

CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY
THE UNIVERSITY OF MICHIGAN

Vol. XX, No. 3, pp. 63-73 (2 pls.)

SEPTEMBER 17, 1965

A REVISION OF THE ORDOVICIAN TRILOBITE
ASAPHUS PLATYCEPHALUS STOKES

BY
DAVID G. DARBY AND ERWIN C. STUMM



MUSEUM OF PALEONTOLOGY
THE UNIVERSITY OF MICHIGAN
ANN ARBOR

CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY

Director: LEWIS B. KELLUM

The series of contributions from the Museum of Paleontology is a medium for the publication of papers based chiefly upon the collection in the Museum. When the number of pages issued is sufficient to make a volume, a title page and a table of contents will be sent to libraries on the mailing list, and to individuals upon request. A list of the separate papers may also be obtained. Correspondence should be directed to the Museum of Paleontology, The University of Michigan, Ann Arbor, Michigan.

VOLS. II-XIX. Parts of volumes may be obtained if available.

VOLUME XX

1. Upper Devonian and Lower Mississippian Pectinoid Pelecypods from Michigan, Ohio, Indiana, Iowa, and Missouri, by Thomas W. Hutchinson and Erwin C. Stumm, Pages 1-48, with 7 plates.
2. Two New Middle Devonian Species of the Starfish *Devonaster* from Southwestern Ontario, by Robert V. Kesling and Jean D. Wright. Pages 49-61, with 4 plates.
3. A Revision of the Ordovician Trilobite *Asaphus platycephalus* Stokes, by David G. Darby and Edwin C. Stumm. Pages 63-73, with 2 plates.

A REVISION OF THE ORDOVICIAN TRILOBITE
ASAPHUS PLATYCEPHALUS STOKES

BY
 DAVID G. DARBY AND ERWIN C. STUMM

ABSTRACT

The Ordovician trilobite *Asaphus platycephalus* Stokes is determined to be a valid species and is assigned to the genus *Isotelus*. The species is compared with *I. gigas* Dekay, *I. iowensis* (Owen), and *I. maximus* Locke. The Ordovician stratigraphy of St. Joseph Island, Ontario, the type locality of *I. platycephalus* is reviewed.

CONTENTS

Introduction 63
 Stratigraphy 64
 References cited 71
 Plates (after) 71

INTRODUCTION

IN 1820, Dr. J. J. Bigsby, of England, visited St. Joseph Island, Ontario, in conjunction with work on the geography and geology of Lake Huron. One of the fossils he found on the island was apparently a new species of trilobite. This was given, upon Dr. Bigsby's return, to Mr. Charles Stokes. In 1824, in an appendix to Dr. Bigsby's work, Mr. Stokes figured (but did not describe) and named the specimen *Asaphus platycephalus*. Later in that year, J. E. Dekay erected a new genus, *Isotelus*, based on a trilobite from Trenton Falls, New York, with *Isotelus gigas* as the type species. Since then most authors have considered the two species synonymous, the only questions being raised were by Hall, 1847, on the validity of the genus *Isotelus* and the character of the genal spines, if any, of *A. platycephalus*, since the area of the librigenae was missing on Stokes' original specimen.

The purpose of this work is to ascertain the nature of the genal spines of the St. Joseph Island trilobite and to decide if the species is valid, or a synonym of *I. gigas* Dekay. The genus *Isotelus* is now known to be valid, and *I. platycephalus* is a valid species of it.

