

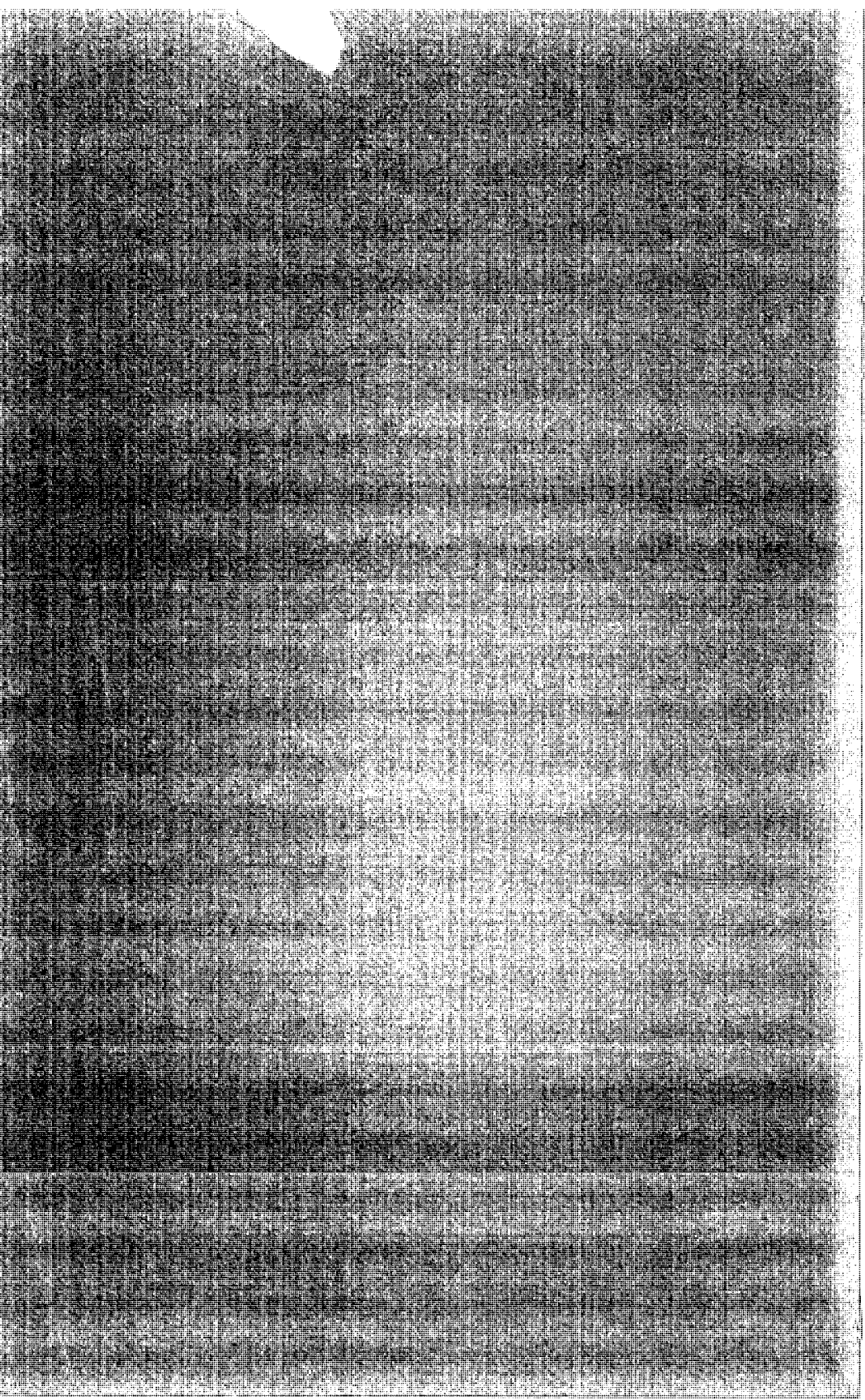
GEOLOGY STUDIES

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CONTENTS

The Isla de Lobos and Associated Reefs, Veracruz, Mexico J. Keith Rigby and William G. McIntire	3
Some Octocorallia of Isla de Lobos, Veracruz, Mexico C. Kent Chamberlain	47
Dinosaur Eggs from the Upper Cretaceous North Horn Formation of Central Utah James A. Jensen	55
Geology of the Kingsley Mining District, Elko County, Nevada Roger Steininger	69
A Study of Fluid Migration in Porous Media by Stereoscopic Radiographic Techniques J. Raymond Rutledge	89
<i>Actinocoelia maeandrina</i> Finks, from the Kaibab Limestone of Northern Arizona Leland R. Griffin	105
Preliminary Petrology and Chemistry of the Cenozoic Basalts in the Western Grand Canyon Region Myron G. Best, Wm. Kenneth Hamblin, and Willis H. Brimhall	109
Publications and Maps of the Geology Department	125



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Actinocoelia maeandrina Finks, from the Kaibab Limestone of Northern Arizona

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ABSTRACT.—Numerous sponges of the species, *Actinocoelia maeandrina* Finks, are found in cherty concretions of the Beta Member of the Kaibab Limestone. They were collected from 8 sections in an east-west traverse, from the Kaibab Plateau on the east, to near Las Vegas, on the west.

