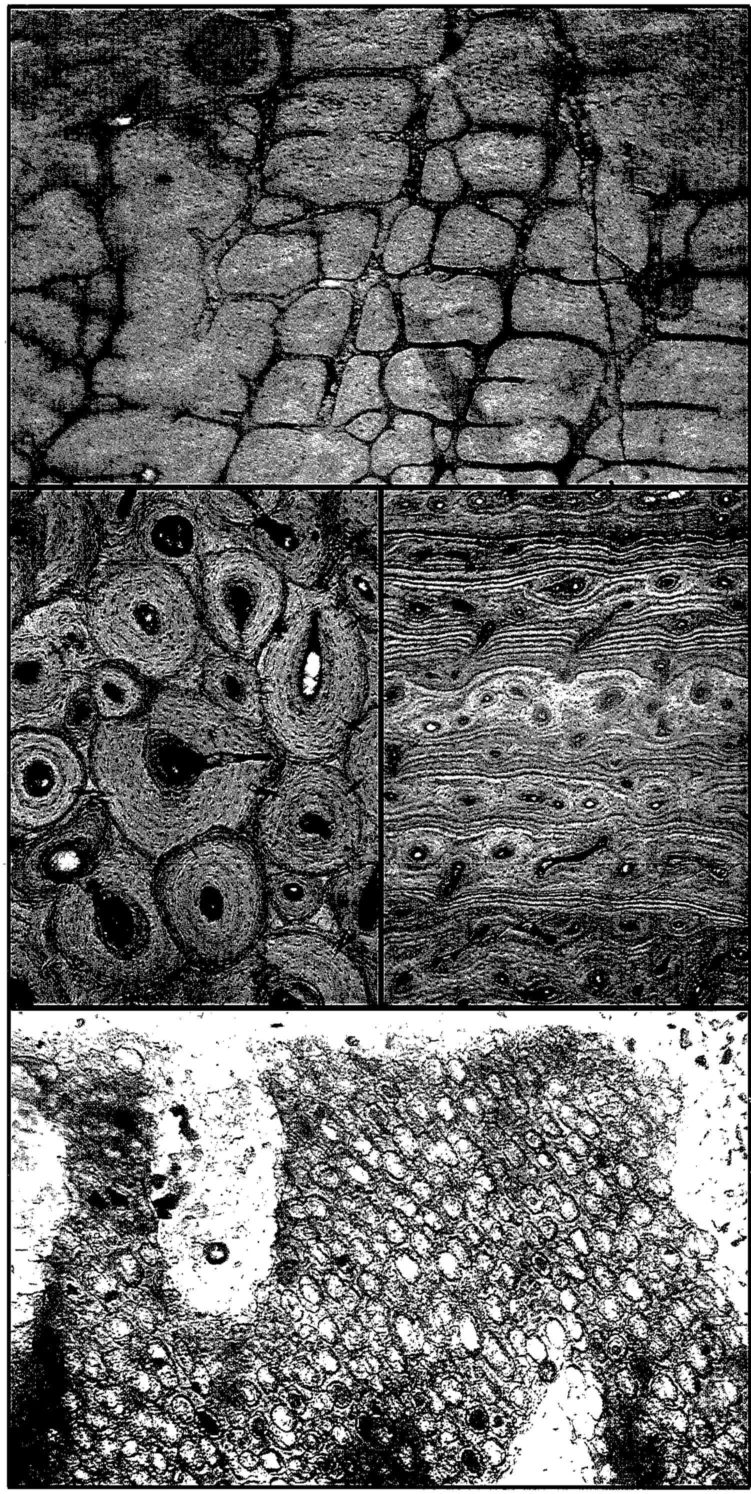
BRIGHAM YOUNG UNIVERSITY

GEOLOGY STUDIES



VOLUME 41 • 1996

BRIGHAM YOUNG UNIVERSITY
GEOLOGY STUDIES

Volume 41, 1996

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A Publication of the
Department of Geology
Brigham Young University
Provo, Utah 84602

Editors

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Brigham Young University Geology Studies is published by the Department of Geology. This publication consists of graduate student and faculty research within the department as well as papers submitted by outside contributors. Each article submitted is externally reviewed by at least two qualified persons.

Cover: Fossil tissues from Cleveland-Lloyd allosaurs.

Top: Uniform periosteal bone with reticulating primary vascular canals, some of which are aligned longitudinally (left to right) and radially. Caudal vertebra, centrum; longitudinal section; C-LQ 087.

Middle left: Vascular zonal bone with lamellated annuli and non-lamellated zones. Local development in a right radius; transverse section; C-LQ 109.

Middle right: Dense Haversian bone showing secondary osteons, secondary vascular canals at their centers, and the concentric arrangement of osteocyte lacunae (small dark bodies) around them. Dorsal rib; transverse section; C-LQ 106.