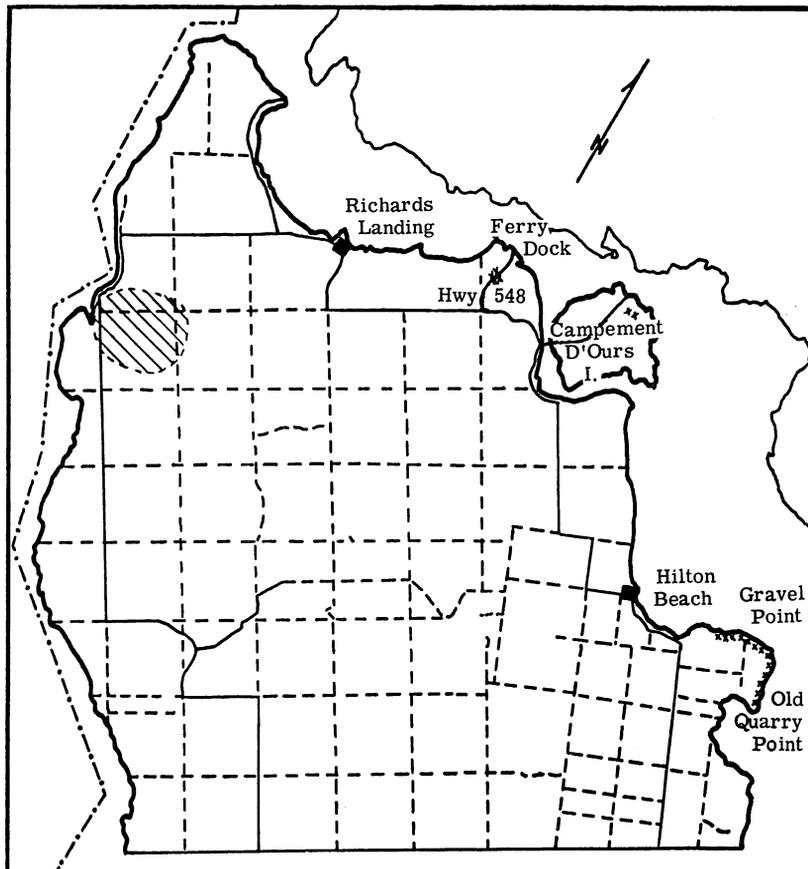
The authors wish to thank Dr. W. T. Dean of the Department of Paleontology, British Museum (Natural History) for the gift of the cast of the lectotype of *Asaphus platycephalus* Stokes (Pl. II, Fig. 1). Thanks are also due to Dr. G. A. Cooper of the U. S. National Museum for the loan of the syntypes of *Asaphus (Isotelus) iowensis* Owen, and to Dr. K. E. Caster of the University of Cincinnati for the loan of specimens of *Isotelus maximus* Locke.

We are indebted to Drs. L. B. Kellum, C. A. Arnold, and R. V. Kesling for critically reviewing the manuscript.

All illustrated specimens are deposited in the Museum of Paleontology, The University of Michigan.

STRATIGRAPHY

St. Joseph Island is located in the northwest corner of Lake Huron, just east of the United States-Canadian border. The island is approximately nineteen miles long by seventeen miles wide (Fig. 1). Geologically, the island lies on the northeast edge of the Michigan basin. Rocks of Black River age are found on the northern part of the island, and those of Trenton age on the southern part. The beds of Black River age correlate with the Bony Falls Limestone of the Escanaba River section in northwestern Michigan, and the beds of Trenton age correlate with the *Prasopora* bed of the Chandler Falls Limestone in the same region (see Stumm and Kauffman, 1958, p. 944). No Cambrian rocks are in the area, and the Ordovician rocks lie unconformably upon Precambrian igneous and metamorphic rocks. Pleistocene drift covers most of the sediments, and only two significant outcrops of Black River rocks occur, one along the beach beginning on the northeast side of the island at Old Quarry Point and continuing northward to Gravel Point, and then west for approximately two miles. The second outcrop is in a quarry which was used by the highway department for road-building material. It is situated one mile from the ferry dock on both sides of Highway 548. The section along the beach provided the better collecting because of the increased rate of weathering and the long exposure, as contrasted with the fairly recent development of the quarry.



SECTION ALONG NORTHEAST SHORE OF ST. JOSEPH ISLAND
(OLD QUARRY POINT)

Top of Section:

<i>Bed</i>	<i>Feet</i>	<i>Inches</i>
6. Very dense medium gray limestone, weathering buff. Bedding 1 to 4 inches, rectangular fracture pattern. Relatively unfossiliferous. Top not exposed	24	
5. Mottled fine to medium-grained calcilitite. Uniformly gray in color, beds 6 to 12 inches thick. Fractures conchoidal. Contains <i>Foerstephyllum halli</i> (Nicholson)—characteristic of the upper part, <i>Eoleperditia fabulites</i> (Conrad), <i>Lambeophyllum</i> sp., <i>Strophomena</i> sp., <i>Endoceras</i> sp.—characteristic of the lower part, bryozoans, pelecypods, gastropods, brachiopods, and crinoid columnals	12	
4. Same lithology as unit 6	1	

