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Pennsylvanian Sponges from the Oquirrh Group of Central Utah

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ABSTRACT.—The new sponge, *Belemnospongia neofascicularis,* is figured and described from middle Pennsylvanian beds in the Oquirrh Group of the Oquirrh Range in central Utah. Root tufts and dissociated hexactinellid sponge spicules are also figured and described from Pennsylvanian Oquirrh rocks in the Oquirrh and Wasatch ranges in Utah.

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INTRODUCTION

Isolated reports of sponge spicules have been made by several workers during investigation of the exceedingly thick Oquirrh Group of central Utah, but no sponges have been described previously from the section. Several sponges and spongelike fossils have been recently collected from the middle part of the group in the Oquirrh Range by Jaren Swensen and from nearly equivalent beds 30 miles to the southeast, in Provo Canyon, in the Wasatch Range, by J. Keith Rigby and students, including William Brooks, from Brigham Young University.

SYSTEMATIC PALEONTOLOGY

Phylum PORIFERA Grant, 1872
(?) Class DEMOSPONGEA Sollas, 1875
(?) Order EPIPOLASIDA Sollas, 1888
(?) Family CHOIIDAE de Laubenfels, 1955
Genus BELEMNOSPONGIA Ulrich, 1889

BELEMNOSPONGIA NEOFASCICULARIS n. sp.

Plate 1, figs. 1-3

Diagnosis.—Low conical to wrinkled funnel-shaped sponge with small spicules strongly clustered in distinct, widely spaced bundles radiating outward from basal area. Spicules diactine, joined to one another by rare short processes.

Description.—The several specimens at hand are low funnel-shaped to broadly conical sponges with circular to slightly elliptical outlines as viewed from above. They range from 20 to 25 mm in diameter and are 3 to 4 mm high. The outer edge of each is bounded by markedly elongated bundles of spicules. At their maximum diameter, near their outer terminations, these bundles or "fascicules" are from 0.3 to 1.0 mm across. They are spaced from 0.5 to 1.0 mm apart at the outer margin, where most are most strongly bundled. In cross section the bundles show great numbers of spicules, ranging from a minimum of 10 to 20 spicules to a maximum of approximately 100. Maximum number of spicules occurs where bundles are of greatest diameter, near their outer development.

Some specimens have an inner half that is like a wrinkled funnel, with spicules occurring between the inner ends of bundles and with inner bundle projections showing as positive wrinkles.

Most bundles are straight, gently spreading structures, but some bifurcate near the outer edge of the sponge.

The bundles do not all originate at the same level on the sponge; rather, they occur in a crudely alternating upper and lower position around its circumference. That is, the spacing is somewhat irregular: there are no consistent even levels, the bundles occurring through approximately 10 degrees of arc, as seen in side view.

Spicules are oriented approximately parallel to the bundle axis, although a few do occur at irregular odd angles, possibly as a result of postmortem shift. Spicules are nearly all approximately the same size, there being no evidence of much larger spicules in either the cores or the external parts of the bundles. Individual spicules are diacts from 1.0 to 2.4 mm long, most near the outer end of the bundles being approximately 2.0 mm long. The spicules have small maximum diameters, ranging from 0.02 to 0.04 mm but with most 0.03 to 0.04 mm in diameter. Maximum diameters occur at approximately midlength. Small overgrowths of hooklike projections occur irregularly along spicules and fasten to one another. Most such projections are smaller than the main axis of the spicules and extend for only approximately one diameter to contact an adjacent spicule. Such overgrowths are most evident in thin section where single spicules are tangent to the section surface and where irregularities show as slightly lighter or darker gray areas along the spicule trace.