Although the sponges are numerous and occur over a wide area, only one species was found in the member.

Associated fossils include brachiopods, pelecypods, crinoid stems, corals and bryozoa.

CONTENTS

TEXT	page	ILLUSTRATIONS	page
Introduction	105	1. <i>Actinocoelia maeandrina</i>	
Acknowledgments	106	Finks	following page 108
Description	106	Text-figures	
Available material	108	1. Index map of collecting	
Repository	108	localities	106
References Cited	108	2. Generalized stratigraphic	
		sections of collecting	
		localities	107

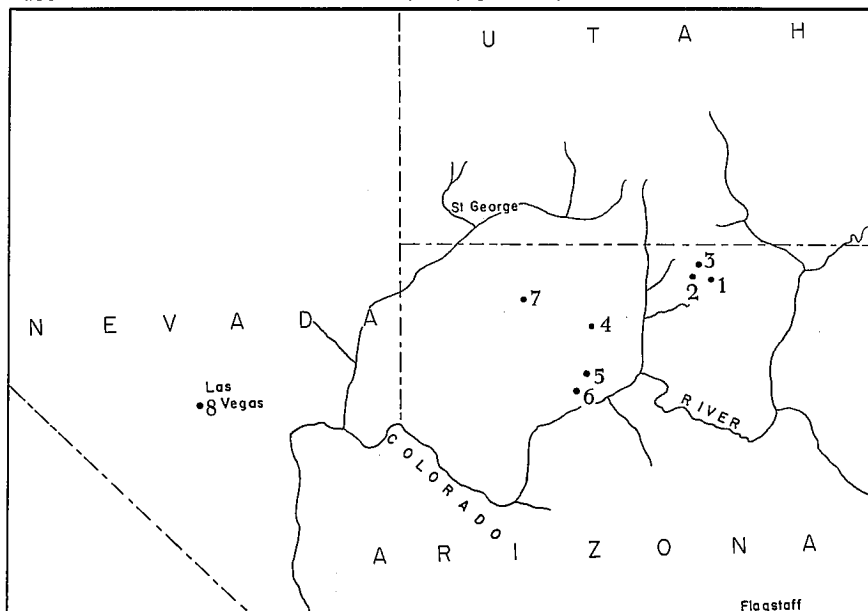
INTRODUCTION

The Kaibab Formation, from which all fossils for this study were collected, covers an area of many thousand square miles in northern Arizona, southern Utah and southern Nevada. It extends from Snowflake, Arizona, in the south-east to Spring Mountain, Nevada, on the west. To the north, it has been found as far as the San Rafael Swell and the Confusion Range in Utah. Fossils for this work were not obtained from all extremities of the formation, but were collected from an eastward traverse from the Kaibab Plateau in north-central Arizona, on the east, to an area near Las Vegas on the west (Text-figure 1). McKee (1938, p. 155) reported sponges from sections to the north and they have also been reported by Finks (1960, p. 71-72) from the formation.

The Kaibab Formation varies in thickness from place to place, but averages approximately 400 feet in the Kaibab Plateau.

Because of the high structural position of the Kaibab Formation and because of its resistance to erosion, many areas have been exposed within the unit from which sponges can be easily collected. Road cuts which pass through the formation proved to be good areas.

McKee (1938, p. 45-54) divided the Kaibab Formation into two members. The upper Alpha Member is composed of cherty beds of limestone, fine clastic material, thin-bedded impure limestone, and gypstone, and the lower Beta Member is composed of massive, cherty, fossiliferous, normal marine limestone (Schleh, 1960, p. 1). The Beta Member contains the fossils described here. The fossil sponges appear in the center of chert concretions and nodules which are



TEXT-FIGURE 1.—Index map of collecting localities: (1) 9.8 miles east of Jacob Lake Lodge; (2) 3.6 miles east of Jacob Lake Lodge; (3) Orderville Canyon; (4) Hacks Canyon; (5) Upper Toroweap Valley; (6) Lower Toroweap Valley; (7) Hurricane Ledge; (8) 17.9 miles west of Las Vegas.

abundant in the upper Beta beds, and have been referred to as the "cannon-ball chert" (Schleh 1960, p. 44). These nodules are abundant and range in diameter from two to ten inches, but average six inches. The size averages somewhat larger in southern Nevada than in northern Arizona.

