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THREE NEW SPECIES OF THE CYSTID
GENUS *LIPSANOCYSTIS*
FROM
THE MIDDLE DEVONIAN
TRAVERSE GROUP OF MICHIGAN

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VOLUME XII

1. Four New Species of Rugose Corals of the Middle Devonian Genus *Eridophylum*, from New York, Michigan, and Ohio, by Erwin C. Stumm. Pages 1-11, with 2 plates.
2. Ornamentation as a Character in Specific Differentiation of Ostracods, by Robert V. Kesling. Pages 13-21, with 2 plates.
3. Mississippian Megaspores from Michigan and Adjacent States, by William G. Chaloner. Pages 23-35, with 2 plates.
4. A Tertiary Azolla from British Columbia, by Chester A. Arnold. Pages 37-45, with 2 plates.
5. Pleistocene Vertebrates from the Upper Becerra (Becerra Superior) Formation, Valley of Tequixquiac, Mexico, with Notes on other Pleistocene Forms, by Claude W. Hibbard. Pages 47-96, with 9 plates.
6. Three New Species of the Cystid Genus *Lipsanocystis* from the Middle Devonian Traverse Group of Michigan, by Erwin C. Stumm. Pages 97-103, with 2 plates.

THREE NEW SPECIES OF THE CYSTID
 GENUS *LIPSANOCYSTIS*
 FROM
 THE MIDDLE DEVONIAN
 TRAVERSE GROUP OF MICHIGAN

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 ERWIN C. STUMM

CONTENTS

Introduction 97
 Systematic descriptions 98
 Family Callocystidae Bernard 98
 Genus *Lipsanocystis* Ehlers and Leighly 98
 Lipsanocystis traversensis Ehlers and Leighly 99
 Lipsanocystis magnus Stumm, sp. nov. 99
 Lipsanocystis rugosus Stumm, sp. nov. 100
 Lipsanocystis oblatius Stumm, sp. nov. 101
 Literature cited 101
 Plates (after) 102

INTRODUCTION

EHLERS and Leighly (1922, pp. 155-60, Pl. X, Figs. 4-6) described a new cystid genus, *Lipsanocystis*, and species, *L. traversensis*, from the Middle Devonian Traverse group of Michigan. Up to the present, this species from the Thunder Bay limestone has been the only cystid known from the Traverse Group, but three new species of *Lipsanocystis* have recently been found in other formations of this group. In the present paper these are described and the generic diagnosis and the description of *L. traversensis* are revised on the basis of more complete material than was available to Ehlers and Leighly.

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

SYSTEMATIC DESCRIPTIONS
 Phylum ECHINODERMATA
 Subphylum PELMATOZOA
 Class CYSTOIDEA
 Order RHOMBIFERA
 Family Callocystidae Bernard

Diagnosis (Schuchert, 1904, pp. 209–10).—

Regularia with the theca closed to the mouth, plates in the circles in complete numbers. Ambulacra with paired ambulacralia and parambulacralia, projected radially over the theca and provided with numerous brachioles (fingers). Anus of medium size, generally surrounded by a ring of marginal plates. Pectinirhombs with the grooved recesses separated. Thecal plates generally sculptured with pits

Subfamily Apiocystinae Jaekel

Callocystidae with the 4 or 5 ambulacra simple, and relatively with widely separated brachioles.

Genus *Lipsanocystis* Ehlers and Leighly

Lipsanocystis Ehlers and Leighly, 1922, pp. 155–56.

Diagnosis (Ehlers and Leighly, 1922).—

Apiocystinae with 20 plates arranged as follows: Plates 4,1,2,3, in basal row; Plates 5,6,7,8,9, in second row; Plates 10,11,12,13,14, (15), in third row; Plates 16,17,18, (13),19,15, in fourth row.

Deltoid 23 is double and contains both the madreporite and the hydropore. The former is divided, and appears as two elevations, each with an orifice in its apex. The hydropore appears as a small circular opening below and between the two parts of the divided madreporite. Anal opening moderately large, entirely closed by plate 13, except for about 2 mm. of its periphery, which is formed by the upper edge of plate 8. One basal and 2 upper pectinirhombs, with numerous dichopores, situated respectively on plates 1 and 5, 14 and 15, and 12 and 18. The halves of the pectinirhombs on plates 5, 14, and 12 surrounded by conspicuous raised margins, those on 1, 15, and 16 without marginal walls.

Ambulacra four, simple, extending to the basal row of plates. These are RI, RII, RIV, and RV. Brachioles relatively few in number and rather widely spaced. Column unknown.