<i>Bed</i>	<i>Feet</i>	<i>Inches</i>
3. Fine to medium-grained argillaceous limestone. Dark gray on fresh surface, weathering light gray. Some layers nearly all bryozoan, some with large numbers of pelecypods. Also contains brachiopods, cephalopods, and ostracods	2	6
2. Calcilitite similar to unit 5. Contains <i>Isotelus platycephalus</i> (Stokes), <i>Basiliella barrandei</i> (Hall), <i>Bumastus milleri</i> (Billings), <i>Ceraurus</i> sp., <i>Bathyurus</i> sp., <i>Eoleperditia fabulites</i> (Conrad), and pelecypods ...	3	
1. Fine to medium-grained argillaceous limestone. Thin bedded. Gray on fresh surface; the base of the bed is beneath water level. Contains large numbers of <i>Rhynchotrema</i> sp.	2	
Total exposed thickness	44	6

The beds dip 6 degrees S, 35 degrees W.

Bed 2 contained all the specimens of *Isotelus platycephalus* found, and the principal fossil of this bed is the ostracod *Eoleperditia fabulites*, which occurs in large numbers. The ostracods and trilobites are, with few exceptions, the best preserved fossils.

The presence of disconformities in the Middle Ordovician of northern Michigan and Canada makes difficult exact correlations with both developed sections in Ohio and elsewhere. The association of *Isotelus platycephalus* with *Eoleperditia fabulites* indicates that these beds may correlate with the Mifflin, upper Magnolia, and Quimby's Mill members of the Platteville Formation in northern Illinois, Scott, 1951), the Lowville Limestone of New York, the Lebanon Limestone of Tennessee and the Glade Limestone of Kentucky (Swartz, 1949).

SYSTEMATIC DESCRIPTION

Phylum ARTHROPODA

Class TRILOBITA

Order OPISTHOPARIA

Family Asaphidae Burmeister 1843

Genus *Isotelus* Dekay 1824

Isotelus platycephalus (Stokes) 1824

(Pl. I, Figs. 1-5; Pl. II, Figs. 1-5)

Asaphus platycephalus Stokes, 1824, p. 208, pl. 27.

Brongniatia platycephala, Eaton, 1832 (partim), p. 32-33.

(?) *Isotelus* sp., Raymond and Narraway, 1910, p. 56, Pl. 15, Fig. 3.

Isotelus gigas, Hussey, 1952, Pl. 8, Figs. 1 and 12; Pl. 10, Fig. 18.

Diagnosis.—Adult approximately twice as long as wide. Cephalon and pygidium subequal in size and subrounded, the latter with a broad concave border. Thorax with eight segments, the axial lobe less than one-half and more than one-third the total width. Surface covered by subequal punctae

which decrease in number and distinctness toward the extremities. Eye lobes prominent. Adult without genal spines.

Description.—Cephalon evenly rounded at anterior extremity, the librigenae of immature specimens bearing spines which extend a short distance posteriorly alongside the thorax (Pl. II, Fig. 5). Adult with genal extremities ending in a slightly pointed obtuse angle (Pl. II, Fig. 3). Surface convex centrally, the border characterized anteriorly by an indistinctly defined flattened area, which becomes concave and more distinct laterally, and ends prior to genal angles. Dorsal intramarginal isoteliform facial sutures begin laterally behind the eyes and extend inward surrounding subcircular palpebral lobes; they continue, curving distally in front of the eyes, then curving inward, paralleling the anterior margin, to meet at a distinct angle at the midpoint of the anterior margin (Pl. II, Fig. 1). No median tubercle observed.

Glabella convex, indistinctly defined, no lateral or occipital furrows apparent (Pl. I, Fig. 5).

Eyes prominent, subcircular, comparatively wide apart. Visual surface connected with librigenae, reniform in shape viewed dorsally; transversely convex, widening toward the base which is raised off the librigena. Palpebral lobes slightly concave centrally, and flattened abaxially. Eyes holochroal, but no lenses evident. The surface of the only complete eye bears minute striations, some of which bifurcate, trending vertically over the convex surface.

Ventrally, a wide doublure bearing a median suture extends posteriorly half way to a point beneath the eyes. Doublure concentrically marked by terrace lines. Surface of doublure essentially flat.

