and directed more posteriorly. Occipital lobes absent on internal mold. Occipital furrow and ring too incomplete for description. Palpebral lobes gently arched, reniform, distinctly wider than those of *D. (D.) valentini* and *D. (D.) planimarginata*. Free cheeks unknown except for one short, stout genal spine.

Thorax with a moderately arched axis composed of smooth, low-convex segments and pleurae having smooth segments with strongly developed medial grooves.

Pygidium almost twice as wide as long, with an indistinct, peripherally sloping brim. Axis forming one fourth the width of the pygidium, moderately convex, composed of about 12 smooth, low-convex segments. Pleurae with about 8 broad, flat-topped segments, increasing in diameter peripherally and merging indistinctly into brim. Medial grooves weakly preserved on anterior pleural segments of exfoliated specimens.

Entire test minutely punctate.

Remarks.—This species most closely resembles *D. (D.) planimarginata* (Meek) but differs from it in the possession of a flat cephalic brim, a proportionally smaller and more conical glabella, and wider pygidial pleural segments.

Occurrence.—Middle Devonian: (Columbus limestone), abandoned Lake Shore Railroad quarry, 1¾ miles south of Venice, Erie County, Ohio.

Types.—Holotype No. 16976, Museum of Geology, Ohio State University; hypotype No. 29778, Museum of Paleontology, University of Michigan.

Dechenella (Dechenella) delphinula (Hall and Clarke)

(Pl. III, Fig. 6)

Proetus delphinulus Hall and Clarke, 1888, pp. 111–12.

Description.—Cranidium with an unusually wide brim having a distinct

medial furrow. Posterior half of brim relatively flat, anterior half sloping upward anteriorly. Glabella small, equal in length to the width of the brim, triareal. Anterior glabellar lobe narrowly conical. Anterior pair of glabellar furrows directed almost horizontally, extending a little over one half the distance to the axis. Anterior pair of lateral glabellar lobes subrectangular in outline. Medial pair of glabellar furrows slightly larger than anterior pair and directed slightly posteriorly. Medial pair of lateral glabellar lobes subrectangular, curved posteriorly in their axial portions. Third pair of glabellar furrows directed axially and posteriorly. Third pair of lateral glabellar lobes convex, subovate. Occipital lobes very small, subrounded. Occipital furrow distinct, relatively deep and wide. Occipital ring smooth, sloping upward posteriorly.

Remarks.—This addition to the original description of Hall and Clarke is based on a perfectly preserved cranidium from the type locality.

Occurrence.—Middle Devonian: (lower Onondaga limestone), Port Colborne, Welland County, Ontario.

Types.—Repository of holotype unknown; plastotype No. 13988/1, New York State Museum; hypotype No. 29779, Museum of Paleontology, University of Michigan.

Dechenella (Dechenella) (?) angustifrons (Hall)

(Pl. III, Fig. 7)

Proetus angustifrons Hall, 1861, p. 70; 1862, p. 98; 1876, Pl. 20; Hall and Clarke, 1888, pp. 91–93.

Remarks.—A cranidium illustrated by Hall (1876, Pl. 20, Fig. 1) and by Hall and Clarke (1888, Pl. 20, Fig. 1) is refigured here for comparison with other species from the lower Onondaga limestone. The pygidia, free cheeks, and other glabellae figured by Hall (1876) and by Hall and Clarke (1888, Pl. 20, Figs. 2–5; Pl. 22, Figs. 1–3) may not be conspecific.

The cranidium refigured in this publication is here chosen as the lectotype. The elongate, relatively narrowly conical glabella is a distinctive feature, but it is so badly exfoliated that the nature of the glabellar furrows can not be determined. The large size of the occipital lobes suggests that the species may belong in the subspecies *Basidechenella.*

Occurrence.—Middle Devonian: (Schoharie grit facies of the lower Onondaga formation), Albany County, New York.