Remarks.—Structural differences in the three new species of *Lipsanocystis* make it necessary to revise a few statements in the generic diagnosis. The halves of the pectinirhombs on plates 1, 15, and 16 may have marginal walls, although these are never as elevated as those on plates 5, 14, and 12. The ambulacra may terminate on the second or third row of plates. The column is now known and is smooth, circular, and either gradually or rapidly tapering. Ornamentation on the thecal plates may consist of tubercles, ridges, or both, and may be arranged radially, concentrically, or in an irregular pattern.

Type species.—By original designation and monotypy, *Lipsanocystis traversensis* Ehlers and Leighly (1922, pp. 157–58).

Lipsanocystis traversensis Ehlers and Leighly

(Pl. I, Figs. 1–6; Pl. II, Figs. 1, 4)

Lipsanocystis traversensis Ehlers and Leighly, 1922, pp. 157–58.

Revised description.—Length ranging from 20 to 25 mm., width from 18 to 25 mm., thickness from 12 to 20 mm. Ambulacra slender, extending from mouth to posterior part of basal plates, terminating 1 to 2 mm. above column attachment. Ambulacra having a narrow, deep axial groove bordered by low convex ridges each bearing seven pinnule sockets. Pinnules not preserved.

Pectinirhombs with dichopores ranging from 40 to 56. Halves of pectinirhombs on plates 5, 14, and 12 with low marginal walls. Halves of pectinirhombs on plates 1, 15, and 16 without walls. Anal pyramid with a series of about twelve small bordering plates surrounding seven narrow triangular plates. Ornamentation consisting of low, indistinct tubercles arranged irregularly on the thecal plates. Column unknown.

Remarks.—Eight specimens are in the collections of the Museum of Paleontology, University of Michigan. On one of these the anal pyramid is preserved, though badly crushed. Other specimens are in the collections of the United States National Museum and the Buffalo Museum of Science. *Lipsanocystis traversensis* is the only one of the species that is known from a relatively large number of specimens.

Occurrence.—Middle Devonian: Traverse group—Thunder Bay limestone; exposures along the north shore of Partridge Point, on Thunder Bay, 4 miles south of Alpena, Michigan.

Types.—Holotype No. 5414; hypotype No. 26422.

***Lipsanocystis magnus* Stumm, sp. nov.**

(Pl. I, Figs. 7–11; Pl. II, Fig. 2)

Description.—Length 25 mm., width 22 mm., thickness 16 mm. Shape similar to *L. traversensis* except proportionally wider and thinner and with a wider, flattened summit. Ambulacra large, with deep, narrow axial grooves bordered by high convex ridges each bearing eight brachiole sockets. Brachioles not preserved. Ambulacra extending almost to base of second row of thecal plates. Ambulacral plates nearest summit with sharp medial spines.

Pectinirhombs arranged as in *L. traversensis* but halves on plates 5, 12, and 14 with high margins and halves on plates 1, 15, and 18 with low margins. Dichopores averaging 35. Madreporite diploid, each aperture

with thin, elevated walls. Hydropore depressed, just beneath center of madreporite.

Anal pyramid with about twelve subrectangular border plates and seven triangular axial plates. Ornamentation consisting of tubercles and ridges covering the thecal plates in an irregular pattern. Column not preserved.

Remarks.—This distinctive species is known only from the holotype and a large fragment of that is missing. However, the distal surface, one ambulacrum, the three pectinirrhombs, and the anal plates are excellently preserved. *L. magnus* is easily distinguished from *L. rugosus*, because it is larger, has longer ambulacra with twice as many brachiole sockets, and has the ridges on the thecal plates arranged in an irregular pattern.

Occurrence.—Middle Devonian: Traverse group—Four Mile Dam formation—Dock Street clay member; abandoned quarry of the Thunder Bay Quarries Company, Alpena, Michigan.

Type.—Holotype No. 31431.

***Lipsanocystis rugosus* Stumm, sp. nov.**

(Pl. I, Figs. 12–18; Pl. II, Fig. 3)

Description.—Length ranging from 15 to 20 mm., width from 12 to 17 mm., thickness from 10 to 14 mm. General shape of calyx very similar to that of *L. magnus*, except not quite as flattened. Thecal plates arranged as in *L. traversensis*. Ambulacra short, extending only to top of second row of plates. Axial furrow relatively wide, bordered by medium convex ridges, each bearing four pinnule sockets. Pinnules with biserial, rectangular plates arranged in offset pattern. Madreporite with relatively widely separated halves, each with an elevated margin. Hydropore small, situated just below space between halves of madreporite.

Pectinirrhombs arranged as in *L. magnus* but with lower margins and an average of 30 dichopores. Anal pyramid with about twelve polygonal bordering plates and six triangular axial plates; each bordering plate bearing a low medial node. Ornamentation consisting of tubercles and ridges on the thecal plates. Ridges forming a radial pattern diverging from the center of each plate. Column with eight preserved segments, circular, tapering very gradually away from the calyx. Segments with smooth, rounded margins.