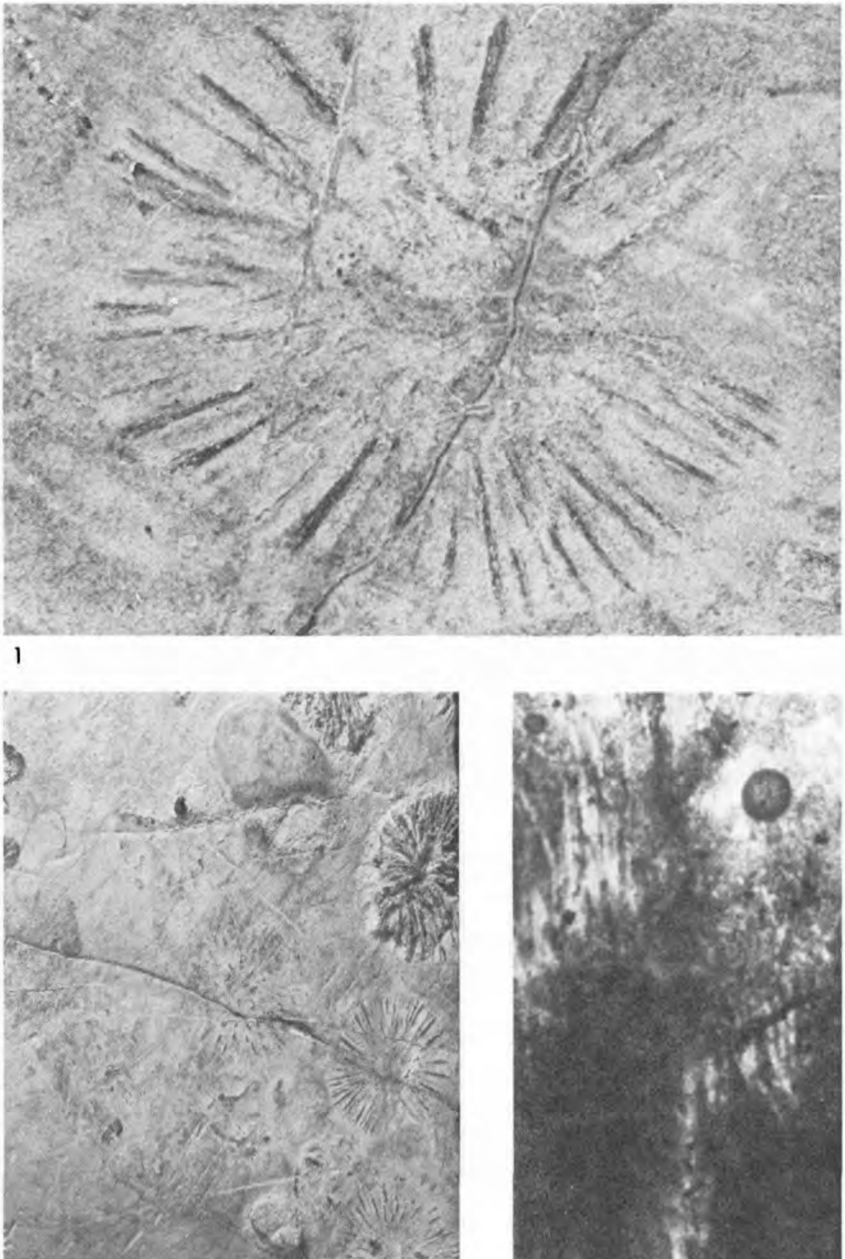
Discussion.—The most closely related sponge is *Belemnospongia fascicularis* Ulrich 1889, originally described from Osagean rocks near Keokuk, Iowa, and Nauvoo, Illinois. The Utah species is similarly shaped and has bundled spicules, but the bundles of the Mississippi Valley form are less well defined and are composed of considerably fewer spicules, and its spicules are significantly larger: *B. fascicularis* Ulrich 1889 (1889, 1890) has spicules 0.1 to 0.2 mm in diameter, in contrast to spicules 0.02 to 0.09 mm in diameter in the Utah specimen.

Choi carteri Walcott 1920 (1920, p. 292-294: pl. 72, fig. 1b), and *C. utahensis* Walcott 1920 (1920, p. 295; pl. 75, fig. 1), in some flattened preservations are similar in appearance to the present species. Both species

EXPLANATION OF PLATE 1

BELEMNOSPONGIA NEOFASCICULARIS NEW SPECIES

FIGS. 1-3 ..*Belemnospongia neofascicularis* n. sp.; *1,* holotype showing radiating strongly bundled spicules, 5x, BYU 990-A *2,* block containing holotype and paratypes, 1x, BYU 990. *3,* photomicrograph of thin section tangential through sponge bundle, showing spicule irregularities and lineation within bundles. Lateral processes show as irregularities in the somewhat obscure calcareous preservation, 5x, BYU 991-B. Oquirrh Group, Oquirrh Mountains, Utah.



