

CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY

THE UNIVERSITY OF MICHIGAN

Vol. XVIII, No. 7, pp. 117-134 (3 pls., 1 fig.)

SEPTEMBER 16, 1963

THE MIDDLE DEVONIAN IPPERWASH LIMESTONE
OF SOUTHWESTERN ONTARIO AND TWO
NEW BRACHIOPODS THEREFROM

BY

JEAN D. WRIGHT and EDWARD P. WRIGHT



FROM THE

EDWARD PULTENEY WRIGHT MEMORIAL VOLUME

Publication of this paper is made possible by the
Federal-Mogul-Bower Bearings, Inc.
Paleontology Research Fund

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-XVII. Parts of volumes may be obtained if available.

VOLUME XVIII

1. Morphology and Taxonomy of the Cystoid *Cheirocrinus anatiformis* (Hall), by Robert V. Kesling. Pages 1-21, with 4 plates.
2. Ordovician Streptelasmid Rugose Corals from Michigan, by Erwin C. Stumm. Pages 23-31, with 2 plates.
3. *Paraconularia newberryi* (Winchell) and other Lower Mississippian Conulariids from Michigan, Ohio, Indiana, and Iowa, by Egbert G. Driscoll. Pages 33-46, with 3 plates.
4. Two New Genera of Stricklandid Brachiopods, by A. J. Boucot and G. M. Ehlers. Pages 47-66, with 5 plates.
5. Species of the Crinoid *Dolatocrinus* from the Middle Devonian Dock Street Clay of Michigan, by Robert V. Kesling and Leigh W. Mintz. Pages 67-100, with 7 plates.
6. Key for Classification of Cystoids, by Robert V. Kesling. Pages 101-116.
7. The Middle Devonian Ipperwash Limestone of Southwestern Ontario and Two New Brachiopods Therefrom, by Jean D. Wright and Edward P. Wright. Pages 117-134, with 3 plates.

THE MIDDLE DEVONIAN IPPERWASH LIMESTONE
OF SOUTHWESTERN ONTARIO AND TWO
NEW BRACHIOPODS THEREFROM

BY

JEAN D. WRIGHT and EDWARD P. WRIGHT*

CONTENTS

Introduction	117
Acknowledgments	118
Historical background	118
Description of strata	119
Localities	125
Systematic descriptions	127
Literature cited	129
Plates	(after) 131

INTRODUCTION

IN 1957 several boat wells in the Kettle Point Indian Reservation in Lambton County, Ontario, on the shore of Lake Huron, were deepened. Large quantities of bluish-gray shale and limestone, the upper part of the Ipperwash limestone described originally by Stauffer (1915, p. 11), were brought to the surface and piled on either side of the channels.

Many times during 1957 and the following years the authors and Mr. Charles Southworth of Thedford, Ontario, examined that dredged material. As it weathered, fine specimens of fossils, some of them hitherto unreported from that horizon, were exposed and collected.

Soon after the dredging, Dr. George M. Ehlers of the Museum of Paleontology, The University of Michigan, visited the locality with the authors. He photographed one very large block of rock (Plate I, Fig. 2), which showed a contact between the Upper Devonian Kettle Point black shale and the Middle Devonian Ipperwash limestone.

Previous to examination of this new locality of the Ipperwash in the Indian Reservation the authors had studied that formation at the following outcrops: at Stony Point (Stauffer, 1915, p. 180), on the west side of Ipperwash Beach (*ibid.*, p. 182), at Smith Falls (*ibid.*, p. 189), and in a field near Ravenswood (Cooper and others, 1942, p. 1767).

In an effort to learn more about the Ipperwash limestone, the authors, in the summer of 1961, examined material dredged from the lake bottom

* Died April 7, 1962.

at Shepherd's Boat Livery, about four miles southwest of the exposures in the Indian Reservation. From there they went by boat to Blue Point, about five and one-half miles farther to the southwest; the rocks at Blue Point had been mentioned by Stauffer (1915, p. 11).

The information obtained from study of the Ipperwash limestone at all of the above localities is summarized in the succeeding pages. The relation of the rocks at these scattered outcrops is suggested.

ACKNOWLEDGMENTS

The authors wish to express their appreciation to all who aided them in the preparation of this paper: to Dr. George M. Ehlers, Curator Emeritus of the Museum of Paleontology, The University of Michigan, for his wise counsel and great help in many phases of the work; to Dr. G. Arthur Cooper, Head Curator, Department of Geology, Smithsonian Institution, United States National Museum, for making available his field notes on the Ipperwash limestone; and to Charles Southworth of Thedford, Ontario, with whom they spent many hours in the field examining the Ipperwash rocks and collecting fossils. Thanks are extended to Karoly Kutasi for the excellent photographs used in the plates, and to Mrs. Helen Mysyk who did the final typing.

Dr. L. B. Kellum, Dr. C. A. Arnold, and Dr. R. V. Kesling kindly reviewed the manuscript.

HISTORICAL BACKGROUND

The fossiliferous rocks which compose a low-lying reef west of Ipperwash Beach on the Ontario shore of Lake Huron and a promontory east of that beach known as Stony Point were first described by Clinton R. Stauffer (1915, p. 11). The original description follows:

The top division of the Hamilton is a grey limestone with a small amount of bluish shale. Its upper part may be seen outcropping along the shore of Lake Huron between Kettle point and Ipperwash beach. A better outcrop of somewhat lower beds is to be found at Stony point to the east of the beach, and again at Smith falls on the Sydenham river. The outcrops of this member are not very satisfactory at any point, but since those on either side of Ipperwash beach are the better and more extensive, it may be called the Ipperwash limestone. Great masses of this rock have been brought up from the bottom of Lake Huron and now lie along the water's edge at Blue point north of Camlachie. The oil wells at Petrolia show a thickness of about 40 feet for this division.

Stauffer gave additional descriptions of three of these outcrops. Of the exposure of the Ipperwash east of Kettle Point he said (*ibid.*, p. 182):

On the west side of Ipperwash beach, near Kettle point, the upper layers of the Ipperwash limestone appear in a small anticline projecting into the lake. This consists of 2 or 3 feet of hard, crinoidal, blue limestone with some dark grey to black chert.