Hypostoma with bifurcating posterior margin, the fork extending more than one-third the length. Sides of forked portion gently curving, extending posteriorly at approximately 20 degrees to a saggittal line. Outer margin convex for the posterior two-thirds, anteriorly becoming concave forming notches terminating in small anterolateral wings (Pl. I, Figs. 3-4). Overall surface slightly convex with distinct terrace lines. Anterior to the base of the fork there is a distinct, relatively broad central impression. Two distinct circular impressions, the maculae, present on either side and slightly anterior to the central depression. The concentric terrace lines surround, but do not cross the maculae. A few widely spaced punctae are present on the anterior portion. On the inner surface the forked portion of the hypostoma rises higher, and each fork is angularly convex (Pl. II, Fig. 4).

Eight thoracic segments present. Sides of thorax straight, surface convex, the edges rising steeply. Axial lobe distinct, less than one-half and

more than two-thirds the total width; tapering posteriorly very gently. Each segment with a slight posterior curve along the median line. Pleurae bent strongly downward at peripheral extremities. Each pleura with a straight (exsag.) outer margin. A slight furrow present near, and parallel to, the peripheral extremity of each pleura. Pleural furrows beginning anteriorly just distal to the axial furrows and continuing laterally to the point where the pleurae bend downward. The anterolateral extremity of each pleura bears a flat subtriangular articulating facet, slanting anteriorly.

Pygidium subtriangular, the lateral margins slightly curved, the posterior extremity somewhat truncated. Segmentation absent to vestigial. Dorsal border wide and concave becoming flattened anteriorly. Axial lobe tapering abruptly to a slightly raised terminus at the dorsal border. Axial lobe convex, separated from the pleural region by a broad, indistinct, axial furrow. Pleural area less convex than axial lobe, and a slightly raised area separates the border from the pleural field. A pleural furrow exists near the anterior extremity of each field extending laterally as do those of the thoracic pleurae to a point where the articulating facet begins.

Remarks.—No enrolled specimens were found.

Isotelus platycephalus differs from *I. gigas* (Pl. I, Fig. 7) in that the cephalon and pygidium are more rounded and less triangular. The cephalon has no raised rim at the border, and the pygidium has a wide concave border. The angle of the hypostomal forks is less than in *I. gigas*. The axial lobe is less than one-half the thoracic width in the adult (Pl. I, Figs. 1–2).

These two species have usually been considered synonymous since 1824 when both were described. In 1839 (p. 38) Green made this observation, "The *A. platycephalus* [sic] is synonymous with *I. gigas* of Dr. Dekay; and if Mr. Stokes' drawing and Dr. Dekay's figure be accurate representations of nature, we think they must be drawn from analogous fragments belonging to animals at least specifically distinct." Although the statement appears to be a direct contradiction of itself, Green probably recognized the fact that there might be two separate species. As stated, no description was included in Stokes' original work, but the figures are excellent. A cast of the lectotype is illustrated (Pl. II, Figs. 1–2).

Mr. Stokes placed the fossil in the genus *Asaphus*. Dekay, in erecting *Isotelus*, differentiated it from *Asaphus* by the following, "By the middle lobe which is double the size of the lateral ones; by the absence of a membranous expansion on the sides; by the non-reticulation of the eyes, etc." Since Dekay's work, it has been found that certain characteristics are variable from one molt to the next in *I. gigas*, and this basis of differentiation is not always true. Raymond (1914) in his discussion of the ontogeny

of *I. gigas* has shown that the young specimens may have a thoracic axial lobe less than one-half the width. Wilson (1947) in her specific description stated that the axial lobe is less than half and more than one-third the whole width in *I. gigas*. This is not exactly true, since the lobe does reach, and even exceeds, a width of half the total, and in young instars may be less than one-third. Raymond described a very young specimen 3 mm in length whose axial lobe was only 0.20 the total width, and a large specimen 181 mm long with an index of 0.53. A ratio of one-half may be reached prior to complete maturity, since the author has found this on specimens still retaining the genal spines, which are lost at adulthood.

The eyes may appear reticulated if the cornea remains transparent so that the lenses are visible.

The best modern differentiation of the genera is by Jannusson (1959): "*Asaphus*—Cephalon and pygidium without any trace of border. Glabella long, reaching external cephalic margin, frontal area absent or very narrow; posterior margin of librigenae typically convex . . ." *Isotelus* species all have some border, although it may be poorly defined.