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2 3

PLATE 1

of *Choia,* however, have considerably coarser spicules and generally are unbundled or only weakly bundled.

The known specimens of *B. neofascicularis* n. sp. occur in a laminated spiculitic argillaceous limestone. All are preserved in a presumed upright position, with the weak tip of the funnel pointed downward. The only fossils in the rocks are sponges. The laminate fine grain of the matrix suggests quiet water and a bottom generally lacking burrowing organisms, although some layers above and below the sponges are fecal pellet carbonates. Widespread evidence of bioturbation is wanting.

Hinde (1891) suggested that somewhat similar spicule clusters may be, not complete organisms, but attachment structures of hexactinellid sponges. Time and additional material may ultimately allow decisions concerning the origins of those sponges.

Material.—Five complete or nearly complete specimens occur on a bedding plane of a single block. One additional partial specimen was nearly ground away in preparation of thin sections across and tangential to the bundle surfaces. The single block and sections are in collections of the Geology Department, Brigham Young University. The holotype is designated as BYU 990-A; paratypes, as 990-B to 990-E. The sectioned paratype is designated as BYU 991-A and B.

Locality.—Oquirrh Group, Butterfield Peaks Formation (Tooker and Roberts, 1970); or Oquirrh Group, Butterfield Formation, Billiard Ball Limestone Member (James and Welsh, 1961), Des Moinesian age. The locality is approximately one mile south of Butterfield Canyon and one mile east of peak 9360 at an elevation of 7,975 feet; SE ¼, NW ¼, SW ¼, Sec. 14, T. 4 S., R. 3 W., Fairfield Quadrangle, Salt Lake County, Utah.

Class HEXACTINELLIDA Schmidt, 1870

Root Tufts

Plate 2, figs. 1, 2

Hexactinellid root tufts are well developed locally. They are of variously sized spicules ranging up to gigantic diactines that are 1.5 to 1.8 mm in maximum diameter at their midlength. Fragments are up to 95 mm long, and evidence suggests that some large spicules may be twice that long. Most spicules are from 0.3 to 0.4 mm in diameter and approximately 25 mm in length. Tuft fragments are partially silicified, and many spicules show the central crepidal canal.

Individual ropelike tufts are up to 5 cm thick and 12 cm wide, and all are irregular in outline. Most are flattened, irregular tabular structures in

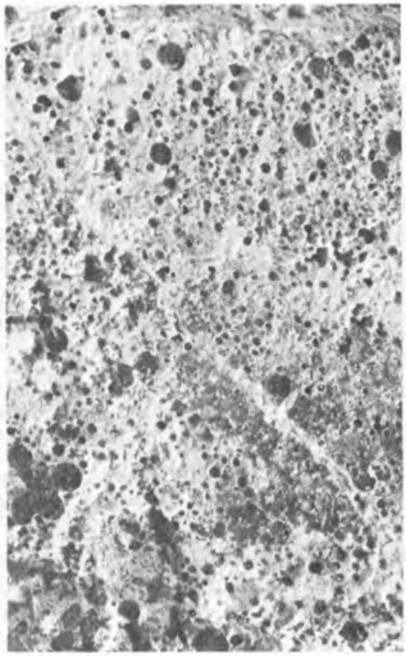
EXPLANATION OF PLATE 2

ROOT TUFTS AND HEXACTINES

FIGS. 1, 2.—Root tufts, 1, cross section, 2x, BYU 992, 2, longitudinal view of spicule cluster, 2x, BYU 992. Oquirrh Formation, Oquirrh Mountains, Utah.

FIG. 3.—Large pentactines and hexactines and associated smaller spicules in dark gray limestone, 1x, BYU 994. Oquirrh Formation, Wasatch Mountains, Utah.

