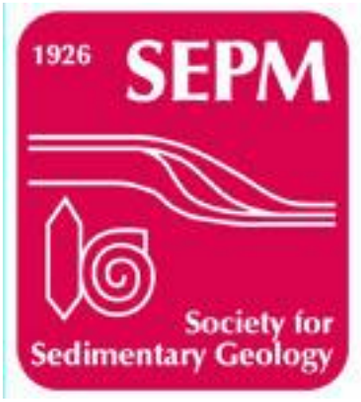

JOURNAL OF PALEONTOLOGY, V. 43, NO. 1, P. 125–128, PL. 25, 2 TEXT-FIGS., JANUARY 1969

A NEW MIDDLE CAMBRIAN HEXACTINELLID SPONGE FROM WESTERN UTAH

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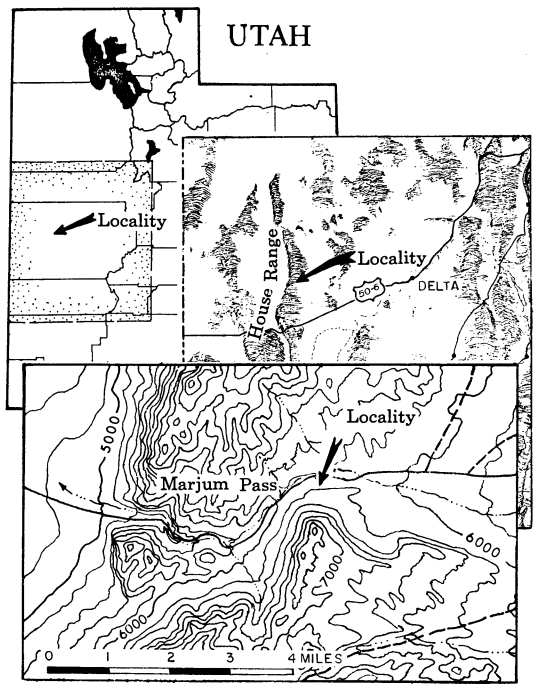
ABSTRACT—A new genus and species of lyssakid sponge, *Ratcliffespongia perforata,* are proposed and described from a single Middle Cambrian specimen from western Utah. The sponge is conico-cylindrical with large elliptical parietal openings which pierce a thin, loose-textured wall composed of irregularly oriented coarse stauract spicules of at least three sizes. Oscular and basal regions are unknown because of the fragmental nature of the specimen.

INTRODUCTION

SPONGES have been known from the Middle Cambrian rocks of the Great Basin since the publication of Walcott's work on the System (1886, 1920). More recently, the work of Robison (1964), Rigby (1966), and others have documented other occurrences. At best, however, we understand only a few forms, and only a few localities have been closely examined for sponges.

The present paper is based upon a single specimen collected in Marjum Pass, in the central part of the House Range, western Millard County, Utah (text-fig. 1) by Mr. William Ratcliffe. The sponge is on a piece of float which is lithologically similar to the Marjum Limestone that forms the hills and ledges above the pass, south of the road. The fragment could have come only from the lower Marjum Limestone or uppermost beds of the Wheeler Shale, because of the position of the specimen when found, relative to the formation contact. Because of the lithology and occurrence it is considered to be from the lower part of the Marjum Limestone.



TEXT-FIG. 1—Index map. *Ratcliffespongia perforata* n. sp. was collected from Middle Cambrian beds immediately southeast of Marjum Pass, south of old U.S. Highway 6 in the first series of ledges, in the House Range, Millard County, Utah. The locality is located in Sec. 17, T. 18 S., R. 13 W. (all unsurveyed). The detailed map above is from the Delta quadrangle of the U.S. Geological Survey 1:250,000 map series.