The Alpha Member in many areas has been almost completely eroded away so that the Beta Member, and consequently the fossil sponge beds, is found on or near the top in most exposures.

The Beta Member stands as a resistant ledge and the less resistant overlying Alpha Member, when present, commonly forms gentle slopes above.

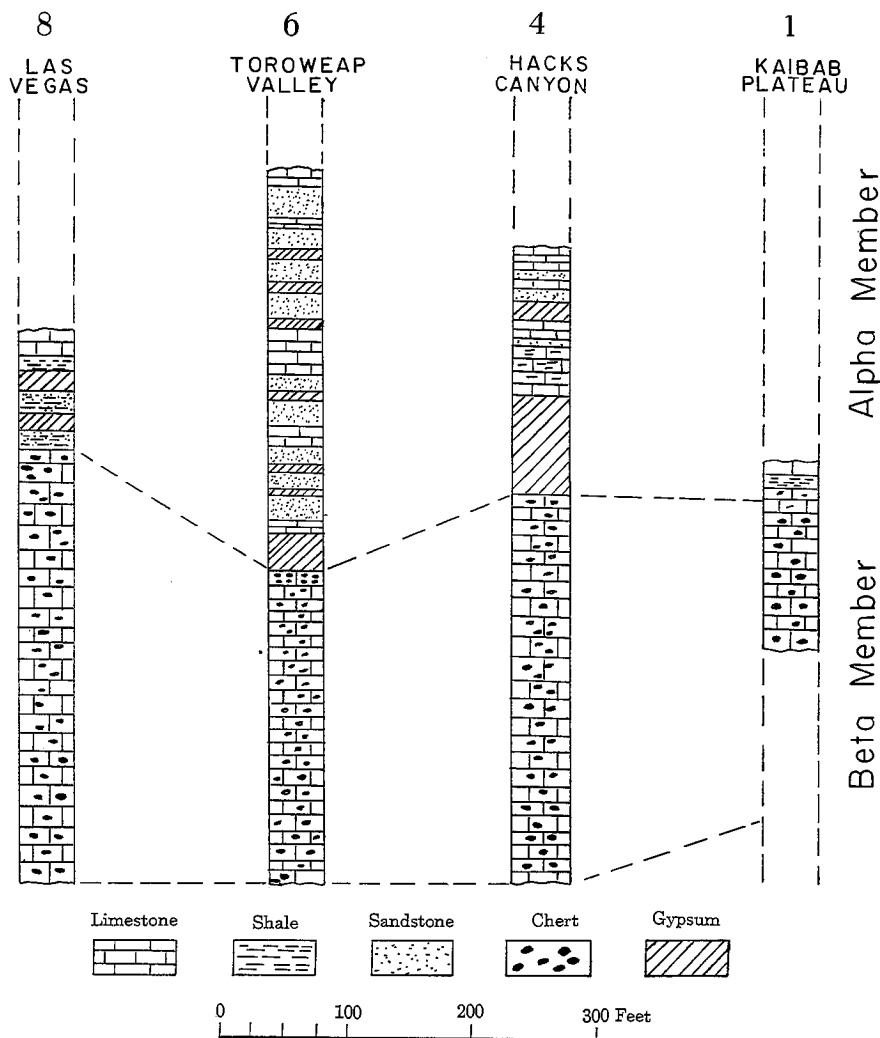
Because of the resistant nature of the chert nodules and concretions, individual fossil sponges are rarely weathered free of the matrix. Only in the Las Vegas area were fossil sponges found which were not entirely encased in this cherty, limestone material (Plate 1, fig. 3).

Acknowledgments

Financial support for collecting the sponges and for their laboratory study was provided by an Undergraduate Research Participation grant by the National Science Foundation to the Department of Geology, Brigham Young University. Page charges were also covered by the grant. Dr. J. Keith Rigby made initial collections at two of the localities and aided the author in preparation of materials and the manuscript.

Description

These sponges occur as massive spheroidal forms which are generally flattened on one side. Finks (1960, p. 72) attributes this flattening to the effect of



TEXT-FIGURE 2.—Generalized stratigraphic sections of collecting localities (modified from McKee, 1938).

post-burial compaction. On those rare specimens where weathering has left the exterior exposed the sponge resembles a common household sponge. In most cases the chertified interior can be observed only after cutting the spherical nodules in which the sponges were encased.