I. platycephalus differs from *I. iowensis* in that the facial sutures meet anteriorly at a distinct angle forming a much more pointed ogive than on *I. iowensis* (Pl. I, Fig. 5). Between the palpebral lobes the glabella of *iowensis* is flat, while that of *platycephalus* is convex. The axial lobe of the pygidium is not as distinct in the latter species (Pl. I, Fig. 1), nor does it truncate with such a prominent elevation. The pygidium is not distinctly segmented, and the border is wider.

The plates accompanying Owen's original description of *I. iowensis* (1852) show four complete or nearly complete specimens. Upon receipt of the type material from the U. S. National Museum, these were missing. No complete cephalon was included. If the more complete specimens are still in existence, they are not in the National Museum collections. Of approximately twenty pygidia in the type material, all have distinct segmentation, and a prominent axial lobe with a distinctly raised portion at its posterior truncation. These features, rather than exacting shape measurements serve to differentiate the species on the basis of the pygidium alone (Pl. II, Fig. 6).

The specimen *Isotelus* sp. figured by Raymond (1910, p. 56, Pl. 15, Fig. 3) from Mechanicsville, New York, may be conspecific with *Isotelus platycephalus*. The pygidium is not segmented as distinctly as *I. iowensis*, to which he later compared it, nor is the border as narrow. If the facial sutures had been preserved, they likely would have been seen to meet at a distinct angle.

I. platycephalus differs from *I. maximus* in that it loses its genal spines in maturity and the shape of the cephalon and cranium is not as circular. Comparing the two species on the basis of length to width ratios of the cephalon and pygidium is only successful in differentiating adult specimens. The ratio in *I. maximus* is approximately two-thirds, while in *I. platycephalus* it is approximately three-fourths. Immature specimens of *I. maximus*, however, may have ratios as high as three-fourths, and care must be taken in using measurements to separate the two, especially when dealing with pygidia, which are very similar at some stages of growth.

The name *Isotelus megistos*, proposed by Locke in 1841, is invalid, being in exact synonymy with *Isotelus maximus* Locke. Locke's original figure of *I. maximus* (1838) showed no genal spines, and was largely a product of guesswork based on fragments. When new material was found, he revised his description and changed the name: "These gigantic dimensions suggested the name *maximus*, which I gave in the Ohio Report, but which for obvious[?] reasons, I have changed to the more classical Greek term of the same import." (i.e., *megistos*).

As Foerste (1919) has pointed out, the specimens which caused Locke to rename the species may in reality not be conspecific with the original *I. maximus*, and, therefore, *I. megistos* may constitute a new species. In our opinion, the two should be kept synonymous and, because the first figures were based on such poor material, specific determination is impossible; the figure in his later work (1842) should be regarded as of the type.

Measurements.—Hypotype, UMMP No. 29569. Length 82.4 mm, width at posterior of cephalon 42 mm, length of cephalon ca. 29 mm, width of thorax 43 mm, axial lobe 17 mm, width of pygidium 41 mm, length 31.7 mm.

A cranium was found which measures approximately 56 mm in length and 63.5 mm in width across the posterior indicating an animal approximately 164 mm long, which is the maximum indicated size of any individual found.

Occurrence.—Black River (lower Middle Ordovician). All material came from St. Joseph Island, Ontario. One hypostoma, UMMP No. 36394, from the west side of adjacent Neebish Island, Michigan, appears to be conspecific.

Types.—Lectotype in British Museum (Natural History); cast of lectotype No. 51643. Hypotypes Nos. 29569, 30058, 37491, 37492, 37493, and 37494. Hypotype of *I. gigas*. No. 15635; hypotypes of *I. iowensis* No. 36388. All specimens are deposited in the University of Michigan Museum of Paleontology (UMMP).