Type.—Lectotype (here chosen), the original of Hall (1876, Pl. 20, Fig. 1) and Hall and Clarke (1888, Pl. 20, Fig. 1), No. 2900/1, American Museum of Natural History.

Dechenella (Dechenella) (?) halli, nom. nov.

Proetus verneuili Hall, 1861, p. 73; 1862, p. 101; 1876, Pl. 20, Figs. 18–19; Hall and Clarke, 1888, pp. 108–9, Pl. 20, Figs. 18–19; *non Proetus verneuili* Barrande, 1852, pp. 119, 129.

Remarks.—No additional information can be given concerning this species. The holotype, the only known specimen, consists of an incomplete thorax and a complete pygidium. The species may belong to the subgenus *Basidechenella.*

Occurrence.—Middle Devonian: (Lower Onondaga limestone), Williamsville, New York.

Type.—Holotype No. 4074/1, American Museum of Natural History.

Dechenella (Basidechenella) Richter

Dechenella (*Basidechenella*) Richter, 1912, p. 262.

Subgenotype.—By subsequent designation of Vogdes, 1925, p. 91, *Dechenella (Basidechenella) kayseri* Richter, 1912, pp. 278–81.

Diagnosis.—See Stumm, 1953, p. 116.

Dechenella (Basidechenella) clara (Hall)

(Pl. IV, Figs. 1–9)

Proetus clarus Hall, 1861, p. 71; 1862, p. 99; 1876, Pl. 20; Hall and Clarke, 1888, pp. 104–6.

Remarks.—Hall and Clarke's detailed description need not be repeated here. The species appears to be characteristic throughout the Onondaga limestone of New York and its equivalents in southwestern Ontario, Michigan, and the Ohio Valley. The subconical, very faintly constricted glabella, the very faintly impressed glabellar furrows, and the relatively wide, flat or slightly concave cephalic brim with its elevated border, makes the species easy to recognize.

Occurrence.—Middle Devonian: (Onondaga limestone), New York and southwestern Ontario; (Bois Blanc formation), Mackinac Straits region, Michigan; (Detroit River Group), southeastern Michigan; (Columbus limestone), north-central and central Ohio; (Jeffersonville limestone), Falls of the Ohio River, vicinity of Louisville, Kentucky.

Types.—Lectotype (here chosen) the original of Hall (1876, Pl. 20, Figs. 12–13), No. 4075/1, American Museum of Natural History; hypotypes Nos. 29509, 29510, 29511, 29512, 29513, 29514, 29515, Museum of Paleontology, University of Michigan; hypotype No. 25884, United States National Museum.

Dechenella (Basidechenella) canaliculata (Hall)
(Pl. IV, Fig. 10)

Proetus canaliculatus Hall, 1861, p. 73; 1862, p. 101; 1876, Pl. 20, Figs. 10–11; Hall and Clarke, 1888, pp. 107–8, Pl. 20, Figs. 10–11, possibly Pl. 23, Figs. 10–11.

Remarks.—The holotype is refigured here for comparison with *Dechenella (Basidechenella) clara.* The cranidia of the two species are quite similar. The glabella of *D. (B.) canaliculata* differs in being slightly more constricted medially and in having a narrower cephalic brim with a distinct ridge bounding the border. The occipital ring shows a very faint axial node.

Occurrence.—Middle Devonian: (Jeffersonville limestone), Falls of the Ohio River, near Louisville, Kentucky; (Columbus limestone), north-central Ohio.

Types.—Holotype the original of Hall (1876, Pl. 20, Figs. 10–11), No. 4253/1, American Museum of Natural History.

Dechenella (Basidechenella) tumida (Hall and Clarke)
(Pl. IV, Fig. 11)

Proetus tumidus Hall and Clarke, 1888, p. 113, Pl. 23, Fig. 9.

Remarks.—A complete cranidium from the type locality gives additional information regarding the cephalic structure of this species. The brim is flat and of moderate width. The glabella is very highly convex, globose in appearance, tapering very slightly anteriorly, without trace of glabellar furrows. The occipital lobes are large but very low and inconspicuous. The occipital furrow is relatively wide and moderately deep. The occipital ring is relatively wide and flat.