Of the rocks exposed at Stony Point, he gave a section of the Ipperwash showing 3 feet of "semi-crystalline, blue to grey limestone with some shaly bands" overlying 8 inches of soft, blue shale, with the following comments (*ibid.*, p. 180):

These beds are evidently lower than those outcropping on the west side of Ipperwash Beach but they are considered to be a part of the Ipperwash limestone. At Petrolia the total thickness of this subdivision is about 40 feet, while at Sarnia more than double that amount of rock, presumably belonging to this horizon, has been penetrated in the deep wells.

Stauffer gave this account of the outcrops at Smith Falls (*ibid.*, p. 189):

On the Sydenham river $1\frac{1}{2}$ miles above Shetland, Euphemia township, the Ipperwash limestone or upper member of the Hamilton outcrops. The falls are caused by a $2\frac{1}{2}$ to 3-foot layer of bluish grey limestone which appears to be underlain by soft bluish shale. This outcrop contains an abundance of Hamilton fossils, . . .

For each of these three outcrops Stauffer appended a faunal list. He made no further reference to the rocks at Blue Point.

Cooper and others (1942, pp. 1767-68) discussed the Ipperwash limestone: ". . . exposed along the shore of Lake Huron from Ipperwash Beach to Silica Point and in the vicinity of Ravenswood. . . The writers believe that the Ipperwash fauna is closer to that of the basal Wanakah than to the fauna of the Tichenor [of New York State]."

In a personal communication to the authors (January 23, 1960), Cooper wrote that he and A. S. Warthin, while on a field trip in connection with their work on the Devonian Correlation Chart, heard the reef west of Ipperwash Beach referred to as "Silica Point." Although the name does not seem to be used locally at present, it is here preserved as a means of identification.

Caley (1943, pp. 54-56) suggested that certain rocks cropping out in the vicinity of Thedford and Arkona belong to the Ipperwash limestone. This was inconsistent with Stauffer's definitions of his four formations (Wright and Wright, 1961, pp. 291-92); as Stauffer said (1915, p. 180), the Ipperwash limestone ". . . lies much higher, stratigraphically, in the Hamilton than any of the beds outcropping in the immediate vicinity of Thedford."

DESCRIPTION OF STRATA

From Stauffer's initial description of his Ipperwash limestone it is evident that this formation consists of a lower and upper limestone separated by a covered interval. The covered interval probably contains shale and is represented on the shore of Lake Huron by Ipperwash Beach, which is about two and one-half miles in extent.

The faunal assemblages of the upper and lower limestones are different as will be noted from the lists of fossils given below. Each limestone contains a distinctive *Spinocyrtia* which has proved to be a valuable index fossil. *Spinocyrtia carinata* (Ehlers and Wright, 1955, pp. 15-17) has been found only in the lower limestone at Stony Point and in drift blocks of this rock. Specimens of *Spinocyrtia ravenswoodensis* (Ehlers and Wright, 1955, pp. 17-18), are characteristic of the upper limestone. They have been collected at many places on the shore west of Kettle Point where the excavation of boat wells has brought up blocks of the upper limestone from the lake bottom.

The Upper Ipperwash Limestone

Near Kettle Point the upper Ipperwash limestone forms a shallow syncline, the trough of which contains the Kettle Point black shale, the basal formation of the Upper Devonian exposed in the Province of Ontario. The eastern rim of this syncline is adjacent to a small anticline, Silica Point, which is almost entirely covered by the waters of Lake Huron when the lake level is high.

More complete knowledge of the upper part of the Ipperwash has been obtained from the western edge of the syncline, along the lake shore in the Kettle Point Indian Reservation. G. A. Cooper, in the aforementioned personal communication to the authors (January 23, 1960), gave the following description of this exposure from field notes made by himself and A. S. Warthin:

... According to my notes "Silica Point" is $2\frac{3}{4}$ miles west of Ipperwash exposure. I note about 2' of limestone with dark gray to black flint, rusty brown on surface. Limestone with *Chonetes vicina*, *S. [Strophodonta] demissa*. Below the ls. is blue shale. (Sample taken). This bed might represent Wanakah. The notes go on: About 2 miles SW of west bluff of Kettle Point, the Silica Point section appears again, 22" thick. The bottom of the bed contains the channel fillings with pyrite. In the lower part were found *Tropidoleptus*, *S. granulosus [= Spinocyrtia granulosa]*, and *L. [= Protoleptostrophia] perplana*.

In the upper part of the limestone *C. vicina* is abundant with *Homalonotus*, etc.

The black shale (Huron) lies directly on the Silica Point limestone and is in a low basin of the Silica Point. ...

In 1957 several of the boat wells in the Kettle Point Indian Reservation were deepened by dynamiting and dredging, with the result that many blocks of the upper Ipperwash limestone and a great quantity of bluish-gray shale were brought to the surface. This material was piled on both sides of the channels. One very large limestone block was photographed and examined (Plate I, Fig. 2). It showed the relationship of the

Ipperwash limestone to the overlying Kettle Point black shale. A description of the rock in this block follows:

Unit	Feet	Inches
3 Chert, dark gray to black, with Kettle Point black shale, weathered gray, in places		8
2 Limestone, dark gray, composed of an abundance of complete and fragmentary fossils; upper and lower contact surfaces uneven		2-3
1 Limestone, gray, massive. <i>Mucrospirifer</i> sp. at top.; <i>Chonetes vicinus</i> (Castelnau) throughout. Channel fillings about 1½ inches thick at base	1	5
Total thickness		2'3" to 2'4"

The authors examined the dredged material many times during the years 1957 through 1961. The shale of this material contains crystals of marcasite. Associated with the shale are pieces of gray argillaceous limestone, and blocks of interbedded marcasite-bearing limestone and shale. It is believed that the shale and associated rocks must have come from beneath the bed of limestone represented by Unit 1 of the block described above and that they composed a unit at least three feet thick.