LITERATURE CITED

- DEKAY, J. E. 1824. Observations on the Structure of Trilobites, and Description of an Apparently New Genus. *Ann. Lyceum Nat. Hist. New York*, Vol. 1, Part 1, pp. 174-89, Pls. 12-13.
- EATON, AMOS. 1832. *Geological Text-Book*, 134 pp., 5 pls., 3 text figs., 2d ed., Albany, N.Y.: Websters and Skinners.
- FOERSTE, A. F. 1919. Notes on *Isotelus*, *Acrolichas*, *Calymene*, and *Encrinurus*. *Bull. Sci. Lab. Denison Univ.*, Vol. 19, pp. 65-81, Pls. 14-18.
- GREEN, JACOB. 1839. Remarks on the Trilobite. *Am. Journ. Sci.*, Vol. 37, pp. 25-39, 2 Pls.
- HALL, JAMES. 1847. *Natural History of New York*, part 6, Paleontology, Vol. 1, xxiii+338 pp., 33 Pls.
- HUSSEY, R. C. 1952. The Middle and Upper Ordovician Rocks of Michigan. *Mich. Geol. Surv.*, Publ. 46, *Geol. Ser.* 39, 89 pp., 10 Pls.
- JANNUSSON, VALDAR. 1959. *In* Treatise on Invertebrate Paleontology, Part O, Arthropoda 1, *Geol. Soc. Am.*, 560 pp., 415 text figs., Univ. Kansas Press.
- LOCKE, JOHN. 1838. 2d Ann. Rept. *Geol. Survey Ohio*, pp. 203-74, 15 text figs.
- . 1842. On a New Species of Trilobite of a Very Large Size. *Am. Journ. Sci. and Arts*, Vol. 42, No. 2, pp. 366-68, Pl. 3.
- OWEN, D. D. 1852. Report *Geol. Survey Wisconsin, Iowa and Minnesota*, App., Art. 1, xxxviii + 638 pp., 15 Pls., maps and cross sections after plates.
- RAYMOND, P. E. 1914. Notes on the Ontogeny of *Isotelus gigas* DeKay. *Bull. Mus. Comp. Zool.*, Vol. 58, No. 5, pp. 247-63, 3 Pls.
- SCOTT, H. W. 1951. Instars and Shell Morphology of *Eoleperditia fabulites*. *Journ. Paleontol.*, Vol. 25, No. 3, pp. 321-26, Pl. 51, 3 text figs., 2 tab.
- STOKES, CHARLES. 1824. On a Trilobite from Lake Huron. *In* J. J. Bigsby, Notes on the Geography and Geology of Lake Huron. *Trans. Geol. Soc.*, ser. 2, vol. 1, pt. 2, p. 175-209, Pl. 27.
- STUMM, E. C., and KAUFFMAN, E. G. 1958. Calymenid Trilobites from the Ordovician Rocks of Michigan. *Journ. Paleontol.*, Vol. 32, No. 5, pp. 943-60, Pls. 123-24, 2 text figs.
- SWARTZ, F. M. 1949. Muscle Marks, Hinge and Overlap Features, and Classification of some Leperditiidae. *Ibid.*, Vol. 23, No. 3, pp. 306-27, Pls. 65-67, 2 text figs.
- WILSON, A. E. 1947. Trilobita of the Ottawa Formation of the Ottawa-St. Lawrence Lowland. *Can. Geol. Surv. Bull.*, No. 9, v + 86 pp., 10 Pls.

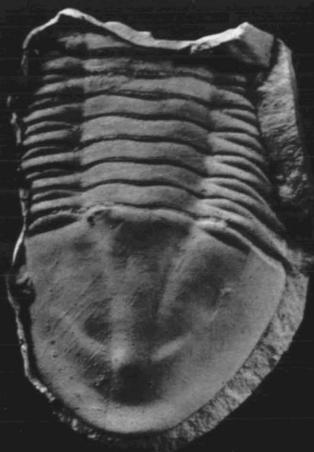
Submitted for publication February 23, 1965

EXPLANATION OF PLATE 1

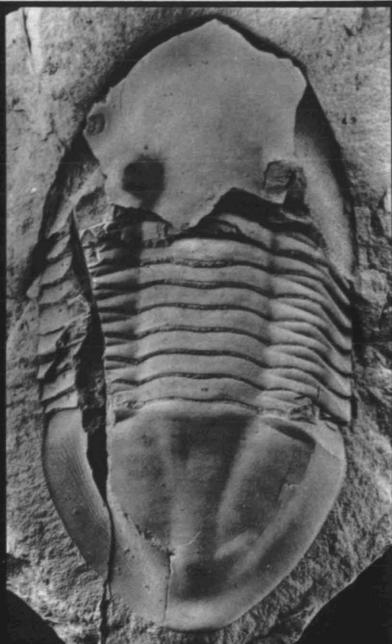
(All figures $\times 1$)