Occurrence.—Middle Devonian: (lower Onondaga limestone), Port Colborne, Welland County, Ontario.

Types.—Repository of holotype unknown; hypotype No. 29516, Museum of Paleontology, University of Michigan.

Dechenella (Basidechenella) eriensis Stumm, sp. nov.
(Pl. IV, Figs. 12–14)

Description.—Cephalon semicircular with a relatively broad, flat brim. Outer part of brim composed of a shallowly concave furrow separated from inner part of brim by 2 distinct, very closely set, parallel ridges. Border with a single, rounded, elevated ridge. Glabella low convex, slightly longer than wide, subquadrate, tapering very slightly anteriorly, slightly constricted opposite the anterior ends of the eyes, with a rounded anterior margin. Glabellar furrows absent in most specimens, represented by faint impressions or color markings in others. Wherever visible, anterior and medial pairs are anteriorly convex, extending posterolaterally about one

half the distance to the glabellar axis, enclosing subrectangular anterior and medial lateral glabellar lobes. Posterior pair of glabellar furrows extending axially for about one half their length, then becoming directed abruptly posteriorly, extending to the occipital furrow and enclosing subquadrate lateral glabellar lobes. Occipital lobes convex, relatively large, subovate. Occipital furrow distinct; occipital ring low convex. Palpebral lobes of medium size, elongate reniform. Eyes reniform, high as glabella, about one half as long as glabella. Free cheeks with moderately convex ocular platforms and brims identical in structure to that of cranidium. Free cheeks terminating in stout genal spines extending to about the seventh thoracic segment. Spines with distinct medial ridges bounded axially by the posteriorly deflected occipital furrow and peripherally by the concave furrow of the brim border.

Thorax with a moderately convex axis composed of low-convex segments apparently without axial nodes. Pleurae flat axially, strongly inclined peripherally, composed of low-convex segments bearing prominent medial furrows.

Pygidium about twice as wide as long with a moderately wide, low-convex, peripherally sloping brim. Axis less than one third width of pygidium, tapering posteriorly, terminating just anterior to brim, composed of about 10 low-convex segments each bearing a faint axial node. Pleurae composed of 6 to 7 low-convex segments separated by relatively wide, shallow furrows. Segments apparently without medial furrows.

Entire test covered with very small, indistinct granules, moderately developed on glabella, very faintly developed on remainder of test.

Remarks.—This species has been compared with *Dechenella (Basidechenella) rowi* (Green) from the Marcellus formation of western New York (see Pl. IV, Figs. 17–18), but differs from it in the much shorter, less constricted glabella and in the shorter, wider pygidium.

Occurrence.—Middle Devonian: (upper part of Delaware limestone), abandoned Wagner quarry just west of the Norfolk and Western Railroad classification yards, about 2 miles south of Sandusky, Erie County, Ohio.

Types.—Holotype No. 7538*a*; paratype No. 7538*b*, Geological Museum, Oberlin College; paratype No. 29517, Museum of Paleontology, University of Michigan.

Dechenella (Basidechenella) rowi sanduskiensis Stumm, subsp. nov.

(Pl. IV, Figs. 15–16)

Description.—Cephalon similar to that of *D. (B.) rowi* (Green), except for shorter glabella tapering more rapidly anteriorly. Glabella more heavily and closely tuberculate and without trace of glabellar lobes.

Thorax similar to that of *D. (B.) rowi* except for lack of axial nodes on posterior axial segments.

Pygidium much wider and shorter than that of *D. (B.) rowi*, averaging about twice as wide as long, with a moderately wide, low-convex brim. Axis tapering posteriorly, composed of about 10 low-convex segments apparently without axial nodes. Pleurae with 6 to 8 low-convex segments, separated by wide, shallow furrows. Segments apparently without trace of medial furrows.