Bottom: Calcified cartilage showing the rounded form of the spaces (lacunae) once occupied by chondrocytes. Proximal end of a fibula; longitudinal section; C-LQ 014.

In all sections the direction of the external surface is upward.

ISSN 0068-1016
4-96 700 17254/18570

Barroisia siciliana n. sp., A Thalamid Sponge from Upper Jurassic Reefs of the Madonie Mountains, Sicily

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ABSTRACT

Barroisia siciliana, a new thalamid and calcispongid sponge, is described from the Upper Jurassic (Tithonian) reef limestones exposed in Pizzo Carbonara in the Madonie Mountains, Sicily. This is the first report of thalamid sponges in Jurassic reefs of Sicily.

INTRODUCTION

The thalamid or segmented sponges, as important reef builders, are abundant in Upper Triassic reefs of the world, especially in the Norian-Rhaetian reefs in Sicily, where they occur in several localities in western and central Sicily (Senowbari-Daryan and Schäfer, 1986; Senowbari-Daryan, 1990; Di Stefano and others, 1990). At the end of the Triassic not only the reefs but also the majority (almost 100%) of segmented and non-segmented sponges disappear abruptly. "*Stylothalamia*" seems to be the only representative of segmented sponges that passes through the Triassic/Jurassic-boundary. It has been reported from several localities of the Liassic limestones from former Yugoslavia (Radoicic, 1966: Pl. 150, Fig. 1–2, described as "*Pelleria bonomi*"); Italy (Palini and Schiavinotto, 1981; Schiavinotto, 1984; Becarelli Bauck, 1986; Broglio Lorigo and others, 1991); Morocco (Le Maitre, 1935; Schroeder, 1984); Spain (Schroeder and Willems, 1983); and from Peru (Hillebrandt, 1971, 1981; Senowbari-Daryan, 1990; Senowbari-Daryan and Stanley, 1994). However, the identification of the Jurassic "*Stylothalamia*" as an independent genus or whether it has affiliation with the Triassic *Stylothalamia* described by Ott (1967) should be checked again.

As shown by Senowbari-Daryan (1990), thalamid sponges are a polyphyletic group, and the term Sphinctozoa (Steinmann, 1882) cannot be used for all segmented sponges with a rigid skeleton. The rigid skeleton of thalamid type occurs not only in Calcispongea but also in heteractinid, demospongid, and hexactinellid groups as well. For the demospongid thalamid sponges the term Verticillitida Termier and Termier (in Termier and others, 1977) and for the calcispongid thalamid sponges the term Sphaerocoelida Vacelet (1979) have been proposed (Senowbari-Daryan, 1990).

Representatives of calcispongid thalamid sponges occur mainly in Upper Jurassic and Cretaceous deposits. They are included in three genera: *Sphaerocoelia* Steinmann, *Thalamopora* Römer, and *Barroisia* Munier-Chalmas (for the validity of the genus "*Tremacystia*" Hinde, see Hillmer and Senowbari-Daryan, 1986). In all three genera the spicular skeleton is composed of primary calcite, but spicules are of different shapes.

GEOLOGIC SETTING AND LOCALITY

The Madonie Mountains in central Sicily represent a segment of the Sicilian Chain and are composed of an overlapping series of tectonic units revealing deposits of shallow and deeper water environments. Two main units can be distinguished:

a. Mesozoic-Tertiary shallow water deposits including platform carbonate rocks characterized by marginal and slope facies (Panormide Domaine); and
b. Mesozoic Tertiary successions characterized by basinal deposits (Imerese Domaine).

The sponge described here was found in Pizzo Carbonara near Piano Battaglia where the Upper Jurassic (Tithonian) reef limestones are exposed (Fig. 1). Microfacies investigation of these Upper Jurassic (Lower Cretaceous?) shallow water carbonates (reef and lagoon limestones) were carried out by Catalano and others (1974). A paleogeographic model of the Upper Jurassic environments was given by Catalano and D'Argenio (1978).

The Upper Jurassic reef limestones, exposed in some localities (Monte Mufara, Pizzo Carbonara) in Piano Battaglia

(Fig. 1), contain a great number of reef and lagoon organisms (e.g., corals, sponges): abundant are "chaetetids" = sclerosponges, "hydrozoans" (most abundant are ellipsactinid types), "*Tubiphytes*," and different groups of algae and problematic organisms, etc. Corals and "*Tubiphytes*" are the most abundant reef builders (Schäfer and Senowbari-Daryan, 1980). Algae may locally be of great importance. The different algae of the reef limestone were described by Senowbari-Daryan and others (1994).

