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Sponges from the Middle Permian Quinn River Formation, Bilk Creek Mountains, Humboldt County, Nevada

J. KEITH RIGBY
Department of Geology, S-389 Eyring Science Center, Brigham Young University, Provo, Utah 84602-4606

REX A. HANGER
Department of Geology, Room 102 Bell Hall, George Washington University, 2029 G Street, NW, Washington D.C. 20052

ABSTRACT

The rhizomorine demosponge *Haplistion aeluroglossa* Finks, 1960, and an unidentifiable anthaspidellid orchocladinid demosponge are reported for the first time from the Quinn River Formation (Middle Permian), Bilk Creek Mountains, northern Nevada. This is the first time that this species has been reported outside the West Texas region. The fossils have been partially silicified in a dolomitic matrix.

INTRODUCTION

A small fauna of demosponges was collected by Hanger from the Guadalupian part of the Quinn River Formation in the Bilk Creek Mountains in northern Nevada (Fig. 1). The sponges occur in a massive, light-brownish grey calcareous and cherty dolomite. They have been partially replaced by silica so that in surface exposures their detailed structure and microstructure have been largely lost. Cut slabs that show skeletal materials have also been replaced in sample interiors by dark gray silica and their microstructure largely destroyed. However, thin sections do show some spicules are preserved in both species of sponges in the fauna.

The Quinn River Formation is well dated by radiolarians, conodonts, and brachiopods (Blome and Reed, 1995) and ranges from Middle Permian to the Late Triassic. The sponges described here are from the top of a conspicuous dolomitic unit immediately above strata bearing a Middle Permian (Guadalupian-Wordian) fauna (Fig. 2).

Paleozoic strata of the Bilk Creek Mountains are part of the Black Rock Terrane of northwestern Nevada (Silberling et al., 1987), one of the "McCloud Belt" of terranes in western North America that are grouped based upon similar lithologic sequence and distinctive McCloud province faunas (Miller, 1987; Stevens et al., 1990). Great controversy exists concerning the original paleogeographic position of these terranes, and faunal data to date have been equivocal in determining paleolongitudinal separation between terranes and the North American continent (Jones, 1990).

Sponges in the collection consist principally of the rhizomorine *Haplistion aeluroglossa* Finks, 1960, and an unidentifiable anthaspidellid tetracladine sponge. All occur in the more or less in-place assemblage.

As with the fossils recovered from the Cache Creek Group of British Columbia (Rigby, 1973), the sponges of the Quinn River Formation characterize Boreal faunas of Arctic Canada, Spitsbergen and Russia and suggest no major tectonic transport, although they are distinct from coeval North American faunas (Rigby and Senowbari-Daryan, 1995).

The fossil locality occurs on the Mustang Spring, Nevada, 7.5 minute quadrangle (figure 1). The UTM coordinate is 11TLS89159890. The geographic coordinates are 41°32′10″N, 118°19′48″W. Figured and reference specimens of the collections have been deposited in the U.S. National Museum, Washington D.C.

SYSTEMATIC PALEONTOLOGY

Class DEMOSPONGEA Sollas, 1875
Order LITHISTIDA Schmidt, 1870
Suborder RHIZOMORINA Zittel, 1878
Family HAPLISTIIDAE De Laubenfels, 1955
Genus HAPLISTION Young and Young, 1877
HAPLISTION AELUROGLOSSA Finks, 1960
Figs. 3.1, 3.2, 3.4–3.8

Haplistion aeluroglossa Finks, 1960 p. 89–90, pl. 19, figs. 8–10, pl. 26, figs. 9–12, pl. 27, figs. 1, 2