Occurrence.—Middle Devonian: (Upper part of Delaware limestone), abandoned Wagner quarry just west of Norfolk and Western Railroad classification yards, about 2 miles south of Sandusky, Erie County, Ohio.

Type.—Holotype No. 7538*c*, Geological Museum, Oberlin College.

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Submitted for publication October 21, 1952

EXPLANATION OF PLATE I

(All figures × 1)

PAGE

Proetus (*Proetus*) *stenopyge* Hall and Clarke 14

FIG. 1. Short wide pygidium with rapidly tapering axis. Hypotype No. 29518. Bois Blanc fm; shore of Garden Island, Lake Michigan, sec. 7, T. 39 N., R. 9 W., Charlevoix County, Michigan.

Proetus (*Crassiproetus*) *crassimarginatus* (Hall) 15

FIG. 2. Cranidium, subquadrate glabella with rounded anterior margin. Hypotype No. 2897/4, American Museum of Natural History (original of Hall, 1876, Pl. 20, Fig. 22). Onondaga ls; Clarence Hollow, New York.

FIG. 3. Well-preserved free cheek, rounded genal angle. Hypotype No. E12345, Buffalo Museum of Science. Onondaga ls; abandoned Vogelsanger quarry, near Williamsville, New York.

FIG. 4. Side of cephalon, brim, glabella, and free cheek. Hypotype No. E12896, Buffalo Museum of Science. Horizon and locality (Fig. 3).

FIG. 5. Dorsal view of specimen (Fig. 4), thorax and long, arched pygidium.

FIG. 6. Dorsal view of cephalon of specimen (Fig. 4), glabella, eye, occipital ring, and free cheeks.

FIG. 7. Small cranidium, subquadrate glabella. Hypotype No. 29536. Onondaga ls; abandoned Oneida Lime and Sand Company quarry, North Cayuga Twp., Haldimand County, Ontario.

FIG. 8. Posterior of pygidium. Hypotype No. 29537. Bois Blanc fm; S. side of Trout Island, Lake Michigan, Charlevoix County.

FIG. 9. Well-preserved pygidium. Holotype No. 2897/3, American Museum of Natural History (original of Hall, 1943, p. 172, Fig. 5). Onondaga ls; Williamsville, New York.

FIG. 10 Well-preserved glabella and brim. Hypotype No. 29538. Limestone of Onondaga age; road cut through bioherm just W. of abandoned Marchand quarry, 2½ mi. N. of Formosa, Ontario.

FIG. 11. Free cheek, eye, and ocular platform. Hypotype No. 29539. Horizon and locality (Fig. 10).

FIG. 12. Incomplete pygidium, convex axis. Hypotype No. 29540. Horizon and locality (Fig. 10).

FIG. 13. Incomplete pygidium, well-preserved test. Hypotype No. 29541. Horizon and locality (Fig. 10).

PLATE I

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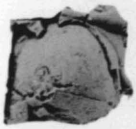

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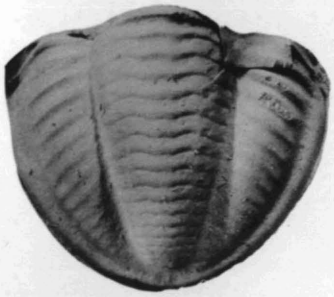

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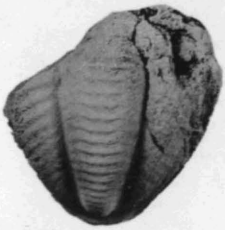

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PLATE II

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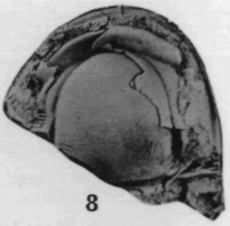

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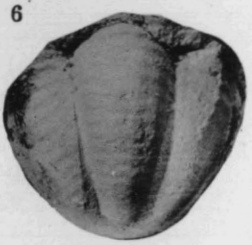