Fossils obtained from weathered limestone of the dredged material are:

Spinocyrtia ravenswoodensis Ehlers and Wright
Mucrospirifer cooperi, sp. nov.
Cyrtina staufferi, sp. nov.
Atrypa sp.
Chonetes vicinus (Castelnau)
Schuchertella sp.
Protoleptostrophia perplana (Conrad)
Dipleura dekayi Green
Greenops boothi (Green)

Fossils obtained from the shale of this material are:

Bucanopsis sp. cf. *B. leda* (Hall)
Spinocyrtia ravenswoodensis Ehlers and Wright
Mucrospirifer cooperi, sp. nov.
Protoleptostrophia perplana (Conrad)
Chonetes vicinus (Castelnau)
Schuchertella sp.
Tropidoleptus carinatus (Conrad)

Further information on the upper Ipperwash was obtained in the summer of 1961 on the lake shore at Shepherd's Boat Livery, approximately four miles southwest of the exposure in the Kettle Point Indian Reservation. Here a small boat harbor was recently deepened by scoop and drag-line. Bluish-gray shale, dark gray chert, and blocks of gray limestone,

similar to those found on the shore at the Kettle Point Indian Reservation, were brought to the surface. The material was studied and specimens of fossils taken. A description of the section shown in one large block of limestone at the Shepherd locality is as follows:

Unit	Feet	Inches
3 Limestone, medium crystalline at top, containing <i>Mucrospirifer cooperi</i> , sp. nov., and <i>Chonetes vicinus</i> (Castelnau); the underlying limestone massive and unfossiliferous except for shale partings containing thin fossil deposits		12-13
2 Shale, bluish-gray		7
1 Limestone, weathering into thin beds		7-8
	Total thickness	2'2" to 2'4"

Some fossils were collected at Shepherd's from slabs of limestone. These are:

- Sulcoretepora* sp.
- Spinocyrtia ravenswoodensis* Ehlers and Wright
- Camarotoechia* sp.
- Mucrospirifer cooperi*, sp. nov.
- Chonetes vicinus* (Castelnau)
- Phacops rana* (Green)
- Greenops boothi* (Green)

Crystals of marcasite are present in some blocks of the limestone. The following fossils were found in the shale:

- "*Productella*" sp.
- Greenops boothi* (Green)
- Platyceras* sp.
- Cypricardinia* sp. aff. *C. indenta* (Conrad)
- Pleurodictyum* sp.

The upper Ipperwash limestone crops out at the site of an abandoned quarry in a field near Ravenswood. Nicholson (1875, p. 82) listed the occurrence of *Spirifer granulifera* (Hall) [= *Spinocyrtia ravenswoodensis* Ehlers and Wright] at Ravenswood; Cooper and others (1942, p. 1767) referred to this locality in their discussion of the Ipperwash.

The authors' description of the section exposed in the old quarry is as follows:

Unit	Feet	Inches
3 Limestone, hard, thin-bedded, and much weathered, with numerous crinoid columnals and fragments of <i>Mucrospirifer</i> sp., a finely costellate <i>Atrypa</i> , a large <i>Schuchertella</i> , <i>Spinocyrtia ravenswoodensis</i> Ehlers and Wright, <i>Aulocystis</i> sp., <i>Sulcoretepora</i> sp., <i>Greenops boothi</i> (Green), <i>Phacops rana</i> (Green), <i>Tentaculites</i> sp., and other fossils		10

2	Shale, weathered brown, containing <i>Spinocyrtia ravenswoodensis</i> Ehlers and Wright, <i>Rhipidomella vanuxemi</i> Hall, <i>Megastrophia concava</i> (Hall), <i>Strophodonta "demissa"</i> (Conrad), and other fossils	7
1	Limestone, dark gray, finely crystalline, weathering to buff-gray, with <i>Spinocyrtia ravenswoodensis</i> Ehlers and Wright, <i>Mucrospirifer</i> sp., and other fossils	1 3½
Total thickness		2' 8½"

In the authors' opinion the Ravenswood strata contain a fauna that is closely related to that of the Ipperwash rocks in the Indian Reservation and at Shepherd's, but probably occupy a slightly lower stratigraphic position than the beds at those places.

It is interesting to note in connection with the thickness of the upper Ipperwash limestone that when a water well was drilled recently in the Indian Reservation by Andrew A. Heal of Watford, Ontario, the drillers first encountered fifty feet of black shale (the Kettle Point black shale) and then three feet of limestone overlying a bluish-gray shale.

The Lower Ipperwash Limestone

The type locality of the lower Ipperwash limestone is on the shore of Lake Huron at Stony Point, now a part of the Ipperwash Provincial Park. The section of rock here, as given by Stauffer (1915, p. 180), was composed of three feet of "semi-crystalline, blue to grey limestone with some shaly bands. The limestone layers are rough and irregular. Much pyrite occurs in this rock, especially in the lower layers." According to Stauffer, this limestone overlay eight inches of "soft, blue shale to the level of the lake."

In 1955 the authors, with Dr. George M. Ehlers of the Museum of Paleontology, The University of Michigan, were able to procure a more complete section due to a lower lake level; this section measured six feet four inches to the water line. In 1958 the lake level was still lower, and the authors noted a six-inch layer of limestone below the lowest unit of the 1955 section; this limestone layer rests upon blue shale of unknown thickness.

A description of the lower Ipperwash limestone compiled from the 1955 and 1958 investigations is as follows:

Unit	Feet	Inches
8 Limestone, gray, weathers buff, more coarsely crystalline than Unit 7, with many fossils including a small <i>Mucrospirifer</i> , <i>Spinocyrtia carinata</i> Ehlers and Wright, <i>Protoleptostrophia perplana</i> (Conrad), <i>Camarotoechia</i> sp., and a small <i>Atrypa</i>		7

7	Limestone, gray, medium crystalline, hard, weathers white	1	3
6	Covered interval	2	4
5	Limestone, gray, fine-grained at top, coarser below, with glauconite; channel fillings at bottom. Contains <i>Megastrophia concava</i> (Hall), <i>Strophodonta</i> sp., <i>Spinocyrtia carinata</i> Ehlers and Wright, and other fossils		9
4	Limestone, greenish-gray, argillaceous, weathers into thin layers, with <i>Spinocyrtia carinata</i> Ehlers and Wright		3-4
3	Limestone, gray, weathers buff; more finely crystalline and with more glauconite than Unit 2. Contains <i>Spinocyrtia tumidigranulata</i> Ehlers and Wright		8
2	Limestone, grayish-green, medium crystalline, containing glauconite; weathers gray		6
1	Limestone, bluish-gray, finely crystalline, weathers buff; top contains water-worn fragments of <i>Spinocyrtia</i> sp., <i>Megastrophia concava</i> (Hall), <i>Mucrospirifer</i> sp., and large grapnel-like columnar terminations of <i>Ancyrocrinus</i>		6
		<hr/>	
Total thickness		6'10"	to 6'11"

Limestone, Unit 1, rests on bluish-gray shale of unknown thickness.