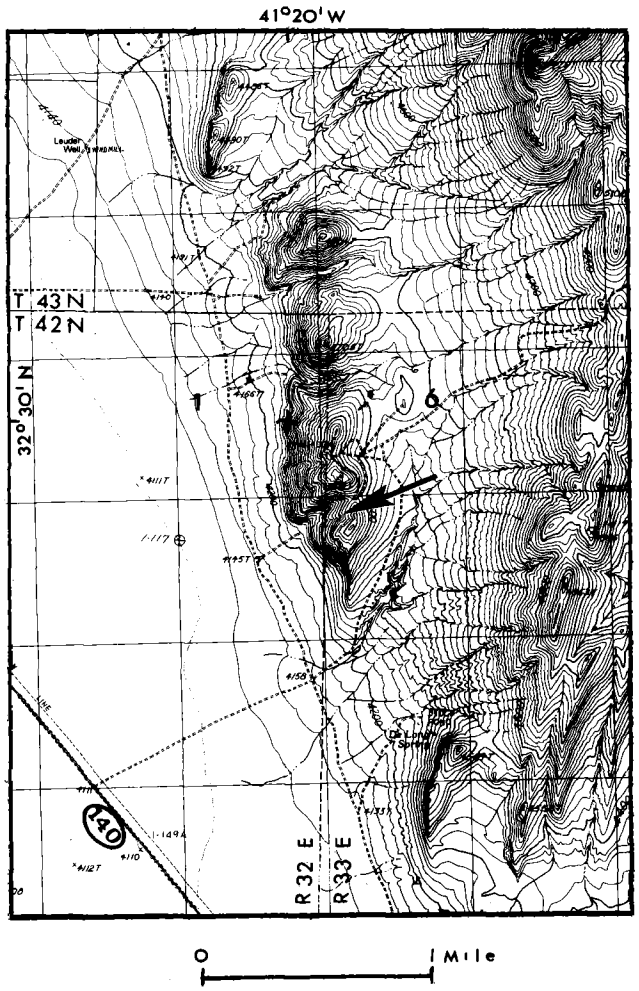

Figure 1. Index map to the sponge locality (arrow) from the Quinn River Formation, in the Bilk Creek Mountains, Humboldt County, northwestern Nevada. It is on the Mustang Spring, Nevada, 7.5-minute quadrangle. Nevada State Highway 140 between Denio and the Fort McDermitt Indian Reservation, northwest of Winnemucca, crosses the southwest corner of the map.