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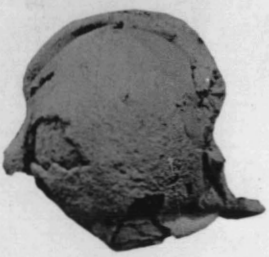

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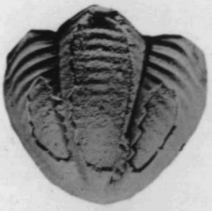

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EXPLANATION OF PLATE II

PAGE

Proetus (*Proetus*) *folliceps* Hall and Clarke 15

FIG. 1. Typical cranidium, conical glabella and wide, weakly concave brim. Hypotype No. E11987, Buffalo Museum of Science. Onondaga ls—Springvale ss member at base; Springvale, Ontario. × 1.

FIG. 2. Pygidium, eight pleural segments. Hypotype No. 29519. Bois Blanc fm; S. side of Trout Island, Lake Michigan, Charlevoix County, Michigan. × 1.

Proetus (*Crassiproetus*) sp. aff. *P.* (*C.*) *crassimarginatus* (Hall) 17

FIG. 3 Anterior, globose glabella. Specimen No. 29543. Detroit River group—Amherstburg dolomite; abandoned Cummin's quarry, 6 mi. S. and 1¾ mi. E. of Petersburg, Monroe County, Michigan. × 2.

FIG. 4. Side view of specimen (Fig. 3). × 2.

FIG. 5. Pygidium, narrow, low-convex axis. Specimen No. 29544. Detroit River group—Amherstburg dolomite; Livingstone Channel, Detroit River, S. of Grosse Ile, Monroe County, Michigan. × 1.

FIG. 6. Large pygidium. Specimen No. 29545. Horizon and locality (Fig. 5). × 1.

Proetus (*Proetus*) *folliceps* Hall and Clarke 15

FIG. 7. Side, low-convex glabella. Hypotype No. 2897/6, American Museum of Natural History (original of Hall, 1876, Pl. 20, Fig. 20). Jeffersonville ls; Falls of Ohio River, near Louisville, Kentucky. × 1.

FIG. 8. Distal view of specimen (Fig. 7), conical glabella and wide brim. × 1.

Proetus (*Crassiproetus*) *crassimarginatus* (Hall) 15

FIG. 9. Typical pygidium. Hypotype No. 29546. Columbus ls; Kelley's Island, Lake Erie, Erie County, Ohio. × 1.

FIG. 10. Pygidium, slightly low, narrow axis. Hypotype No. 2897/6, American Museum of Natural History (original of Hall, 1876, Pl. 20, Fig. 26). Jeffersonville ls; Falls of the Ohio River, near Louisville, Kentucky. × 1.

Proetus (*Crassiproetus*) *crassimarginatus glabrus* Stumm, subsp. nov. 17

FIG. 11. Pygidium, well-impressed anterior segments and obsolete posterior segments. Holotype No. 4897. Jeffersonville ls; Falls of Ohio River, near Louisville, Kentucky. × 1.

Proetus (*Crassiproetus*) *sibleyensis* Stumm, sp. nov. 18

FIG. 12. Cranidium, globose glabella and narrow concave brim with upturned border. Holotype No. 15130. Dundee ls; abandoned Solvay Process Company quarry, Sibley, 2 mi. N. of Trenton, Wayne County, Michigan (enlarged after Bassett). × 2.

FIG. 13. Free cheek, ocular platform and rounded genal angle. Paratype No. 15175. Horizon and locality (Fig. 12). × 2.

FIG. 14. Pygidium, prominent segments. Paratype No. 15128. Horizon and locality, Fig. 12 (after Bassett). × 2.

FIG. 15. Pygidium with weaker posterior segmentation. Paratype No. 15129. Horizon and locality (Fig. 12). × 1.

FIG. 16. Posterior view of specimen (Fig. 15) showing convexity of axis. × 1.