Stauffer, in his original description of the Ipperwash limestone (1915, p. 11), stated that "A better outcrop of somewhat lower beds is to be found at Stony Point to the east of the beach, and again at Smith falls on the Sydenham river." Smith Falls is in Euphemia Township, Lambton County, about one and one-half miles northeast of the village of Shetland and about thirty-five miles due south of Stony Point.

The outcrop at Smith Falls has been studied on several occasions, in seasons when the Sydenham River was low enough to permit examination of the large blocks of limestone which lie in the bed of the river and in the right bank. No fossils which are diagnostic of the lower Ipperwash could be obtained, and the authors believe that there is not sufficient evidence to confirm Stauffer's correlation of the limestone at Smith Falls with that at Stony Point. The fact that this limestone occurs only a short distance upstream from an exposure of the Upper Devonian Kettle Point black shale suggests, on the contrary, that the Smith Falls limestone is correlated with the upper Ipperwash limestone.

Stauffer (1915, p. 11) said that "great masses of this rock [the Ipperwash limestone] have been brought up from the bottom of Lake Huron and now lie along the water's edge at Blue point north of Camlachie." The authors investigated this locality in July, 1961, going by boat from Shepherd's Boat Livery near Cedar Point to just beyond Blue Point, where they went ashore. No bedrock is exposed along the shore between these two places. Blue Point consists of an accumulation of very large

glacial boulders and blocks of limestone, lying beneath the water and extending for perhaps a quarter of a mile out from shore.

After leaving the boat on the south side of Blue Point, the authors walked north along the shore examining the rocks at and beyond the Point. Some of the limestone blocks measured as much as six feet in length; many were approximately two feet thick. The fossils noted on these limestone slabs were those of the lower Ipperwash; they are *Ancyrocrinus* sp., *Megastrophia concava* (Hall), *Protoleptostrophia perplana* (Conrad), *Spinocyrtia carinata* Ehlers and Wright, and other fossils typical of the rocks found at Stony Point.

It is possible that the basal Ipperwash beds approach the surface at Blue Point, and that the limestone blocks now submerged there are in place. This cannot be determined until there is a period of very low lake level, such as that which occurred about 1936 when all the rocky reefs lay well above water. Another possibility is that all the rocks at Blue Point are glacial drift; the huge erratics of Pre-Cambrian rocks found with the limestone blocks suggest a drift origin.

LOCALITIES

1. Shore of Lake Huron at Stony Point, Ipperwash Provincial Park, Bosanquet Township, Lambton County, Ontario, at the end of Military Road.
2. Field near Ravenswood, Bosanquet Township, Lambton County, Ontario, about .4 mile northeast of the Ipperwash Beach road and about .9 mile northwest of Highway 21.
3. Shore of Lake Huron at Silica Point, Bosanquet Township, Lambton County, Ontario, at west side of Ipperwash Beach, about 2.5 miles southwest of Stony Point and about 1 mile southeast of Kettle Point.
4. Shore of Lake Huron in the Kettle Point Indian Reservation, Bosanquet Township, Lambton County, Ontario, about 2 miles south of Kettle Point.
5. Shore of Lake Huron at Shepherd's Boat Livery, Bosanquet Township, Lambton County, Ontario, about .5 mile southwest of Cedar Point and about 4 miles southwest of exposures on shore in Kettle Point Indian Reservation.
6. Shore of Lake Huron at Blue Point, Plympton Township, Lambton County Ontario, about 5.5 miles southwest of Shepherd's Boat Livery and about 11 miles southwest of Kettle Point.
7. Smith Falls, Euphemia Township, Lambton County, Ontario, on the Sydenham River, about 1.5 miles northeast of Shetland and about 35 miles due south of Stony Point.