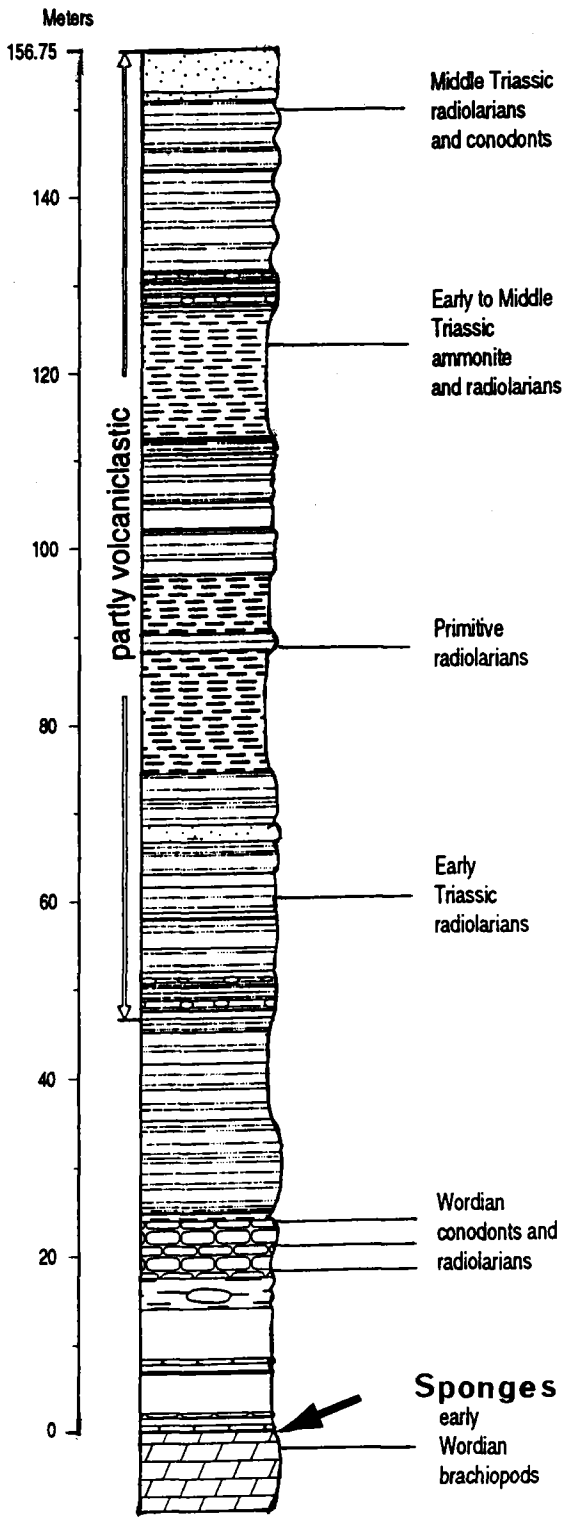

Figure 2. Generalized stratigraphic section of the Quinn River Formation. Occurrence of the sponges is indicated by the arrow (modified from Blome and Reed, 1995). An unconformity must exist between Early Triassic beds and Wordian beds in the lower part of the section, but its position is uncertain.

Diagnosis.—"Flattened-spherical to lobate or digitate; tract diameters in the species small for genus; a few small, circular osculae present, opening into a short radial canal; surface strongly hispid" (Finks, 1960, p. 89).

Description.—Numerous examples of this small sponge range from irregularly massive or lobate to digitate or subcylindrical. Lobate masses range to 50–60 mm across with lobes commonly 10–25 mm across, lobes locally producing small branches or stems range 5–10 mm in diameter. Some isolated sponges appear to be juveniles and others have flared attachment bases, apparently as initial phases of massive lobate development. Individual stems range to

40–45 mm long, although most are approximately half that length; longer stems are larger and commonly 10–15 mm in diameter. Smaller stems only 15–20 mm long, with those 5–7 mm in diameter most common. The skeleton is made of spicule tracts, longitudinal ones characteristically radiating upward and outward from the point of attachment, or from the center of the lobate mass. These are cross-connected by irregularly placed horizontal tracts, to produce an irregular, sub-rectangular net. Horizontal tracts not at uniform levels, although two or three may be at the same level, laterally, in the skeletal structure. Tracts range 0.20–0.30 mm in diameter in their narrow centers, but expand at junctions to about 0.40–0.50 mm across. Tracts are spaced 0.6–0.7 mm apart throughout much of the structure, although locally some are up to 1.1 mm apart in the upward-divergent part of the skeleton.

Some skeletons are locally interrupted by irregular central canals that are 1–3 mm in diameter. Such canals are most commonly present in the smaller branches or stems that are 10 mm or less across. These central canals are interconnected throughout their length by coarse canals.

Longitudinal sections of obconical to branching structures show distinct upwardly divergent skeletal structures, with vertical tracts arching outward from the axis of the structure, becoming subhorizontal in the outer few millimeters of the sponge. So called horizontal tracts are roughly at right angles to the upwardly divergent tracts and have a distinct domal pattern, becoming almost vertical and tangential near the outer surface, at right angles to the radial fibers.

Such tracts define a moderately regular skeletal net when cut tangentially, where the structure is almost rectangularly regular, with both radial and vertical tracts 0.3–0.4 mm in diameter and spaced approximately 1 mm apart, center to center. The tracts are separated by irregular gaps approximately 0.5–0.6 mm across, defining openings 0.6–1.2 mm across, with most in the smaller size range. Individual tracts are commonly 0.15–0.3 mm in diameter in their thinnest parts between intersections, but intersections of the vertical tracts and those tracts at right angles to them may range up to 0.6 mm in diameter, where swollen, although some of that enlargement may be related to diagenetic alteration.