EXPLANATION OF PLATE III

(All figures × 2)

PAGE

Dechenella (*Dechenella*) *valentini* Stumm, sp. nov. 19

FIG. 1. Anterior of semicircular cephalon, lobate glabella and acicular genal spines. Holotype No. 29775. Rogers City ls; quarry of Michigan Limestone Division, United States Steel Corporation, Rogers City, Michigan.

FIG. 2. Long, relatively narrow pygidium. Paratype No. 29776. Rogers City ls; shore of Lake Huron, ½ mi. N. of Rockport, Alpena County, Michigan.

Dechenella (*Dechenella*) *welleri* (Stauffer) 21

FIG. 3. Cranidium, wide, flat brim and rapidly tapering glabella. Holotype No. 16976, Museum of Geology, Ohio State University. Columbus ls; abandoned Lake Shore Railroad quarry, 1½ mi. S. of Venice, Erie County, Ohio.

FIG. 4. Posterior of thorax and pygidium of holotype (Fig. 3).

FIG. 5. Exfoliated pygidium. Horizon and locality as holotype (Fig. 3). Hypotype No. 29778.

Dechenella (*Dechenella*) *delphinula* (Hall and Clarke) 21

FIG. 6. Cranidium, very wide brim with medial furrow. Hypotype No. 29779. Lower Onondaga ls; Port Colborne, Welland County, Ontario.

Dechenella (*Dechenella*) (*?*) *angustifrons* (Hall) 22

FIG. 7. Cranidium, conical glabella. Lectotype No. 2900/1, American Museum of Natural History (original of Hall, 1876, Pl. 20, Fig. 1). Schoharie grit facies of the Lower Onondaga ls; Albany County, New York.

Dechenella (*Dechenella*) *planimarginata* (Meek) 20

FIG. 8. Cephalon, concave brim and glabella with lateral expansions. Hypotype No. 15133. Dundee ls; abandoned Solvay Process Company quarry, Sibley, 2 mi. N. of Trenton, Wayne County, Michigan (after Bassett).

FIG. 9. Cranidium, complete brim. Hypotype No. 15126. Horizon and locality, Fig. 8 (after Bassett).

FIG. 10. Exfoliated pygidium from type locality. Hypotype No. 29777. Dundee ls; Medusa Portland Cement Company quarry, 1½ mi. SW. of Sylvania, Lucas County, Ohio.

FIG. 11. Typical pygidium, partly exfoliated. Hypotype No. 15125. Horizon and locality, Fig. 8 (after Bassett).

FIG. 12. Small pygidium with complete test. Hypotype No. 15122. Horizon and locality, Fig. 8 (after Bassett).

FIG. 13. Posterior of specimen (Fig. 12) showing convexity of axis.

PLATE III

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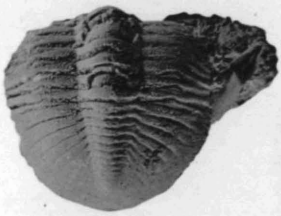

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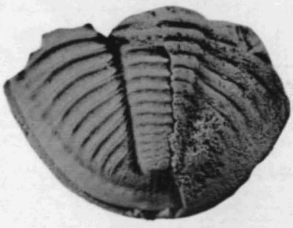

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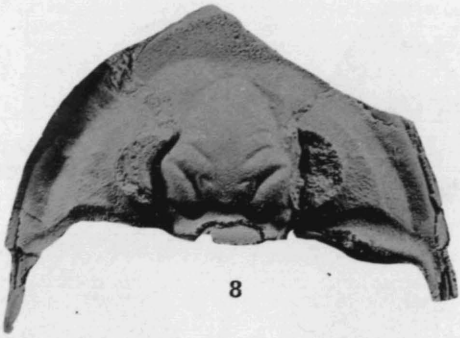