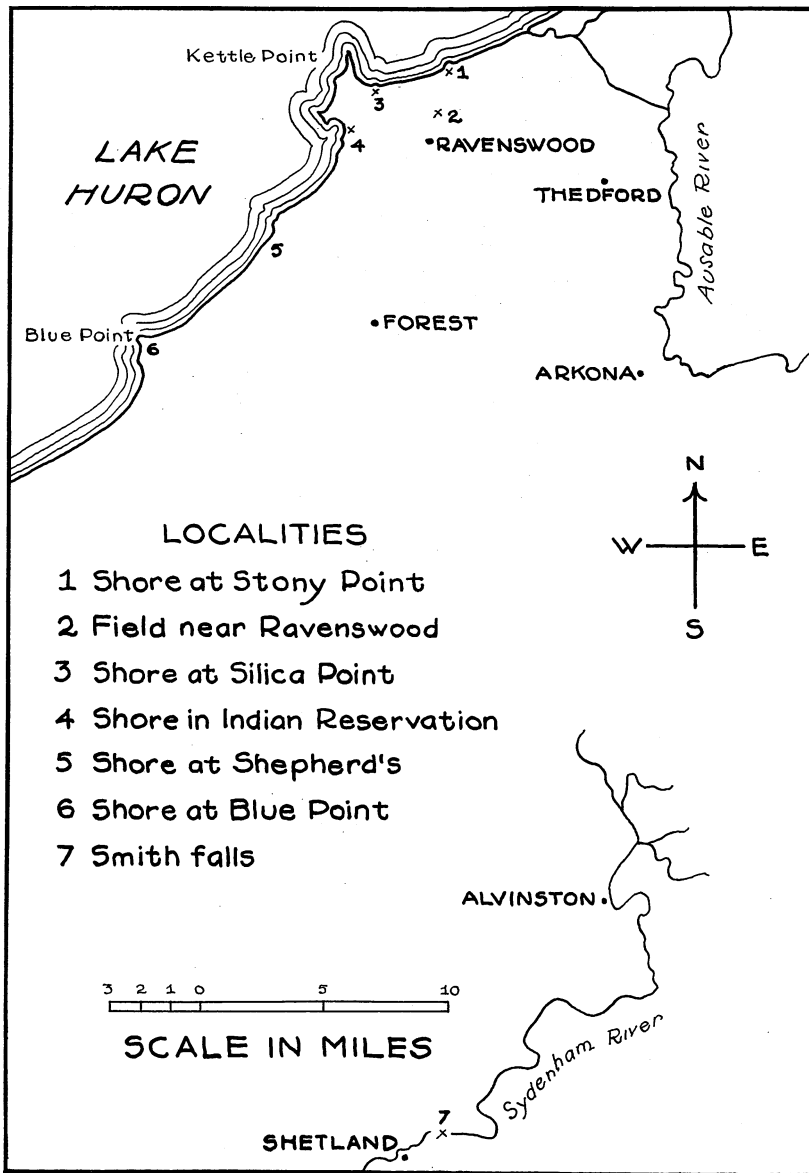


FIG. 1. Index Map of Ipperwash Limestone Localities.

SYSTEMATIC DESCRIPTIONS

Phylum BRACHIOPODA

Class ARTICULATA

Order TELOTREMATA

Superfamily Spiriferacea

Family Spiriferidae King, 1846

Subfamily Spiriferinae Schuchert, 1913

Genus *Mucrospirifer* Grabau, 1931

Type species.—By original designation, Grabau, 1931, pp. 247–48, *Delthyris mucronatus* Conrad, 1841, p. 54. Middle Devonian Hamilton group, Skaneateles formation, Hamilton Township, Madison County, New York.

***Mucrospirifer cooperi*, sp. nov.**

(Pl. I, Fig. 1; Pl. II, Figs. 16–27; Pl. III, Fig. 1)

Description.—Shell equally biconvex. Hinge line straight, greatest width along hinge line. Shell with narrow, elongate cardinal extensions. Majority of specimens have width 5 cm, length 1.5 cm, and thickness 7–9 mm. Surface of shell lateral to fold and sulcus marked by simple rounded, relatively fine costae and furrows; costae ranging in number from 10 to 19 on each side of fold.

Pedicle valve with moderately deep sulcus having a very low median ridge. Beak small, slightly incurved. Interarea narrow with slight concavity; delthyrium of medium width. Imperfectly preserved interiors with prominent teeth and very low median ridge extending from posterior of delthyrial cavity to point at anterior edge of flabellate muscle area.

Brachial valve with relatively flat fold, bearing a distinct median depression from the beak to the anterior edge. Beak very small, very slightly incurved. Interarea very narrow, notothyrium broad. Imperfectly preserved interiors showing dental sockets, socket plates, and myophore with fine vertical ridges in apical part of notothyrium. Low median ridge extending forward from an indistinct cardinal process to point near anterior edge of muscle field.

Remarks.—This species is somewhat similar to *Mucrospirifer arkonensis* Shimer and Grabau found in the Arkona shale of the Thedford-Arkona region of southwestern Ontario. It differs from *M. arkonensis* in having fewer costae, a more curved anterior shell edge, a less prominent depression in the fold, and a less prominent ridge in the sulcus.

Mucrospirifer cooperi is named in honor of Dr. G. Arthur Cooper of the Smithsonian Institution, United States National Museum, who has

been interested in the paleontology and stratigraphy of Ontario for many years.

Occurrence.—Middle Devonian Hamilton group, upper part of Ipperwash limestone, Ipperwash-Kettle Point region, southwestern Ontario.

Types.—Holotype No. 46132, paratypes Nos. 46109*a-f*.

Superfamily Punctospiracea

Family Spiriferinidae Davidson 1884

Subfamily Cyrtininae Schuchert and Le Vene 1929

Genus *Cyrtina* Davidson 1858

Cyrtina Davidson, 1858, pp. 66–68; Whidborne, 1893, pp. 111–12.

Spinocyrtina Fredericks, 1916, p. 18, and 1926, p. 413; type species *Cyrtia hamiltonensis* Hall (1857, p. 166, 4 figs.) *Cyrtina hamiltonensis* Hall (1867, pp. 268–69, Pl. 44, Fig. 31), Middle Devonian Hamilton group, New York, U.S.A.

Type species.—*Calceola heteroclita* DeFrance, 1824, Vol. 32, p. 306, Pl. 80, Figs. 3, 3*a*, 3*b*, by designation of Dall, 1877, p. 24.

***Cyrtina staufferi*, sp. nov.**

(Pl. II, Figs. 1–15)

Description.—Shell of medium size, triangular-subpyramidal; cardinal extremities very slightly extended in some specimens. Width slightly greater than length, the majority of specimens 11 mm wide. Hinge line straight; greatest width of most shells anterior to hinge line. Surface of shell lateral to fold and sulcus marked by 6 to 10 rounded costae on each side of fold, most shells having 7 or 8. Surface of costae, furrows, fold, and sulcus covered with spinules. Endopunctae apparent on weathered surface.

Pedicle valve with relatively broad, shallow, rounded sulcus bearing an indistinct narrow median depression. Lateral slopes gently convex. Beak distinctly incurved. Interarea wider than high, rounded at lateral edges; surface concave, its curvature greatest near beak. Interarea divided into a wide inner perideltidial part and two narrow outer parts by two lines diverging from the beak. Inner and outer parts crossed by very fine lines of growth; a few less weathered surfaces of inner part show thin vertical but interrupted ridges. Delthyrium covered by a convex pseudodeltidium, having a relatively large oval foramen near apex. Interior unknown.