	PAGE
<i>Isotelus platycephalus</i> (Stokes)	66
FIG. 1. Latex cast of exterior mold of a relatively complete specimen showing well-preserved pygidium. Hypotype No. 29569. Bed No. 2 of section at Quarry Point, St. Joseph Island.	
FIG. 2. View of same specimen showing cephalic features, including incipient right genal spine.	
FIG. 3. Ventral side of cephalon of same specimen showing broad doublure with terrace lines, median suture, and hypostoma.	
FIG. 4. Hypostoma of larger individual showing pits and well-developed terrace lines. Hypotype No. 30058. Same occurrence as original of Figs. 1-3.	
FIG. 5. Cranidium showing angular brim. Hypotype No. 37491. Same occurrence as original of Figs. 1-3.	
<i>Isotelus iowensis</i> (Owen)	69
FIG. 6. Cranidium showing rounded brim. Hypotype No. 36388a. Platteville Limestone, near Guttenberg, Iowa.	
<i>Isotelus gigas</i> Dekay	69
FIG. 7. Complete young specimen showing trigonal cephalon and pygidium and slender right genal spine. Hypotype No. 15635. Trenton Group (Sherman Falls Limestone), Trenton Falls, New York.	

PLATE I



1



2



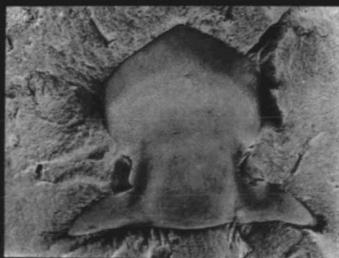