SYSTEMATIC DESCRIPTIONS

Class HEXACTINELLIDA Schmidt, 1870
Order LYSSAKIDA Zittel, 1877
Family TEGANIIDAE De Laubenfels, 1955

De Laubenfels (1955, p. E70) proposed the Family Teganiidae to include, "Hollow spheroidal or sac-shaped forms with protruding long thin diacts." Finks (1960, p. 110) has interpreted the family to include, "More or less globular, thin-walled sponges composed of simple hexacts or derivatives of hexacts, not regularly arranged; parietal gaps small and numerous; well developed monaxial prostalia and basalia present." His emendation was based largely on illustrations by Hall & Clarke (1899, pl. 1, figs. 18–22) of topotype material from Walcott's locality for *Teganium subsphericum* (Walcott). Finks (1960, p. 111) has also summarized the somewhat confused history of the type genus.

Skeletal net and parietal gap development of the specimen at hand are similar to that figured by Hall & Clarke (1899, pl. 1, figs. 19, 21) for *Sphaerodictya subsphaerica* (Walcott), except that the present specimen is much coarser textured. Proportions of skeletal net texture to parietal gap size is markedly similar, however. It is largely on the basis of this similarity, lack of symmetry diagnostic of the Protospongiidae, and questionable development of prostalia, that the present genus is placed within the Teganiidae.

Genus RATCLIFFESPONGIA n. gen.

Diagnosis.—Conico-cylindrical lyssakid sponge with numerous large parietal openings through the thin wall which is composed of irregularly oriented coarse stauract spicules.

Discussion.—Conical shape, irregular coarse spiculation and large elliptical parietal openings on *Ratcliffespongia* differentiate it from other Early Paleozoic lyssakid sponges. General skeletal irregularity and relationships of skeletal elements to parietal gaps within *Ratcliffespongia* are strikingly similar to illustrations of *Teganium subsphericum* (Walcott) as figured by Hall & Clarke (1899, pl. 1, figs. 18–22), except that in the latter form the elements are less than one-fifth the size of those in *Ratcliffespongia.* In addition, *Teganium* is commonly interpreted as a globular sponge while *Ratcliffespongia* appears to be a conico-cylindrical one. Irregular arrangement of the spicules is somewhat reminiscent of the Devonian *Actinodictya placenta* Hall (Hall & Clarke, 1899, p. 143, pl. 30, figs. 1–3, pl. 31, figs. 1, 2) and a new unnamed form from the Ordovician Cat Head Member of the Red River Formation. In these latter forms, however, there are not the large parietal gaps, and the Ordovician Red River genus is nodose with spicule tufts at the tips of the nodes, as well. *Kiwetinokia utahensis* Walcott (1920, p. 313–314, pl. 89, fig. 1, 1a–e) occurs at approximately the same level in the House Range section, but is distinguished by common triacts as well as papillose stauract spicules. *K. spiralis* Walcott (1920, p. 314–315, pl. 89, figs. 2, 2a-b) also occurs in the House Range 600 feet above *K. utahensis* Walcott but is distinguished from the present form by ropelike twisted spicules in association with stauracts. In neither species of *Kiwetinokia* is the shape of the sponge known. *Protospongia* is also known from nearly equivalent beds and is formed of stauracts but it is unusually regular in the skeletal net (Walcott, 1920; Rigby, 1966).

The genus is named for William Ratcliffe, the collector of the specimen and a long-time enthusiastic student of Cambrian and Ordovician faunas of Utah.

Type species.—*Ratcliffespongia perforata* Rigby, n. sp.

Occurrence.—Middle Cambrian, House Range, western Utah.

RATCLIFFESPONGIA PERFORATA, n. sp.
Pl. 25, figs. 1–3; text-fig. 2

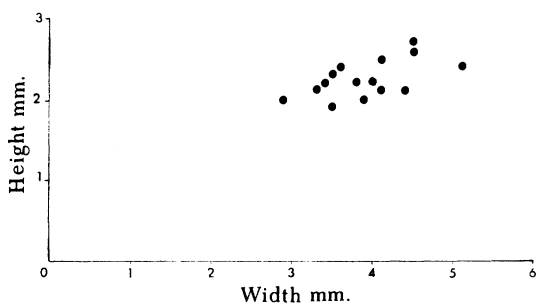
Description.—The single fragment is part of a conico-cylindrical or high conical sponge, with both basal and oscular regions missing because of erosion. The somewhat compressed fragment is approximately 70 mm high and has a maximum width of 40 mm at the top of the preserved part. It tapers downward to approximately 28 mm wide at midheight, and then to a rounded tip at the lower edge of the impression. It is an open-textured form with thin walls which are perforated by large parietal openings. Most of the underlying wall is buried in matrix, and some of the overlying wall has been removed from the spongocoel filling by erosion.