Brachial valve subrectangular in outline. Fold low and gently convex, having a very slight median depression. Lateral slopes moderately convex. Beak small, very slightly incurved. Interarea linear. Interior unknown.

Remarks.—*Cyrtina staufferi* is named in honor of the late Professor

Clinton R. Stauffer, whose memoir *The Devonian of Southwestern Ontario* is an important contribution to the knowledge of the geology of Canada.

Occurrence.—Middle Devonian Hamilton group, upper part of Ipperwash limestone, Ipperwash-Kettle Point region of southwestern Ontario.

Types.—Holotype No. 46112, paratypes Nos. 46113–46120.

LITERATURE CITED

- CALEY, J. F. 1943. Palaeozoic Geology of the London Area, Ontario. Canada Dept. Mines and Resources, Geol. Surv., Mem. 237, 171 pp. 5 figs., 4 maps.
- CONRAD, T. A. 1841. Descriptions of New Genera and Species of Organic Remains. State of New York Legislature Assembly Communication No. 150, Fifth Ann. Rept. on Palaeontology of the State of New York, pp. 48–57.
- COOPER, G. A., and others. 1942. Correlation of the Devonian Sedimentary Formations of North America. Bull. Geol. Soc. Amer., Vol. 53, pp. 1729–94, 1 pl., 1 fig.
- DALL, W. H. 1877. Index to the Names which have been applied to the Subdivisions of the Class Brachiopoda. Bull. U. S. Nat. Mus., No. 8, 88 pp.
- DAVIDSON, THOMAS. 1858. A Monograph of the British Fossil Brachiopoda, Pt. 5, 2d part. Palaeontog. Soc., Vol. 11, pp. 49–80, Pls. 9–16.
- 1884. A Monograph of the British Fossil Brachiopoda, Vol. 5, Pt. 3. *Ibid.*, Vol. 38, pp. 241–476, Pls. 18–21.
- DEFRANCE, M. J. L. 1824. Dictionnaire des Sciences Naturelles, Vol. 32, p. 306, Pl. 80, Figs. 3, 3a, 3b.
- EHLERS, G. M., and WRIGHT, JEAN D. 1955. The Type Species of *Spinocyrtia* Fredericks and New Species of this Brachiopod Genus from Southwestern Ontario. Contrib. Mus. Paleontol., Univ. Mich., Vol. 13, No. 1, pp. 1–32, 11 pls., 1 map.
- FREDERICKS, G. 1916. [In Russian] The Palaeontological Notes. 2. On some Upper Palaeozoic Brachiopods of Eurasia. Comité géol. mém., n. ser., livr. 156, 87 pp., 5 pls. Petrograd.
- 1926. [In Russian] Classification Table of the Genera of the Family Spiriferidae King. Bull. Acad. Sci. U.R.S.S., 6th Ser., Vol. 20, pp. 393–422. Petrograd.
- GRABAU, A. W. 1931. Studies for Students, Ser. 1, Paleontology, The Brachiopoda, Pt. 2, Sci. Quart. Nat. Univ. Peking, Vol. 2, pp. 397–422—reprint, pp. 21–46.
- HALL, JAMES. 1857. Descriptions of Palaeozoic Fossils. Tenth Ann. Rept. of the Regents of the University of the State of New York, on the Condition of the State Cabinet of Natural History, pp. 39–186, illus.
- 1867. Descriptions and Figures of the Fossil Brachiopoda of the Upper Helderberg, Hamilton, Portage, and Chemung Groups. Paleontology, Vol. 4, Pt. 1, 428 pp., 69 pls. Geol. Surv. New York. Albany, N. Y.
- KING, W. 1846. Remarks on Certain Genera belonging to the Class Palliobranchiata. Ann. and Mag. Nat. Hist., Ser. 1, No. 116, Vol. 18, pp. 26–42. [pp. 28, 32.]
- NICHOLSON, H. A. 1875. Report upon the Palaeontology of the Province of Ontario. Toronto: Hunter, Rose and Co., 96 pp., illus.
- SCHUCHERT, C. 1913. *In*: Text-book of Paleontology by Karl A. Zittel, translated and edited by Charles R. Eastman. London: Macmillan and Co., Ltd. Vol. 1, 839 pp., illus. [p. 410.]

- and LEVENE, CLARA M. 1929. Brachiopoda (Generum et Genotyporum Index et Bibliographia). Fossilium Catalogus 1: Animalia, pars. 42, pp. 1-140, J. F. Pompechy, ed. W. Junk, Berlin W. 15.
- SHIMER, H. W., and GRABAU, A. W. 1902. Hamilton Group of Thedford, Ontario. Bull. Geol. Soc. Amer., Vol. 13, pp. 149-86, 5 text-figs.
- STAUFFER, C. R. 1915. The Devonian of Southwestern Ontario. Canada Dept. Mines, Geol. Surv., Mem. 34, Geol. Map. 116A, pp. i-iv, 1-341, 20 pls.
- WHIDBORNE, G. F. 1893. A Monograph of the Devonian Fauna of the South of England, Vol. 2, Pt. 3. Palaeontog. Soc., Vol. 47, pp. 87-160, Pls. 11-17.
- WRIGHT, JEAN D., and WRIGHT, E. P. 1961. A Study of the Middle Devonian Widder Formation of Southwestern Ontario. Contrib. Mus. Paleontol., Univ. Mich., Vol. 16, No. 5, pp. 287-300, 1 pl.