Subparallel spicules of the tracts are evident in thin sections, and most spicules appear to be rhizoclones 0.02–0.03 mm in diameter and 0.5 mm long, or longer. They are separated by thin layers of darker matrix but are connected by nodular-appearing elements, probably zygomes. Spicules curve parallel to tract margins around skeletal pores. Some possible oxeas also occur, probably in outer parts of the tracts. These spicules are smooth cylindrical to tapering, have maximum diameters of 0.03–0.04 mm, and range to at least 0.8 mm long. Some have faint impressions of axial canals.

Transverse sections of well-preserved tracts show differences in tract diameters and numbers of spicules. Small tracts, 0.1 mm in diameter, are composed of 7–10 spicules, intermediate-sized tracts, 0.25 mm in diameter, have 15–17 spicules, and larger tracts, 0.5 mm in diameter, have 25–30 spicules.

Discussion.—Finks (1960, p. 88) subdivided the species of *Haplistion* into two large groups. These were based upon whether mesh spaces are less than 1 mm in diameter, whether radial and horizontal tracts are approximately of equal thickness or diameter, or whether mesh spaces are 1 mm or more in diameter and horizontal tracts are about half the diameter of radial tracts. It is with the first group, with small mesh spaces, that the specimens here seem to be related. Finks also recognized three subgroups in group 1, based upon whether skeletal tracts are less than or about 0.5 mm in diameter, or whether tract diameters are not known. Within the first group, he included *Haplistion armstrongi* Young and Young, 1877, a Mississippian form from the British Isles, and *Haplistion aeluroglossa* Finks, 1960, from the Permian of western Texas.

Haplistion skinneri (R. H. King, 1943), also known from the Permian, is a spheroidal form with regular structure in a skeleton lacking well-defined oscules. *Haplistion skinneri* has both concentric and radial tracts of essentially the same diameter and spacing. Finks (1960, p. 90) observed that in *H. skinneri* the total range of thickness of tracts is 0.25–0.60 mm in diameter, and that tracts are 0.5–1.2 mm apart. He also observed that the only pores in the skeletal structures are circular to polygonal openings 0.25–1.2 mm diameter, with most 0.4–0.7 mm in diameter, defined by the tracts. In contrast, *Haplistion aeluroglossa* has radial and horizontal tracts both approximately 0.15–0.30 mm in diameter. Such tracts maybe less than 0.5 mm apart near the base, with spacing increasing towards the periphery. In general, both sets of tracts are spaced 0.25–0.80 mm apart in the type specimens, much like the structure evident in our Nevada specimens. Other Permian species of *Haplistion* (Finks, 1960) generally have considerably coarser tracts than seen in our material.

Material.—Figured specimens, USNM 480460–480462, and reference specimens USNM 480463–480465, plus additional samples of the sponge-bearing unit occur in the collections.

Occurrence.—Previously reported occurrences of the species (Finks, 1960, p. 90) are in the dark grey limestone of the Leonardian Bone Spring Formation in the Sierra Diablo, Van Horn Quadrangle, Texas, and in the Word Formation, near the top of Limestone 1, in the Glass Mountains, Hess Canyon Quadrangle, Texas, in rocks that range from basin facies to shelf facies.

Suborder ORCHOCLADINA Rauff, 1893
Family ANTHASPIDELLIDAE Miller, 1889
Genus Uncertain
Figures 3.2, 3.6

Description.—Fragments of anthaspidellid sponges are cut at irregular angles in several samples in the collection. These are evident in cross sections and thin sections showing distinct trabs and the cross-connecting dendroclone spicules that make up "rungs" in the ladder-like series characteristic of the family. These trabs are approximately 0.10–0.20 mm in diameter, moderately open-textured, and spaced about 0.2–0.4 mm apart, center-to center, so that 5 occur per millimeter, where the structure is best organized. The trabs and interconnecting dendroclones define skeletal pores 0.2–0.4 mm across, that may be triangular to polygonal in cross section in the apparently transverse sections that are available. The skeletal net is interrupted by canals of two sizes, the smaller approximately 0.5 mm in diameter, and the larger 1.0 mm in diameter. Both tend to be circular and contrast to the more or less angular skeletal pores that are parallel to the trabs.