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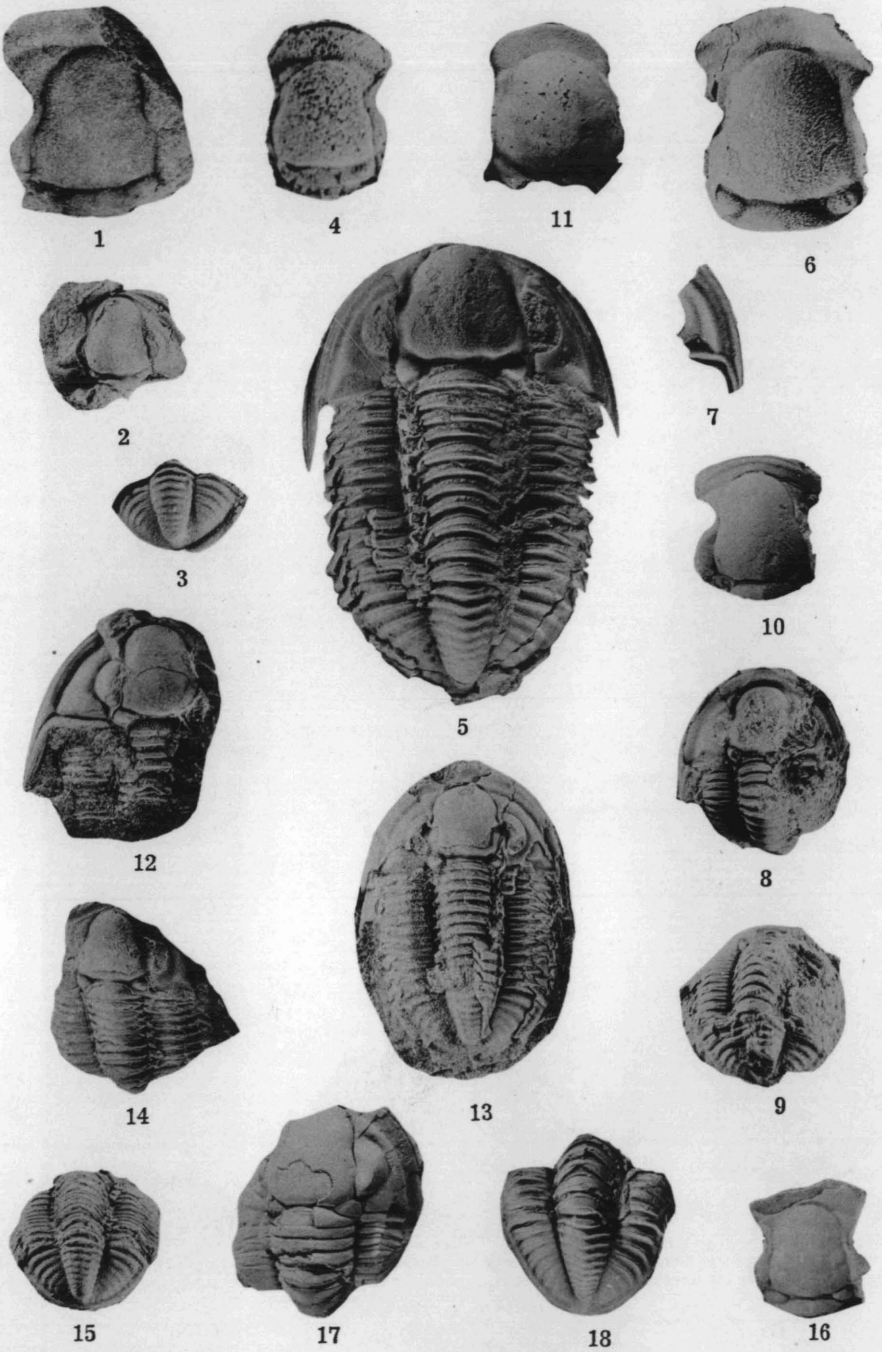
PLATE IV



EXPLANATION OF PLATE IV

PAGE

Dechenella (*Basidechenella*) *clara* (Hall) 23

Fig. 1. Cranidium, wide brim. Apparent constriction of glabella due to distortion. Hypotype No. 29513. Bois Blanc fm; ledges along road just E. of SW. corner sec. 14, T. 39 N., R 4 W., 2 mi. W. of center of Mackinaw City, Michigan. × 2.