PALEONTOLOGY

Phylum PORIFERA Grant, 1836
Class CALCAREA Bowerbank, 1864
Order SPHAEROCOELIDA Vacelet, 1979
Family SPHAEROCOELIIDAE Ott, 1967
Genus BARROISIA Munier-Chalmas, 1882
(in Steinmann, 1882)

Barroisia siciliana n. sp.
(Pl. 1, Figs. 1–5)

Derivatio nominis. Named for the occurrence of the sponge in Sicily.

Holotype. Pl. 1, Figs. 1–5.

Locus typicus. Pizzo Carbonara, Madonie Mountains, Sicily.

Stratum typicum. Upper Jurassic (Tithonian) reef limestones.

Diagnosis. Porate, catenulate, and ambisiphonate sponge with a relatively wide and swollen axial spongocoel. The wall of the spongocoel is much thinner and bears smaller pores than the segment walls. No vesiculae within the chamber interiors. The spicular skeleton is composed of triactines that are embedded within the rigid calcareous skeleton.

Differential diagnosis. See after the description of the species.

Material. Only one specimen. One thin section was made from one half of the specimen. The other half was investigated in REM.

Repository. Institute of Paleontology, University of Erlangen—Nürnberg.

DESCRIPTION

Because only one specimen was found, the description of the holotype corresponds to the description of the species.

This tiny chambered sponge is composed of 5 spherical to subspherical chambers with maximum diameter of 8.5 mm (Pl. 1, Figs. 1–2) and a height of almost 18 mm. The youngest chamber (Pl. 1, Fig. 1) is marginally cut. Individual chambers have heights of 3.5–5 mm. The chamber wall is moderately thick (0.35–0.75 mm) and pierced by numerous single, unbranched pores approximately 0.15 mm (0.12–0.18 mm) in diameter (Pl. 1, Figs. 1–2). The thickest part of the segments is around the osculi at the summit of the chambers (Pl. 1, Figs. 1–2) where the chamber wall "turns down" or "grow upwards" (ambisiphonate sensu Seilacher, 1962). This type of formation of the spongocoel is typical of the genus *Barroisia*. Some parts of the chamber walls indicate a weak two-layered structure: parallel in the interior part and perpendicular in the exterior part of the walls (Pl. 1, Fig. 1).

A relatively wide axial spongocoel is up to 5 mm in diameter (more than 50% of the sponge diameter) and passes through the sponge. The spongocoel is swollen in chamber interiors and has much greater diameter there than in the osculi in the segment summits (Pl. 1, Figs. 1–2). The osculi reach diameters of approximately 2 mm. The spongocoel wall (0.15–0.30 mm) is distinctly thinner than walls of the chambers. Some very thin-walled tubes, approximately 0.15 mm in diameter, pass from the spongocoel wall into the spongocoel or into the chamber interiors (Pl. 1, Figs. 1–2: arrows). Other pores in the spongocoel wall do not show tubelike extensions of the wall.

The spicular skeleton, as investigated in SEM, is composed of triactines (possibly also tetractines?) that are imbedded within the rigid skeleton and do not show any regular arrangements (Pl. 1, Figs. 3–5). The walls are composed of irregularly arranged crystals (Pl. 1, Fig. 5).

DISCUSSION

Several segmented sponges, described from Upper Jurassic and Cretaceous deposits, are assigned to the genus *Barroisia*. All *Barroisia* species with their characteristics and stratigraphic ages known up to 1986 were treated together by Hillmer and Senowbari-Daryan (1986). Reitner (1987) described another species of *Barroisia*—*B. gandarensis*—from the Cretaceous (Albian) mud mounds of Gandara in Northern Spain. *B. gandarensis*, however, is much larger (14 mm) than our species from Sicily and has a much wider spongocoel (about 7.5 mm) than that in *B. siciliana*.

In dimensions and age the Sicilian species shows similarity to the sponge described as *Tremacystia tithonica* (=*Barroisia tithonica*, see Hillmer and Senowbari-Daryan, 1986; Senowbari-Daryan, 1990) from the Tithonian of Stramberg beds by Zeiße (1897). Other Jurassic species of *Barroisia* are much smaller or larger than our Sicilian species.

Barroisia siciliana n. sp. is differentiated from *Barroisia tithonica* (Zeiße) by its much wider spongocoel (*B. tithonica* only 1 mm, *B. siciliana* almost 5 mm) and by the presence of tubelike elements extending from the wall of the spongocoel into both the interiors of the chambers and into the spongocoel.

Barroisia siciliana n. sp. is the first occurrence of the genus in Sicily.

ACKNOWLEDGMENTS

We thank Professor Dr. J. Keith Rigby (Brigham Young University, Provo, Utah) for review and improvement of the English in this paper.

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PLATE 1

Figures 1–5. *Barroisia siciliana* n. sp. from the Jurassic (Tithonian) reef limestones of the Madonie Mountains, Sicily.