Dendroclones have shaft lengths of 0.20–0.30 mm, with most 0.25 mm long. Shaft diameters are 0.02–0.03 mm, with greatest diameters probably where clads diverge near trab margins but details are lost in the coarse iron-stained silicification and dolomitic preservation.

Discussion.—Sections do not show any particular skeletal and canal pattern that can be related certainly to known Permian genera of the family. They are somewhat similar to sections of *Multistella porosa* Finks, 1960, known previously from the Getaway Limestone of the Wordian Cherry Canyon Formation in the Guadalupe Mountains of Texas. All spicules in that species, however, are somewhat larger than those in our material. Some of the irregular canals in our material may be anastomosing grooves, like those characteristic of the *Multistella,* although that relationship cannot be certainly determined in the fragmental material available to us.

Material.—Sections of the sponge are present in Samples USNM 480460 and 480461, plus in additional reference specimens from the Quinn River Limestone, Bilk Creek Mountains, Humboldt County, Nevada.

OTHER SPICULES

Dissociated spicules and a range of siliceous monactine spicules occur in the spiculitic matrix associated with the other sponges. These are commonly seen only in transverse or high-angle oblique sections and range to 0.5 mm in diameter, but also include many other spicules as small as 0.02 mm across or less. Such spicules are commonly very light-grey in the brown dolomite and contrast to skeletal nets of the lithistid sponges, which are commonly preserved as dark-grey siliceous replacements. None of the sponges described here are known to have large root tufts, such as are probably represented by the coarse spicules in the matrix. These dissociated spicules probably represent an additional form otherwise not represented in the samples.

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Figure 3. Specimens and thin sections of Haplistion aeluroglossa *Finks, 1960 and an unidentifiable anthaspidellid demosponge.* 1, 2, 4–8, Haplistion aeluroglossa *Finks, 1960, figured specimens;* 1, *longitudinal section of polished slab showing the upward divergence of the vertical tracts, cross-connected by horizontal tracts, in a partially silicified, iron-stained example, A, poorly preserved anthaspidellid sponge in the lower right, where dark dots indicate transverse sections of trabs, UNSM 480460-A, x2,* 2, *polished slab showing several specimens ranging from transverse and longitudinal-oblique sections of immature forms, with small tracts, to oblique sections of large specimens in the lower right and lower left, UNSM 480461-A, x2;* 4, 5, *photomicrographs of thin sections showing long upward divergent tracts with faint impressions of monaxial spicules that make up much of the tracts, thin section of UNSM 480460-A, x10,* 7, *photomicrograph of a vertical tract showing prominent monaxial spicules of the tract with irregular nodular surfaces (arrow), which suggest the spicules are rhizoclones, USNM 480462-B, x20,* 8, *photomicrograph of vertical tracts which are curved subhorizontally and are cross-connected by shorter discontinuous elements that are representative of horizontal tracts in the outer part of the skeletal grid, both show tracts are composed principally of long monaxial spicules, probably rhizoclones, that are parallel to surfaces of the tracts and are curved where the tracts curve, USNM 480460-A, x20.* 3, 6.—*Anthaspidellid sponge, photomicrographs from thin section USNM 480460-A,* 3, *small specimen cut transverse to the prominent rod-like tracts, which show as dark irregular to circular dots cross-connected by the horizontal rung-like dendroclones (arrow), characteristic of the skeletal structure of the family (arrow), x10,* 6, *same general area indicated by the arrow in figure 3, showing the irregular open-textured trabs as more or less irregular, circular, dark areas, cross-connected by the rod-like dendroclones of the skeletal net, x20.*