Remarks.—This species is easily distinguished from *L. magnus* by the radial ornamentation, shorter ambulacra with fewer pinnule sockets, and six instead of seven triangular axial anal plates.

Occurrence.—Middle Devonian: Traverse group—Four Mile Dam formation—Dock Street clay member; abandoned quarry of the Thunder Bay Quarries Company, Alpena, Michigan.

Types.—Holotype No. 31432; cast of paratype No. 31433; paratype No. 123387, United States National Museum.

***Lipsanocystis oblatum* Stumm, sp. nov.**

(Pl. I, Figs. 19–23)

Description.—Length 24 mm., width 21 mm., thickness 17 mm. Thecal plates arranged as in *L. traversensis*. Ambulacra incomplete and very poorly preserved; furrows on thecal plates indicating original extent of ambulacra to about middle of second row of plates. Madreporite, hydropore, and anal pyramid not preserved.

Pectinirhombs large and lozenge-shaped. Halves of pectinirhombs on plates 5, 12, and 14 with a triangular covering plate leaving a slitlike aperture along the margin farthest from the plate suture line. Dichopores present only in this slitlike aperture. Halves of pectinirhombs on plates 1, 15, and 18 with an average of 27 dichopores covering one-half the area on that part farthest from plate suture line. Part of half dichopore nearest plate suture line nonporous.

Ornamentation consisting of fine tubercles arranged in concentric rows paralleling the plate margins. Column with eight preserved segments, round, tapering rapidly away from calyx. Segments with smooth, rounded margins.

Remarks.—This species is easily recognized by the structures of the dichopores and by the concentric ornamentation on the thecal plates.

Occurrence.—Middle Devonian: Traverse group—Potter Farm formation; shale pit on the Potter Farm adjoining west boundary of Evergreen Cemetery, along west city limits of Alpena, Michigan.

Type.—Holotype No. E15340, Buffalo Museum of Science; cast of holotype No. 31434.

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- EHLERS, G. M., and LEICHLY, J. B. 1922. *Lipsanocystis traversensis*, a New Cystid from the Devonian of Michigan. Papers Mich. Acad., Vol. 11, pp. 155–60, Pl. X, 3 figs.
- SCHUCHERT, C. 1904. On Siluric and Devonian Cystidea and *Camarocrinus*. Smithsonian Misc. Coll., Vol. 47, Pt. 2, No. 1482, pp. 201–72, 10 pls., 44 figs.

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EXPLANATION OF PLATE I

- | | PAGE |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <i>Lipsanocystis traversensis</i> Ehlers and Leighly | 99 |
| FIG. 1. Anal view showing anal aperture almost completely surrounded by plate 13. Holotype No. 5414. Middle Devonian: Traverse group—Thunder Bay limestone, ledges along north shore of Partridge Point, 4 miles south of Alpena, Michigan. $\times 1.5$. | |
| FIG. 2. Right side of holotype showing 14-15 pectinirhomb. $\times 1.5$. | |
| FIG. 3. Antanal view of holotype showing complete ambulacra. $\times 1.5$. | |
| FIG. 4. Left side of holotype showing complete ambulacra. $\times 1.5$. | |
| FIG. 5. Summit of holotype showing ambulacra covering and diverging from mouth. $\times 1.5$. | |
| FIG. 6. Anal view of specimen with anal pyramid preserved. Hypotype No. 26422. Same horizon and locality as holotype. $\times 2$. | |
| <i>Lipsanocystis magnus</i> Stumm, sp. nov. | 99 |
| FIG. 7. Anal view showing well-preserved anal pyramid. Holotype No. 31431. Middle Devonian: Traverse group—Dock Street clay, abandoned quarry of the Thunder Bay Quarries Company, Alpena, Michigan. $\times 1$. | |
| FIG. 8. Summit of holotype showing divergent ambulacra and divided madreporite. $\times 1$. | |
| FIG. 9. View of anal pyramid of holotype. $\times 2$. | |
| FIG. 10. Antanal view of holotype showing long ambulacrum and 1-5 pectinirhomb. $\times 1$. | |
| FIG. 11. Left lateral view of holotype showing 12-18 pectinirhomb. $\times 1$. | |
| <i>Lipsanocystis rugosus</i> Stumm, sp. nov. | 100 |
| FIG. 12. Anal view showing well-preserved pyramid and two short ambulacra. Holotype No. 31432. Same horizon and locality as <i>L. magnus</i> . $\times 2$. | |
| FIG. 13. Right lateral view of holotype showing 14-15 pectinirhomb. $\times 2$. | |
| FIG. 14. Antanal view of holotype showing 1-5 pectinirhomb. $\times 2$. | |
| FIG. 15. Summit of holotype showing divergent ambulacra, divided madreporite, and part of one pinnule. $\times 2$. | |
| FIG. 16. Left lateral view of holotype showing 12-18 pectinirhomb. $\times 2$. | |
| FIG. 17. Left lateral view of specimen showing 12-18 pectinirhomb, thecal plate sutures, and radial ornamentation. Paratype No. 123387, U.S. Nat. Mus. Same horizon and locality as holotype. $\times 1.5$. | |
| FIG. 18. Right lateral view of paratype showing 14-15 pectinirhomb. $\times 1.5$. | |
| <i>Lipsanocystis oblatius</i> Stumm, sp. nov. | 101 |
| FIG. 19. Summit showing two upper pectinirhombs and one ambulacrum. Holotype No. E15340, Buffalo Museum of Science. Middle Devonian: Traverse group—Potter Farm formation, shale pit on the F. N. Potter Farm, just west of west boundary of Evergreen Cemetery which is also west boundary of city limits of Alpena, Michigan. $\times 1.5$. | |
| FIG. 20. Anal view of holotype showing anal aperture and one partly preserved ambulacrum. $\times 1.5$. | |
| FIG. 21. Right lateral view of holotype showing plate sutures and ornamentation. $\times 1.5$. | |
| FIG. 22. Antanal view of same specimen showing ambulacral furrow on thecal plates. $\times 1.5$. | |
| FIG. 23. Left lateral view of same specimen showing 12-18 pectinirhomb. $\times 1.5$. | |