Parietal openings are elliptical, with long axes arranged horizontally, and occupy approximately half the surface. Horizontal diameters of the openings range from 3.3 to 5.2 mm, with most approximately 4.0 mm across, and vertical diameters range from 2.0 to 2.7 mm, with most approximately 2.2 mm high (text-fig. 2). Openings are arranged in horizontal series, with successive series alternating to produce a roughly rhomboidal arrangement.

The skeletal wall is composed of loosely interwoven stauract spicules of several sizes which unite to form rather wide tracts between parietal openings. These tracts range from 1 to 2 mm across but are slightly thicker in the area between the diagonally-placed parietal openings.

Somewhat undulating horizontal tracts and even less well-defined vertical tracts are formed, resulting in a roughly rhomboidal arrangement. This is far less regular than the net of *Protospongia, Diagonella, Cyathodictya,* or the younger *Hydnoceras, Prismodictya,* and related forms. As many as 16 and as few as 5 spicule rays occur in traverses across the skeletal tracts between parietal openings.

Much of the main body spicule net is still evident, even though the specimen is weathered and the spicules are replaced by crystalline cal-



TEXT-FIG. 2—Dimensions of parietal gaps on the holotype of *Ratcliffespongia perforata* n. sp. from the Cambrian of Utah. All the parietal gaps are elliptical and oriented with the long dimension roughly horizonal.

cite. All of the identifiable spicules appear to be stauracts with smooth rays, although some fragments which are interpreted as stauract rays could be fragments of diacts. No unquestioned diacts were observed. There are at least 3 ranks or sizes of spicules. The largest body spicules have a diameter of 0.06 mm at the base of the rays and ray lengths of 2.0 to 3.5 mm. Intermediate size spicule rays are 0.04 mm in diameter and 1.0 to 1.7 or 1.8 mm long, and the smallest preserved ones are 0.02 to 0.03 mm in diameter at the ray bases and 0.5 to 0.8 mm long.

Rarely do all four rays of a spicule meet at right angles. Commonly three of the rays may be nearly at right angles, but the fourth is often at an odd angle, bending to miss the margin of adjacent parietal openings. In some spicules the odd ray bends as much as 30 degrees from right angles. In other spicules, rays on opposite sides are opposed, but angles between opposing pairs are 70 degrees to 110 degrees. Individual rays are sometimes bent, apparently to accommodate other spicules.

The largest spicules occur in the center of the intersection of the horizontal and vertical tracts, in the thickened area between the rhomboidally-placed parietal openings, along the center line of the tracts. There may be more than one large stauract in each intersection and where this is seen, the various large spicules are more irregularly arranged. Only these largest spicules seem to have a roughly quadrate pattern, and this is dictated by the placement of the parietal openings. Smaller spicules lie at odd angles throughout the spicule tract, although there is a general tendency in long-rayed forms for the longer rays to parallel one another in the main axis of the tracts, or along the margin of the parietal openings.

Individual elliptical openings are bounded by many different spicule rays. Some openings have as many as 12 to 14 rays forming part of the wall or skeletal margin of the opening. The spicules are also of all various ranks, but in general most of the wall is formed by smaller spicules. Only occasionally will rays of the largest stauracts occur at the margin of the openings, but in general these large rays curve and sweep through the central part of the skeletal tract. As a result, individual rays of the large forms are rarely straight for their entire length, although rays of some of the smaller forms are commonly straight.

No systematic pattern of interweaving is apparent in the irregularly arranged spicule net. In some areas the vertical rays of the largest stauracts are arranged beneath the center of the next higher spicule of the same rank, but this is by no means a uniform pattern. The net seems composed of only roughly aligned, irregularly sized stauracts. The smaller spicules are the most irregular and also are the most abundant. These smaller spicules make up the fine texture of the margin and much of the main body of the spicule tracts. Spicule rays are not twisted together to make the rope-like structures described for *Kiwetinokia spiralis* Walcott (1920, p. 314–315, pl. 89, figs. 2, 2a-b).