Manuscript Received March 14, 1963

PLATES

EXPLANATION OF PLATE I

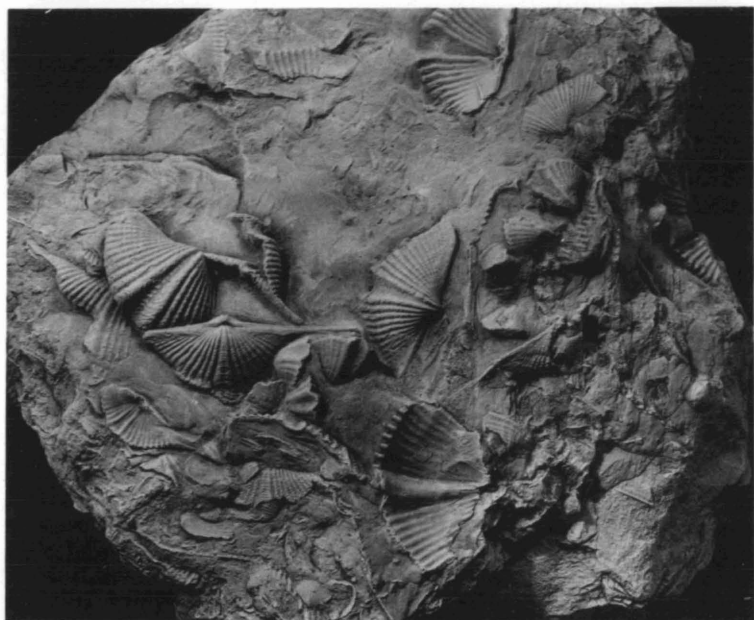
Block of fossiliferous shale from Ipperwash limestone

FIG. 1. Surface of block, showing specimens of *Mucrospirifer cooperi*, sp. nov., in association with *Cyrtina staufferi*, sp. nov. Six specimens of *M. cooperi*, sp. nov., are designated paratypes: 46109a, incomplete brachial valve showing interior, upper margin of figure (see enlarged view, Pl. II, Fig. 25); 46109b, pedicle valve, at center; 46109c, incomplete large pedicle valve showing interior, near lower margin; 46109d, shell with conjoined valves and one mucronate extension, at left of 46109b; 46109e, shell with most of brachial valve imbedded, at upper left of, and in contact with, 46109d; and 46109f, small brachial valve below and at left of 46109d. Locality 4. $\times 1$. See also Plates II and III.

Block of Ipperwash limestone

FIG. 2. Section of strata in this block is described on pages 120 and 121. Limestones of unit 1 (1' 5" thick) and unit 2 (2" to 3" thick) are shown between base of tilted block at lower left and irregular base of dark-colored chert, unit 3 (8" thick). A small patch of the Upper Devonian Kettle Point black shale, one inch thick, rests on chert adjacent to tilted right corner of block. Length of hammer handle, used for scale in Figure 1, is 12 inches. Locality 4.