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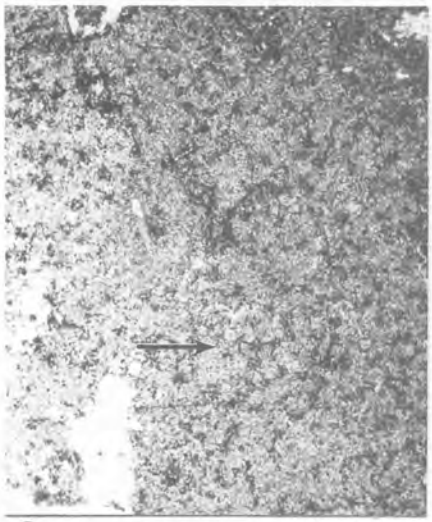

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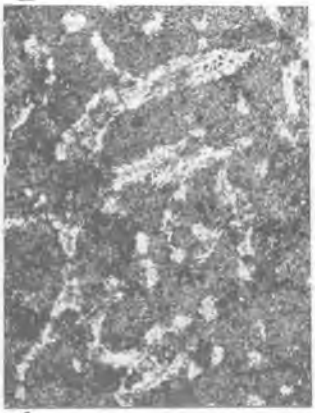

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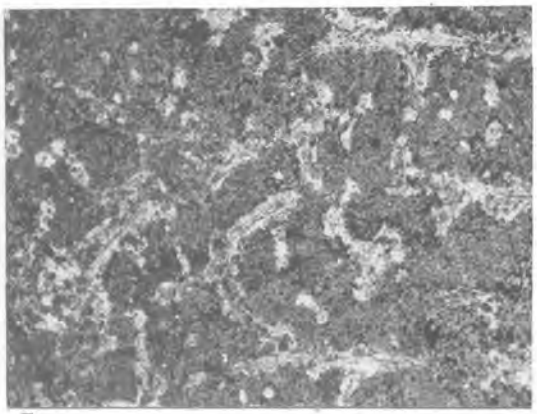

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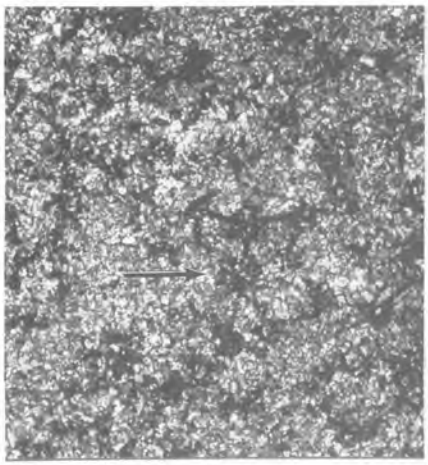

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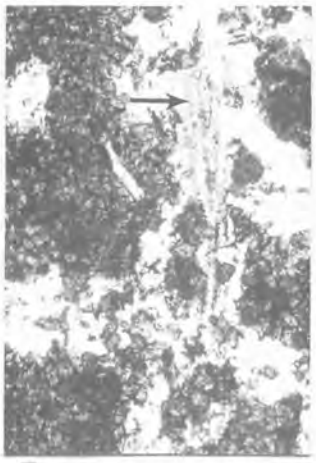

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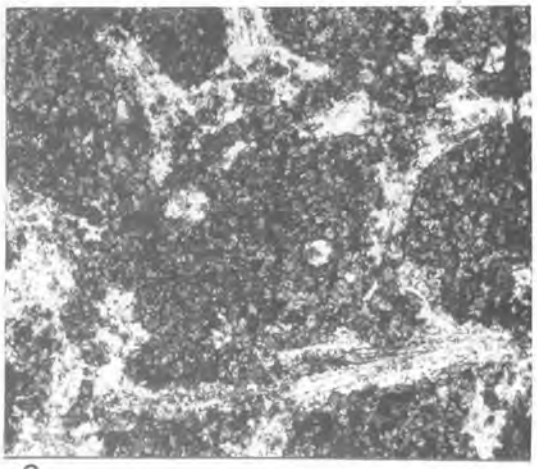

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