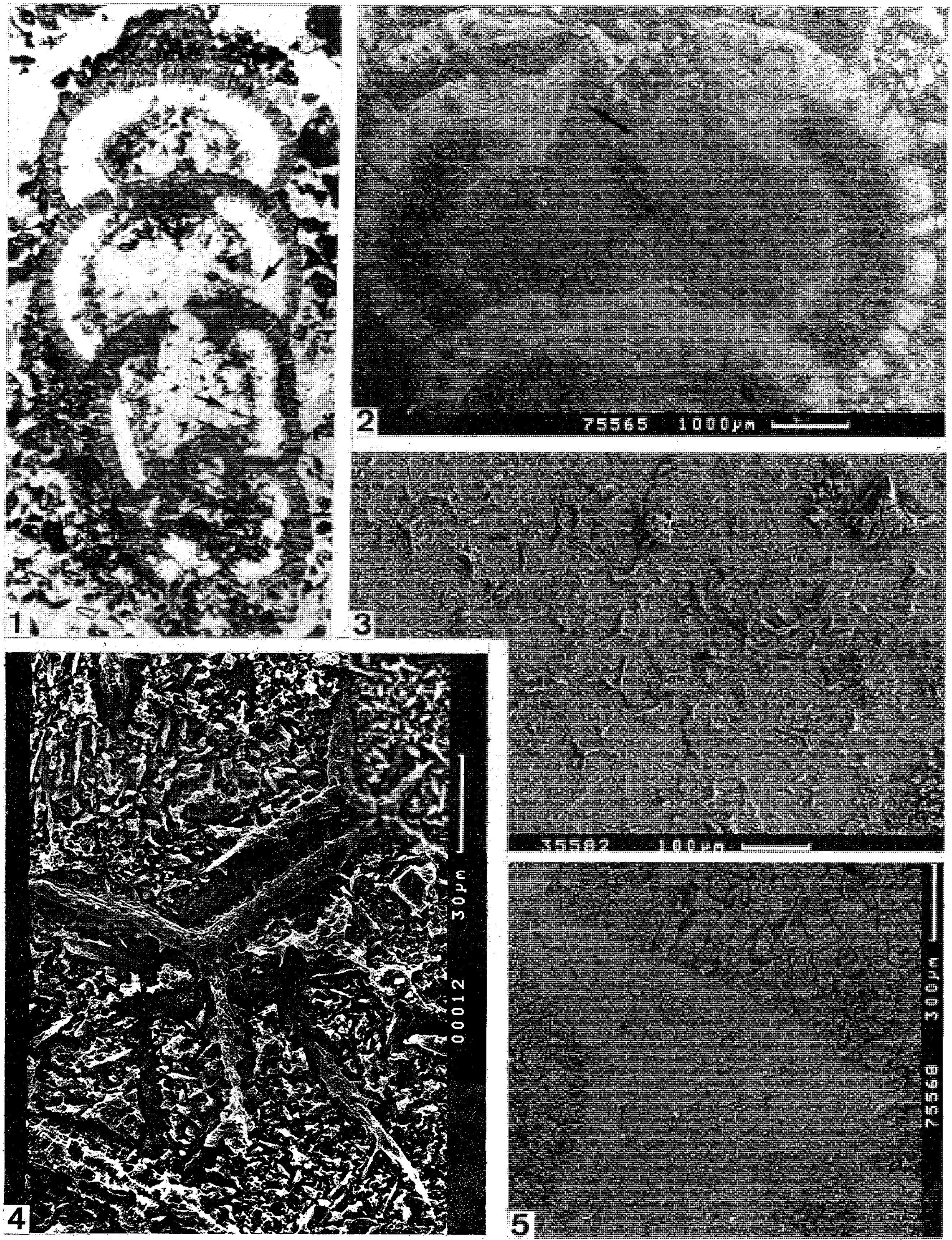
Figure 1. Longitudinal section through four globular to barrel-shaped chambers exhibiting the single pores in the chamber walls. The sponge possesses a relatively wide spongocoel with a thin wall. The interior of the spongocoel is filled by grains and sparry calcite cement, but the chamber interiors are filled only with cement. Arrows indicate the tubelike elements that extend from the sponge wall into the spongocoel or into the chamber interiors. Thin section J/20/1, X20.

Figure 2. REM-microphotograph exhibiting one chamber and two chamber roofs. The chamber walls are pierced by single unbranched pores. The wall of spongocoel is much thinner than that of the chamber walls and is pierced by relatively large pores.

Figure 3. Enlargement from Figure 5 showing the spicular skeleton imbedded within the rigid skeleton of the chamber wall. The spicules are represented by triactines and are composed of primary calcite.

Figure 4. Enlargement from Figure 3 showing triactine spicules in surfaces treated by "Titriplex III solution".

Figure 5. Enlargement from Figure 2 (arrow) showing the chamber roof around the spongocoel and the microstructure of the rigid skeleton in detail.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