2



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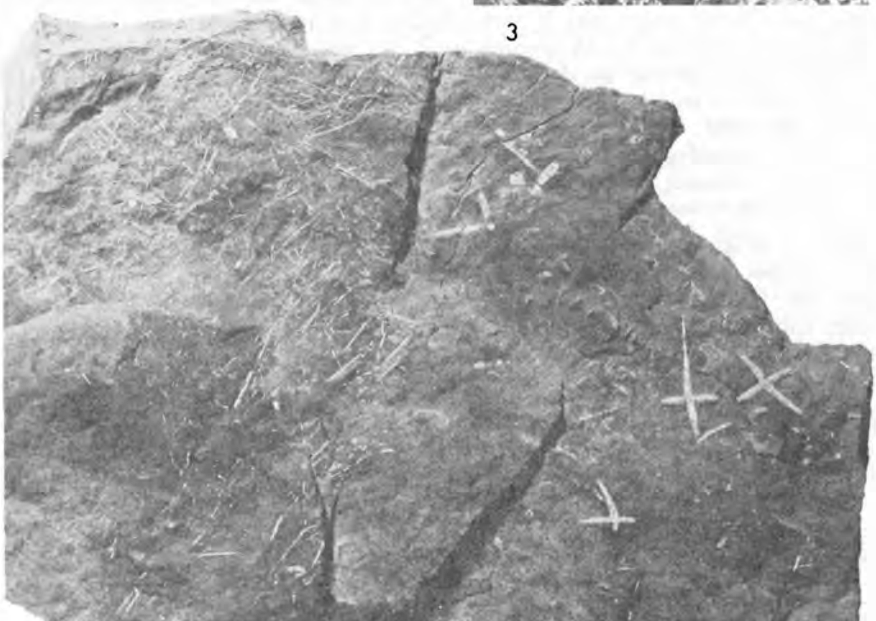

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PLATE 2

cross section and are approximately parallel to the bedding, although some areas show twisting of the structure.

A few large hexactines are associated with the tufts, but no articulated skeletal net was observed.

Material.—Many fragments are in the collection.

Locality.—Oquirrh Group, Bingham Mine Formation, Clipper Ridge Member, Jordan Limestone marker bed (Tooker and Roberts, 1970); or Bingham Mine Formation, Jordan Limestone Member (James and Welsh, 1961); Missourian age. The locality is on the north side of Middle Canyon on the ridge southwest of hill 8745, at an elevation of 6,400 feet; center of the N $\frac{1}{2}$, Sec. 6, T. 4 S., R. 3 W., Bingham Quadrangle, Tooele County, Utah.

Figured Material, BYU 992 and 993.

Dissociated Hexactinellid Spicules and Root Tufts
Plate 2, fig. 3

A few large hexactines and pentactines, with ray diameters of 0.9 to 1.3 mm at the ray base, occur in the Morrowan part of the Oquirrh Formation in the Wasatch Mountains. Spicules have individual rays up to 11 mm long. Rays are generally straight and smooth, with uniform taper, but some spicules are noted with one distinctly curved ray. In such spicules, the curved rays are shorter, usually approximately 5 mm long, with straight rays longer.

The large spicules are associated with a matte of irregularly oriented thin diacts (?) and smaller hexacts. Diacts (?) have a maximum diameter of 0.3 mm and are smooth spicules up to 17 mm long, although most have a smaller diameter and are shorter, ranging down to 0.05 mm in diameter and 1 to 2 mm in length. Small hexacts have rays 0.5 mm in length and 0.04 mm in diameter.

The disoriented spicules occur in beds with ropes of root tufts. The diacts and hexacts represent partially dissociated sponges that may have produced the root tufts.

Material.—Figured specimen, BYU 994. Collected from near the telephone line on the ridgecrest on the west side of Slide Canyon, at C, SE $\frac{1}{4}$, SW $\frac{1}{4}$, Sec. 32, T. 5 S., R. 3 E., Utah County, Utah. The collection came from approximately 200 feet above the base of the Oquirrh Formation, at an elevation of 5,620 feet.

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