PLATE I

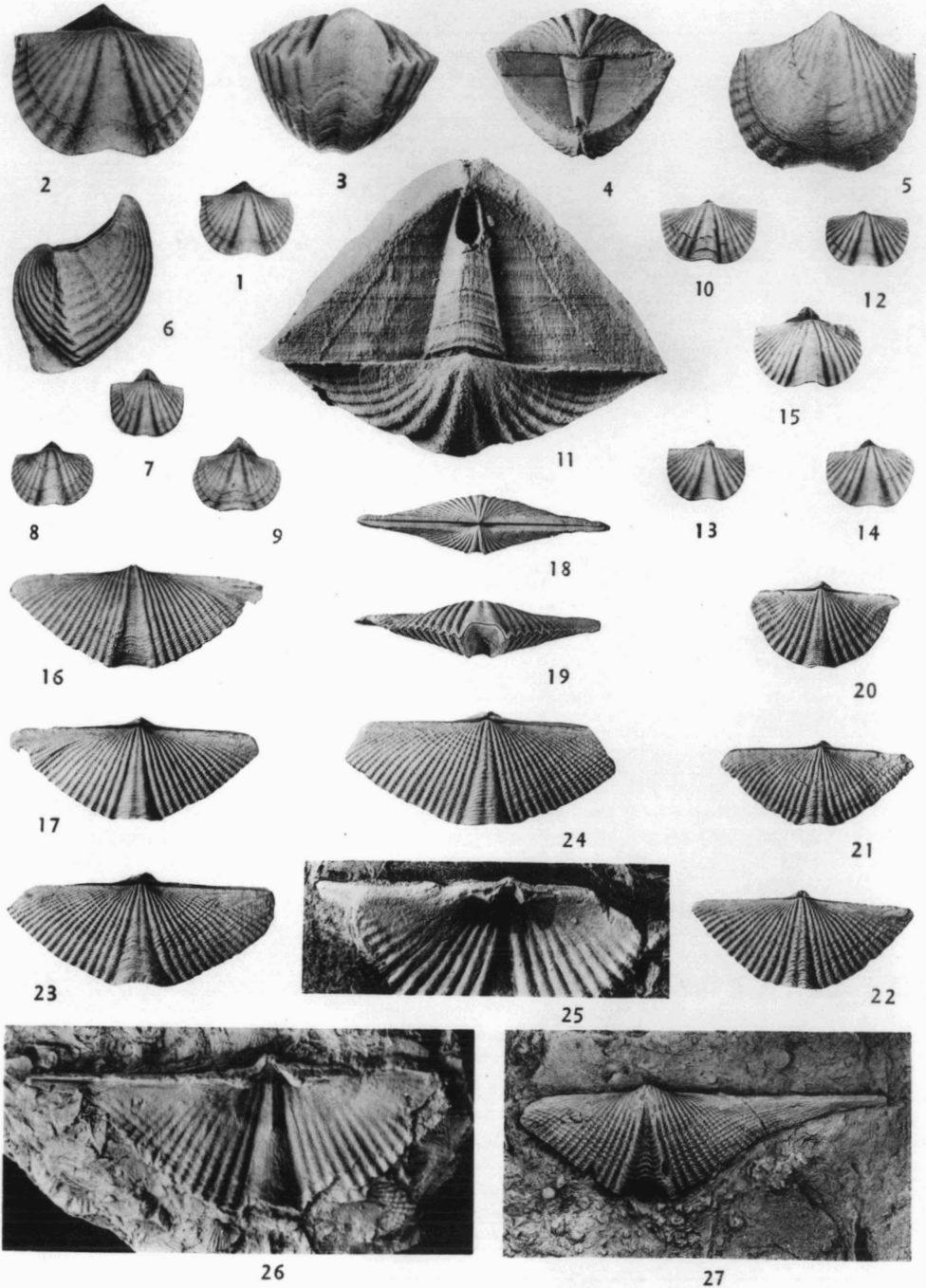


1



2

PLATE II



EXPLANATION OF PLATE II

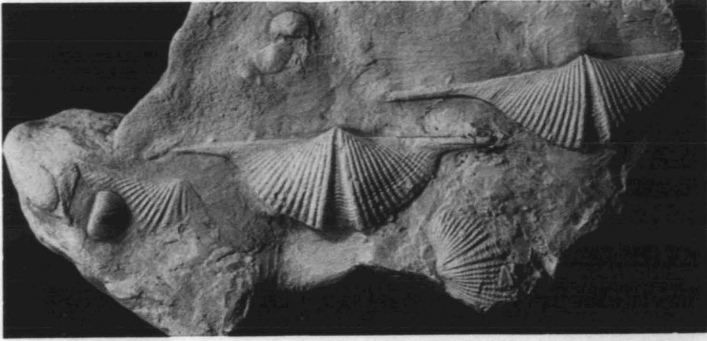
(All specimens illustrated are from Locality 4)

	PAGE
<i>Cyrtina staufferi</i> , sp. nov.	128
FIG. 1-2. Brachial valve and part of pedicle valve of holotype, No. 46112. $\times 1$ and $\times 2$.	
FIG. 3. Anterior view of holotype, showing convexity and depth of valves, height of costae, growth lines, sulcus, and anterior edge of fold. $\times 2$.	
FIG. 4. Posterior view of holotype, exhibiting interarea with convex pseudodeltidium, and oval foramen near apex. $\times 2$.	
FIG. 5. Pedicle valve of holotype, showing width of sulcus and growth lines. $\times 2$.	
FIG. 6. Lateral view of holotype, illustrating profiles and depths of valves, height of fold, and relationship of interarea of pedicle valve to commissure. $\times 2$.	
FIGS. 7-9, 12-15. Views of brachial and parts of pedicle valves of seven shells, showing variations in outline of brachial valves and differences in height and directions of curvature of umbones of pedicle valves. Paratypes, Nos. 46113-46115 and 46117-46120. $\times 1$.	
FIG. 10. Brachial valve and beak of pedicle valve of another paratype, No. 46116.	
FIG. 11. Posterior view of same paratype, showing pseudodeltidium with well-preserved growth lines and foramen, and interarea divided into a wide inner, perideltidial part and two narrow outer parts by two lines diverging from the beak. Inner and outer areas crossed by lines of growth; a few less-weathered surfaces of inner area with thin, vertical but interrupted ridges. $\times 4$.	
<i>Mucrospirifer cooperi</i> , sp. nov.	127
FIGS. 16-19. Pedicle, brachial, posterior, and anterior views of an incomplete, medium to large specimen, exhibiting typical outline and relative dimensions of valves, and character of various external structures. Holotype, No. 46132. $\times 1$.	
FIGS. 20-24. Five medium- to large-sized specimens, showing differences in outline of shell, number of costae, and relatively flat fold with median depression. Paratypes, Nos. 46133-46137. $\times 1$.	
FIG. 25. View of interior of poorly preserved brachial valve, exhibiting dental sockets and myophore which appears as a small, light-colored object beneath beak. Paratype, No. 46109a (also illustrated in Pl. I, Fig. 1). $\times 2$.	
FIG. 26. View of interior of imperfectly preserved pedicle valve, exhibiting teeth and a very low median septum that reaches a point slightly in front of the anterior edge of a poorly defined flabellate muscle scar. Paratype, No. 46138. $\times 2$.	
FIG. 27. View of an incomplete pedicle valve, having one mucronate extension of the valve and showing very well the character of costae, the growth lines, and the low median ridge of the sulcus. Paratype, No. 46110. $\times 1$.	

EXPLANATION OF PLATE III

- | | PAGE |
|--|------|
| Block of fossiliferous argillaceous Ipperwash limestone | 128 |
| <p>FIG. 1. Surface of block shows four specimens of <i>Mucrospirifer cooperi</i>, sp. nov., and near upper edge of photograph, two specimens of <i>Chonetes vicinus</i> (Castelnau). Two of the four specimens of <i>M. cooperi</i> are designated paratypes: 46111a, pedicle valve with well-preserved, elongate cardinal extension, shown at center of Fig. 1; 46111b, another pedicle valve with one elongate cardinal extension, shown above and to right of 46111a. Locality 4. $\times 1$. See also Plates I and III.</p> | |
| <i>Spinocyrtia ravenswoodensis</i> Ehlers and Wright | 121 |
| <p>FIGS. 2-5. Brachial, pedicle, lateral and anterior views of an imperfect shell. Hypotype, No. 46139. Locality 4. $\times 1$.</p> | |
| <p>FIGS. 6-9. Brachial, pedicle, lateral and anterior views of the holotype of <i>Spinocyrtia ravenswoodensis</i>, No. 32682, presented for comparison with photographs of hypotype, No. 46139. Locality 2. $\times 1$.</p> | |

PLATE III



1



2



4



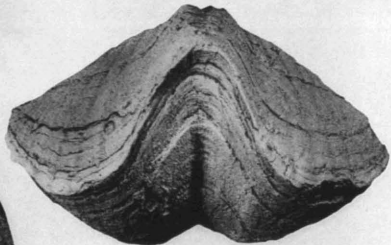
3



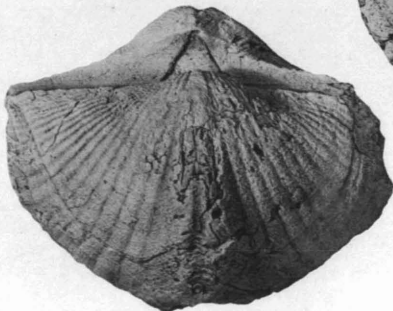
5



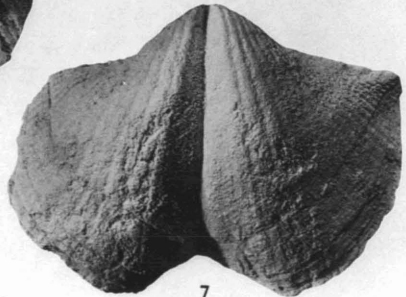
8



9



6



7