Fig. 2. Exfoliated cephalon without genal spine. Hypotype No. 29514. Detroit River group—Amherstburg dolomite; abandoned Cummin's quarry, 6 mi. S. and 1¾ mi. E. of Petersburg, Monroe County, Michigan. × 1.

Fig. 3. Exfoliated pygidium. Hypotype No. 29515. (Fig. 2). × 1.

Fig. 4. Cranidium, typical subconical glabella. Hypotype No. 29512. Lower Onondaga ls; Port Colborne, Welland County, Ontario. × 2.

Fig. 5. Nearly complete individual, mainly exfoliated and lacking cephalic brim. Hypotype No. 25884, United States National Museum. Onondaga ls; LeRoy, New York. × 2.

Fig. 6. Cranidium, glabella with faint furrows. Hypotype No. 29510. Columbus ls; abandoned Wagner quarry, 1½ mi. SW. of Castalia, Erie County, Ohio. × 2.

Fig. 7. Free cheek. Hypotype No. 29511. Horizon and locality (Fig. 6). × 2.

Fig. 8. Anterior of almost complete individual. Hypotype No. 29509. Jeffersonville ls; Falls of Ohio River, near Louisville, Kentucky. × 2.

Fig. 9. Posterior view of original of Fig. 8. × 2.

Dechenella (*Basidechenella*) *canaliculata* (Hall) 24

Fig. 10. Cranidium, ribbed brim, glabella, and occipital ring with faint axial node. Holotype No. 4253/1, American Museum of Natural History (original of Hall, 1876, Pl. 20, Figs. 10–11). Jeffersonville ls; Falls of Ohio River, near Louisville, Kentucky. × 2.

Dechenella (*Basidechenella*) *tumida* (Hall and Clarke) 24

Fig. 11. Cranidium, flat brim and highly globose glabella. Hypotype No. 29516. Lower Onondaga ls; Port Colborne, Ontario. × 2.

Dechenella (*Basidechenella*) *eriensis* Stumm, sp. nov. 24

Fig. 12. Cephalon, well-preserved left free cheek. Paratype No. 7538*b*, Geological Museum, Oberlin College. Upper part Delaware ls; abandoned Wagner quarry, W. of Norfolk and Western Railroad classification yards, 2 mi. S. of Sandusky, Erie County, Ohio. × 1.

Fig. 13. Complete partly exfoliated specimen, well-preserved subquadrate glabella. Holotype No. 7538*a*, Geological Museum, Oberlin College. Horizon and locality (Fig. 12). × 1.

Fig. 14. Cranidium with test preserved, faintly impressed glabellar furrows. Paratype No. 29517. Horizon and locality (Fig. 12). × 1.

Dechenella (*Basidechenella*) *rowi sanduskiensis* Stumm, subsp. nov. 25

Fig. 15. Anterior, tuberculate glabella. Holotype No. 7538*c*, Geological Museum, Oberlin College. Horizon and locality (Fig. 12). × 1.

Fig. 16. Posterior of holotype (Fig. 15), short, wide pygidium. × 1.

Dechenella (*Basidechenella*) *rowi* (Green) 25

Fig. 17. Anterior of typical specimen. Hypotype No. 29547. Marcellus fm—Stafford ls member; 6 mi. E. of Batavia, New York. × 1.

Fig. 18. Posterior of same specimen (Fig. 17). × 1.

Volume XI

1. Ostracods of the Family Aechminidae from the Arkona Shale of Southern Ontario, by Robert V. Kesling. Pages 1–10, with 1 plate. Price $.35.

2. Lower Middle Devonian Proetid Trilobites from Michigan, Southwestern Ontario, and Northern Ohio, by Erwin C. Stumm. Pages 11–31, with 4 plates. Price $.65.