PLATE I



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11



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8



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13



14



18



17



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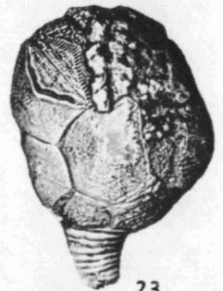
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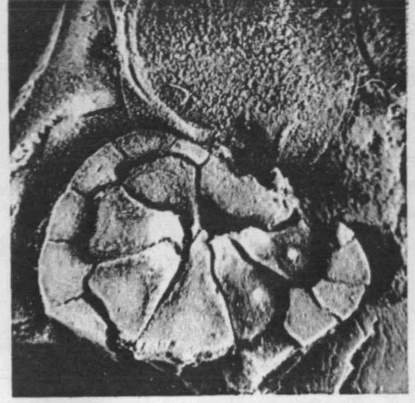


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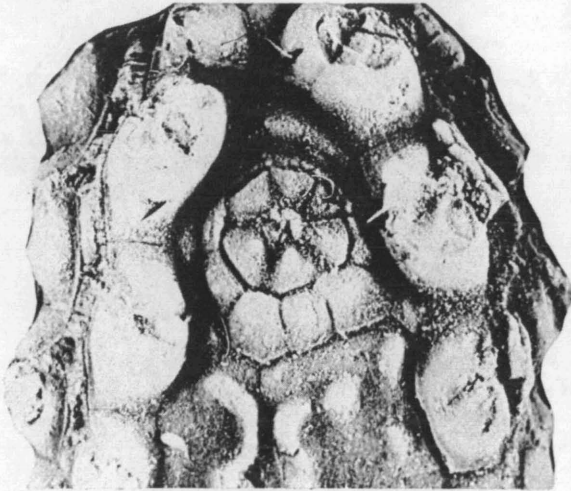
PLATE II



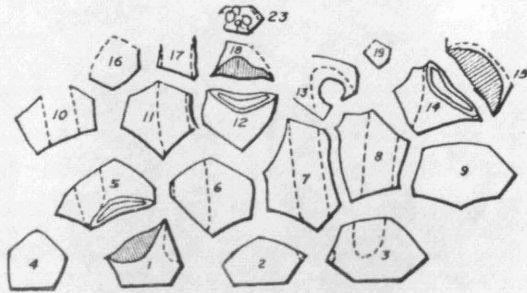
1



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3



4

EXPLANATION OF PLATE II

PAGE

- Lipsanocystis traversensis* Ehlers and Leighly 99
 FIG. 1. View of anal plate system showing peripheral plates and crushed pyramidal plates. Hypotype No. 26422. $\times 10$.
 FIG. 4. Diagram of thecal plates. After Ehlers and Leighly.
- Lipsanocystis magnus* Stumm, sp. nov. 99
 FIG. 2. Anal-plate system of holotype, No. 31431, showing small, subrectangular bordering plates and triangular pyramidal plates, each bearing a central tubercle. $\times 10$.
- Lipsanocystis rugosus* Stumm, sp. nov. 100
 FIG. 3. Anal-plate system and bordering ambulacra of holotype, No. 31432, showing subequally dimensional bordering plates, flat, triangular pyramidal plates, and large, biserial ambulacra with four pairs of pinnule sockets. $\times 10$.