Questionable prostalia are present along one lateral margin where the specimen is partially buried in matrix. In this area the skeletal net is confused and poorly preserved but there are a few long spicules which appear to extend normal to the sponge surface. Most evident of these are 4 to 5 mm long and up to 0.08 mm in diameter. They appear to doubly taper but this is uncertain because of their fragmental nature. These spicules could be part of unusually elongate rays of thin stauracts, but equivalent structures are not seen within the preserved net. They may also have been part of an outer wall or layer much like that described by Hall & Clarke (1899, p. 25, pl. 1, figs. 18, 22). General orientation, dimensions, and position of the spicules, however, suggest that they are fragmental prostalia.

There is no evidence of spicules blocking or covering the parietal openings.

Available material and repository.—BYU 1482 is the holotype and only known specimen. It is in the collections of the Department of Geology at Brigham Young University.

REFERENCES

DAWSON, J. W., & HINDE, G. J., 1889, New species of fossil sponges from the Siluro-Cambrian at Little Metis on the Lower St. Lawrence: Trans. Roy. Soc. Canada, v. 7, sec. 4, p. 31–55, 3 pls., 27 text-figs.

DELAUBENFELS, M. W., 1955, Porifera, *in* Treatise on Invertebrate Paleontology, Part E, Archaeocyatha and Porifera, edit. R. C. Moore: Lawrence, Kansas, Univ. Kansas and Geol. Soc. America, p. E21-E112.

FINKS, R. M., 1960, Late Paleozoic sponge faunas of the Texas Region, The Siliceous sponges: Bull. Am. Mus. Nat. History, v. 120, art. 1, 160 p., 50 pls., 77 text-figs.

HALL, JAMES, & CLARKE, J. M., 1899, Paleozoic reticulate sponges constituting the family Dictyospongidae: Univ. State New York, (New York State Mus.), Mem. 2, 197 p., 70 pls., 45 text-figs.

RIGBY, J. K., 1966, *Protospongia hicksi* Hinde from the Middle Cambrian of western Utah: Jour. Paleont., v. 40, no. 3, p. 549–554, pl. 66, 7 text-figs.

ROBISON, R. A., 1964, Late Middle Cambrian faunas from western Utah: Jour. Paleont., v. 38, no. 3, p. 510–566, pls. 79–92, 4 text-figs.

WALCOTT, C. D., 1886, Second Contribution to the studies on the Cambrian faunas of North America: U.S. Geol. Survey Bull. 30, 369 p. 33 pls.
——, 1920, Middle Cambrian Spongiae: Smithsonian Misc. Coll., v. 67, no. 6, p. 261–364, pls. 60–90, text-figs. 4–10.

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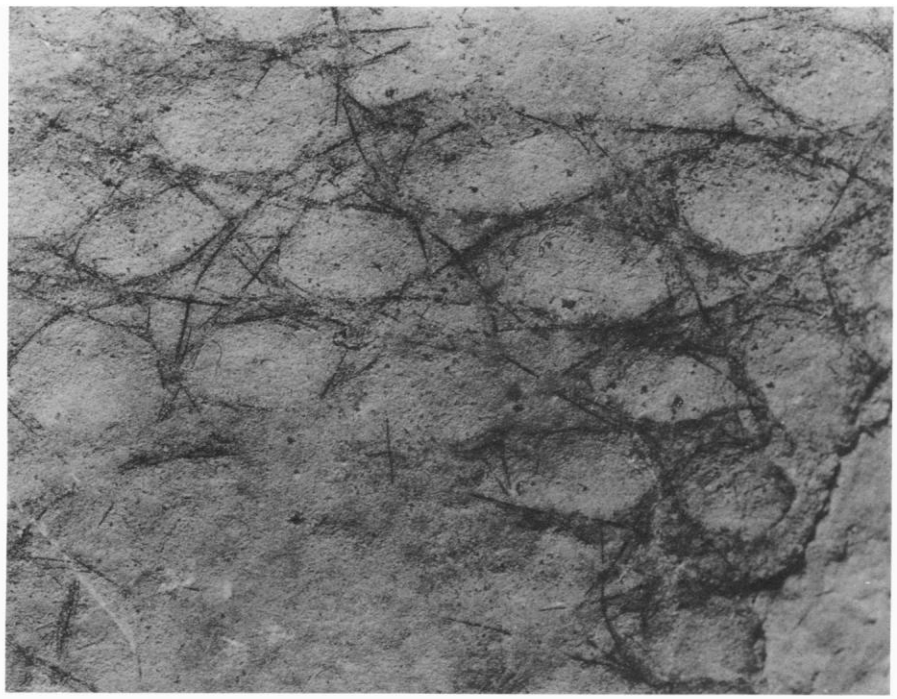
EXPLANATION OF PLATE 25