7



4



3



5



6

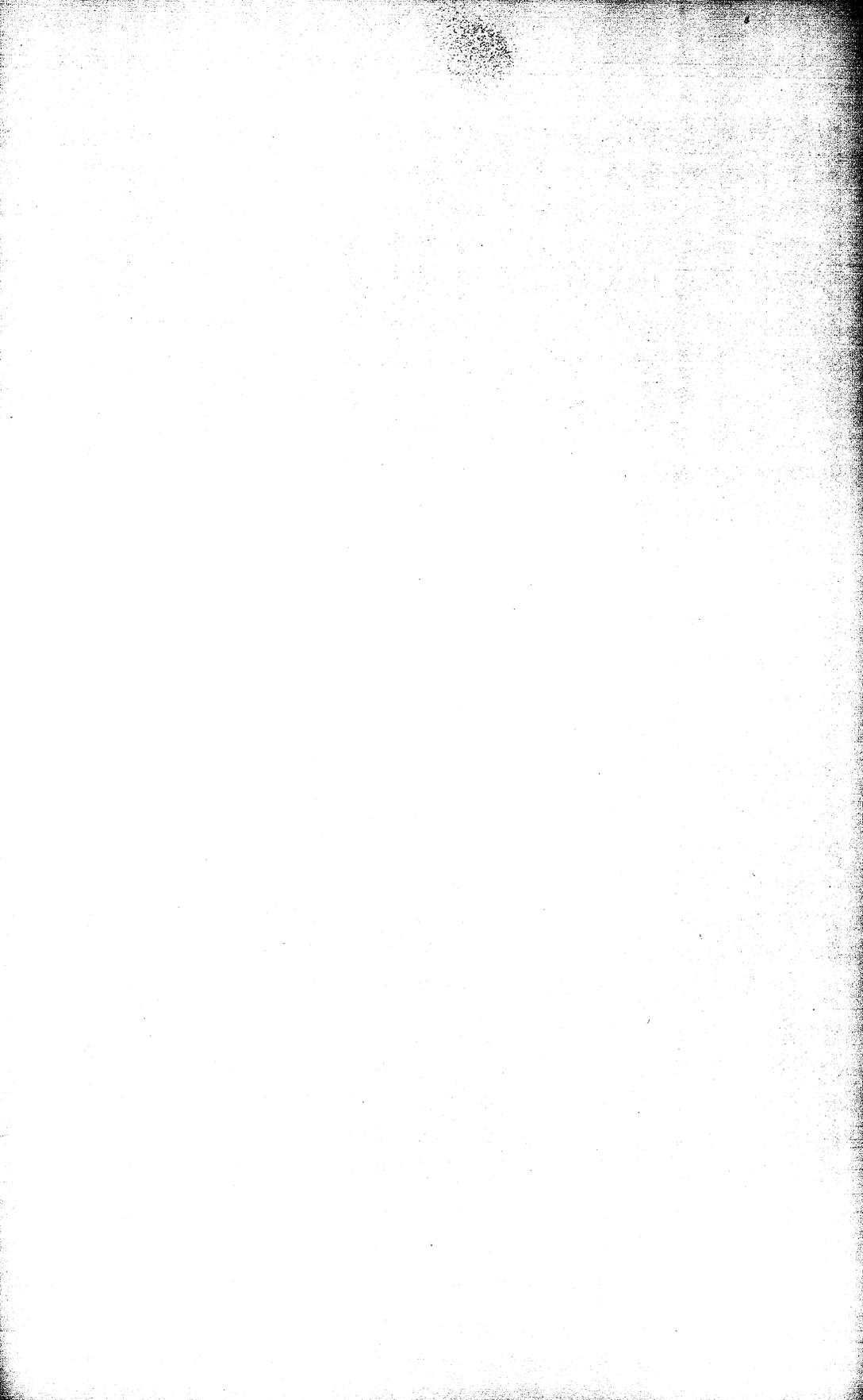
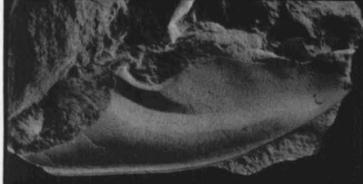
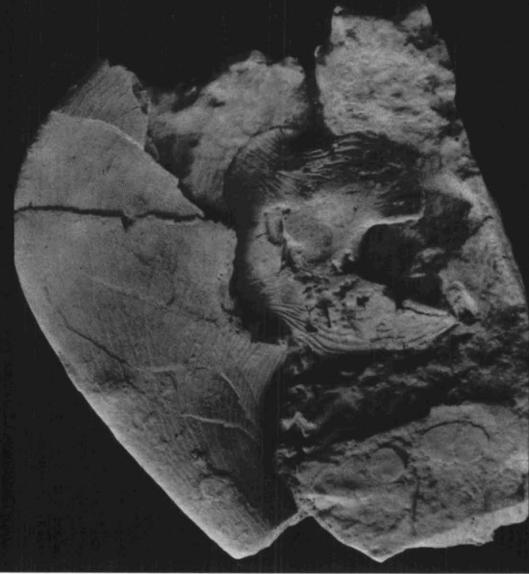
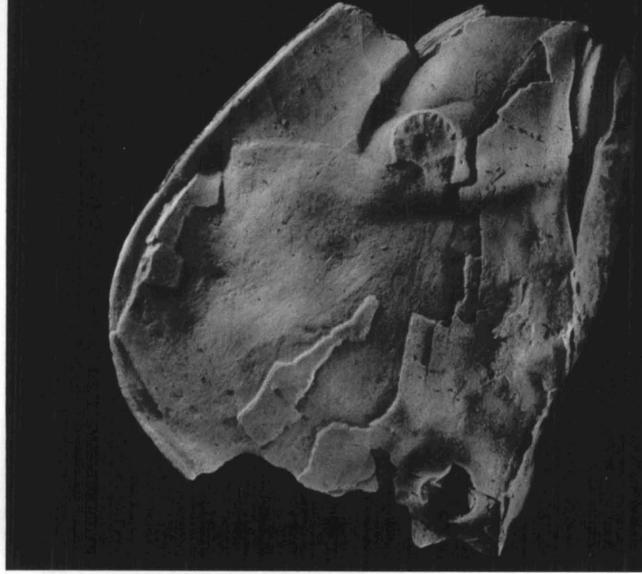




PLATE II



EXPLANATION OF PLATE II

(All figures $\times 1$)

	PAGE
<i>Isotelus platycephalus</i> (Stokes)	66
FIGS. 1-2. Dorsal and ventral views of cast (UMMP No. 51643) of lectotype in the British Museum (Natural History). Same occurrence as originals of Pl. I, Figs. 1-5.	
FIG. 3. Left librigena of mature individual showing genal angle without spine. Hypotype No. 37492. Same occurrence as originals of Pl. I, Figs. 1-5.	
FIG. 4. Under side of hypostoma showing convexity of forks. Hypotype No. 37494. Same occurrence as originals of Pl. I, Figs. 1-5.	
FIG. 5. Ventral view of cephalon of young specimen showing doublure, median suture, and genal spine. Hypotype No. 37493. Same occurrence of originals of Pl. I, Figs. 1-5.	
<i>Isotelus iowensis</i> (Owen)	69
FIG. 6. Partly exfoliated pygidium showing furrows and relatively narrow brim. Hypotype No. 36388b. Platteville Limestone, near Guttenberg, Iowa.	