The diameter of individual sponges ranges from 25 to 95 mm. in eastern collections (locations 1, 2, and 3, Text-fig. 1) but from 55 to 190 mm. in the west (location 8). The thickness or height likewise increases from 10 to 65 mm. in eastern locations (locations 1, 2, and 3) to 35 to 135 mm. in western ones (location 8). Although external measurements show an increase in size from

east to west, there appears to be no noticeable change in the size of the internal structures in the same specimens.

The canal system, which forms a radiating pattern throughout the sponge, has its origin near the base. As the canals are traced toward the surface they are usually straight, but meandering and branching of the canals does appear at various intervals. In cross section the canals may be oval or round, but many have irregular shapes. They emerge at the surface with ostia about the same size as the associated canals. Because of the meandering nature of the canals and intervening trabeculae the surface has a grooved appearance.

Width of canals ranges from 0.4 to 2.5 mm., with 1.3 mm. being the average size. Width of the canals stays approximately the same from their origin until termination at the surface.

The trabeculae are massive and form a radial pattern throughout the sponge and are somewhat narrower than the associated canals. They have a thickness of from 0.3 to 2.0 mm., with 1.0 mm. being the average size. The skeletal network also has horizontal elements which laterally connect the radiating major structures. Presence of lateral trabeculae gives the network a meandering appearance.

Because of the chertified nature of the sponges, the skeletal material has been preserved to various degrees. In the Kaibab Plateau area (locations 1 and 2), spicules are best preserved but in localities to the west only spicule fragments are preserved or are lacking all together.

Where present, the spicules are irregularly arranged tetractones, 0.2 to 0.3 mm. long. The axes are 0.03 to 0.05 mm. thick, and the rays, which have irregular shapes, are 0.02 to 0.04 mm. thick and 0.04 to 0.13 mm. long.

Most specimens have approximately these same canal measurement, however, there are individuals which have a smaller than average size. These few forms may represent a new species when the genus has been intently studied and variability evaluated.

Available Material.—Approximately 170 specimens were collected for the investigation, but numerous other examples were studied in the field. Several thousand sponges could be collected at each locality with little difficulty had variation warranted such extensive material. Since only a single, moderately variable species was discovered, collections were not enlarged.

Repository.—The collection is housed by the Department of Geology, Brigham Young University. Figured specimens are numbers 1098, 1099, 1100; the remainder are catalogued under the collecting locality numbers.

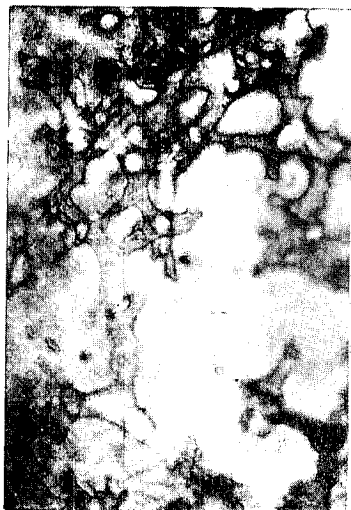
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EXPLANATION OF PLATE 1

ACTINOCOELIA MAEANDRINA FINKS

- FIG. 1, 2.—Photomicrographs of tetraclonal spicules in coarse textured chalcedony; BYU, 1098, x85.
- FIG. 3.—External view of weathered sponge; BYU, 1100, x1.
- FIG. 4.—Polished transverse section through a lobate specimen showing canals and trabecular patterns; BYU, 1099, x1.



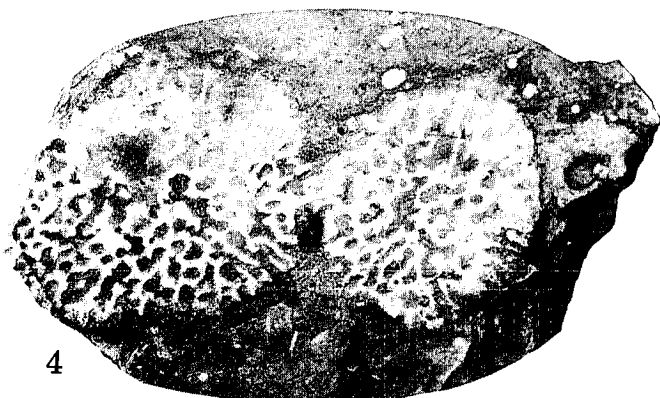
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Actinocoelia maeandrina FINKS FROM THE KAIBAB LIMESTONE