FIGS. *1–3*—*Ratcliffespongia perforata* n. sp., holotype. *1,* Enlarged section of lower part of preserved fragment showing general arrangement of spicules and parietal gaps. Most spicules are stauracts of three ranks, ×5; *2,* conicocylindrical form of holotype, ×1; *3,* enlarged section of upper wall showing confused part of skeletal net with possible prostalia near center, overlying normal skeletal material, ×5. BYU 1482, from Middle Cambrian Marjum (?) Formation, House Range, Utah.



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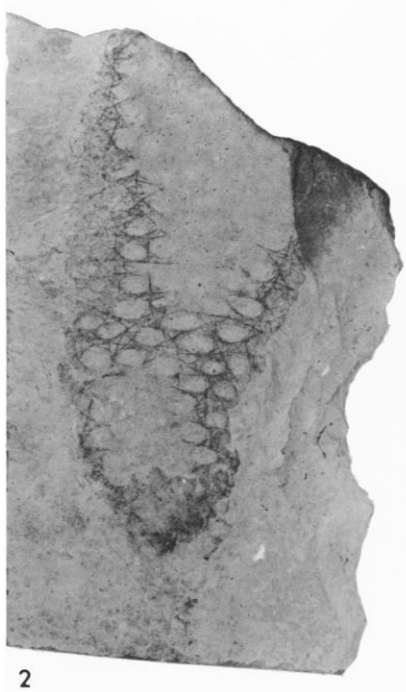

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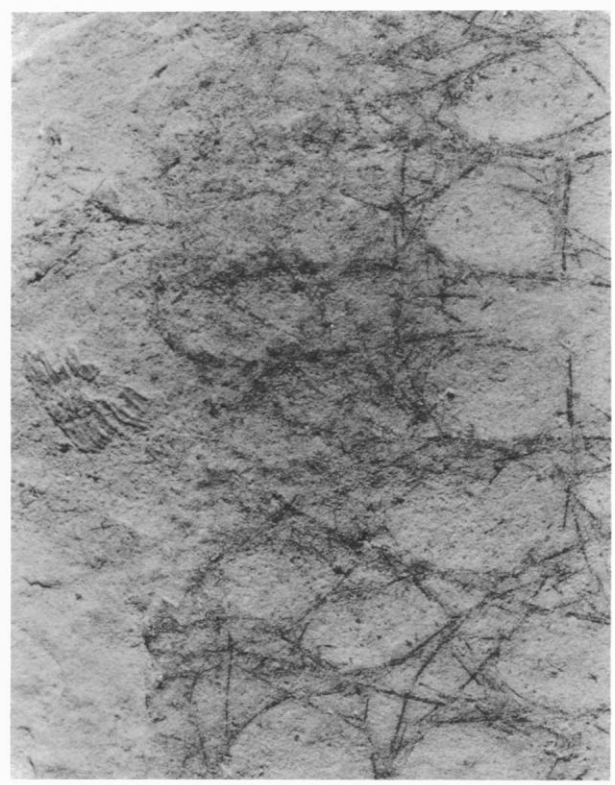

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