SCI. MAR., 57(4): 375-379 SCIENTIA MARINA 1993

RECENT ADVANCES IN ECOLOGY AND SYSTEMATICS OF SPONGES. *M.J. URIZ and K. RÜTZLER (eds.).*

# *Spongionella foliascens:* A new foliose Dendroceratid sponge from the western Atlantic*

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SUMMARY: A new species of *Spongionella* (Dendroceratida: Dysideidae) is described from the Gulf of Mexico. In addition to *Dysidea* and *Euryspongia*, this documents a third dysideid genus from this location, and provides the first record of a foliose dendroceratid from the western Atlantic. The systematics of *Spongionella* is discussed.

*Key words:* Taxonomy, new species, Porifera, Dendroceratida, Dysideidae, *Spongionella,* Gulf of Mexico.

## INTRODUCTION

The genus *Spongionella* is characterized by an extremely regular and compact reticulation of primary and secondary fibers, which are concentrically stratified and pithed to varying degrees (VACELET, 1959; BERGQUIST, 1980). At the surface of the sponge, the primary fibers extend as tapered superficial projections that render the surface of the sponge microconulose. Species of *Spongionella* are cushion-shaped, tubular, or lamellate; among those that are lamellate, a number of their tubes appear to have undergone coalescence and compression in a single plane.

Species of *Spongionella* superficially resemble species in the haplosclerid genus *Callyspongia*, but are easily distinguished from them by the nature of their individual fiber construction, which in *Spongionella* is stratified and pithed, and by the structure of the aquiferous system (VACELET *et al.*, 1989). Despite these differences, DE LAUBENFELS (1936) continued to use *Velinea* (VOSMAER, 1883) after it had been synonymized with *Spongionella* by TOPSENT (1922). De Laubenfels believed that *Velinea* was extremely close to the Callyspongiidae, and particularly to *Dactylia*, a callyspongid that lacks spicules.

In contrast, most earlier authors were in favor of placing *Spongionella* within the dictyoceratid family Spongiidae, rather than within the Haplosclerida. *Spongia pulchella* Sowerby (1806) was named the type species of *Spongionella* by BOWERBANK (1862), and although LENDENFELD (1889) placed Bowerbank's four species of *Spongionella* within *Leiosella*, he recognized *Spongionella* as a subgenus of *Phyllospongia* (BERGQUIST, 1980).

DE LAUBENFELS (1948) compared *Spongionella* with *Dendrilla*, which he recognized as a dysideid because of the presence of large, sac-like choanocyte chambers and stratified fibers. The possible affinity of *Spongionella* with the Dysideidae was not formally

* Received September 10, 1992. Accepted January 18, 1993.

recognized until Vacelet redescribed the Mediterranean species (VACELET, 1958), and drew attention to the presence of eurypylous chambers and stratified, pithed fibers in *Spongionella*.

*Spongionella* is currently placed within the Dysideidae, a family that BERGQUIST (1980) classified within the order Dictyoceratida. However VACELET *et al.* (1989) recently proposed that this family be classified in the order Dendroceratida, owing to the morphology of the choanocyte chambers. At present, the type species *Spongionella pulchella* (Sowerby, 1806), *S. nigra* Dendy (1889), *S. tubulosa* Burton (1937), and *S. gracilis* (Vosmaer, 1883) are considered to be valid species. *S. pulchella* and *S. gracilis* have a northern Atlantic-Mediterranean distribution. These two species have been described in detail by VACELET (1959) and PULITZER-FINALI and PRONZATO (1976).

*Spongionella* extends into the Indian Ocean from the Arabian coast (*S. nigra)* and from southern India (*S. tubulosa*). Dendy (1905) named *Spongionella nigra* Dendy (1889) the type species of *Megalopastas*, a genus he established for sponges with aplysillid affinities, but with a reticulate rather than a dendritic skeleton. Since the type specimen of *Megalopastas* was the only form to lack aplysillid characters, BERGQUIST (1980) synonymized *Megalopastas* with *Spongionella* and erected the new dendroceratid genus *Dictyodendrilla*, to which all other species of *Megalopastas* were subsequently transferred.

Additional species have been described from locations in the Indian Ocean (*Spongionella pulvilla* [Dendy, 1905], *S. frondosa* [Hentschel, 1912], *S. holdsworthi* [Bowerbank, 1873]) and from Vietnam (*S. monoprocta* Lévi, 1961), but no comment can be made about their validity without examining some specimens.

BERGQUIST (1965) reexamined *Spongionella chondrodes* (DE LAUBENFELS, 1954) from Palau in the western Pacific and found it to be a species of *Fasciospongia*. She also found *S. hermanni* to be dictyodendrillid in details of skeletal arrangement, fiber color, and structure (BERGQUIST 1980). TOPSENT (1931) first described this species as *Pseudobasta hermanni* on a specimen identified by LAMARCK (1814) as *Spongia basta* Pallas. DE LAUBENFELS (1948) concluded *Pseudobasta* was synonymous with *Spongionella* because of the presence of a pith in the fibers of both genera.

Here we report a new species of *Spongionella* from the Gulf of Mexico, which extends the distribution of the genus further south and west within the Atlantic Ocean. In addition to *Dysidea* and *Eurypongia*, this confirms the presence of a third dysideid genus and is the first record of a foliose dendroceratid from this location.

## MATERIAL AND METHODS

Material preserved in ethanol was embedded in paraffin wax and sections 100 μm thick were made to examine the fiber skeletal arrangement. A Mallory-Heidenhain stain was added to sections 20 μm thick to examine details of choanocyte chamber structure and spongin fiber construction. Color notation for specimens follows MUNSELL (1942). The *in situ* sponge and its habitat were photographed with a towed, remotely controlled BENTHOS 372 still camera. Type material has been deposited in the Porifera collection of the U.S. National Museum of Natural History.

### Systematics

Order DENDROCERATIDA Minchin
Family DYSIDEIDAE Gray
Genus *Spongionella* Bowerbank

*Spongionella* BOWERBANK (1862:1119); DENDY (1889:94); TOPSENT (1929:1; 1922:2); BURTON (1937:42); DE LAUBENFELS (1948:88); VACELET (1958:144; 1959:70); PULITZER-FINALI and PRONZATO (1976:89); BERGQUIST (1980:482)
*Velinea* VOSMAER (1883:439)
*Megalopastas* DENDY (1905:204)

Type Species: *Spongionella pulchella* (Sowerby, 1806:87) BOWERBANK (1862) by monotypy.
Diagnosis: Tubular, foliose, or lamellate dysideidae. The skeleton is a compact, regular, rectangular reticulation of uncored, pithed, laminated fibers. The secondary fibers are barely differentiable from the primary fibers. The primary fibers terminate in closely spaced, superficial projections. A partial tertiary skeleton may be present in the form of fine spikes or branches that arise from the primary and secondary fibers.

*Spongionella foliascens* n. sp.
(Figs. 1-8)

Type Material: USNM:43141; Collected by dredge at 60 m from Desoto Canyon, Gulf of Mexico, latitude 29°54'40"N, longitude 87°12'30", 6 February 1989.
Comparative Material: *Spongionella pulchella* (Sowerby), Portugal, collected by J. Vacelet.

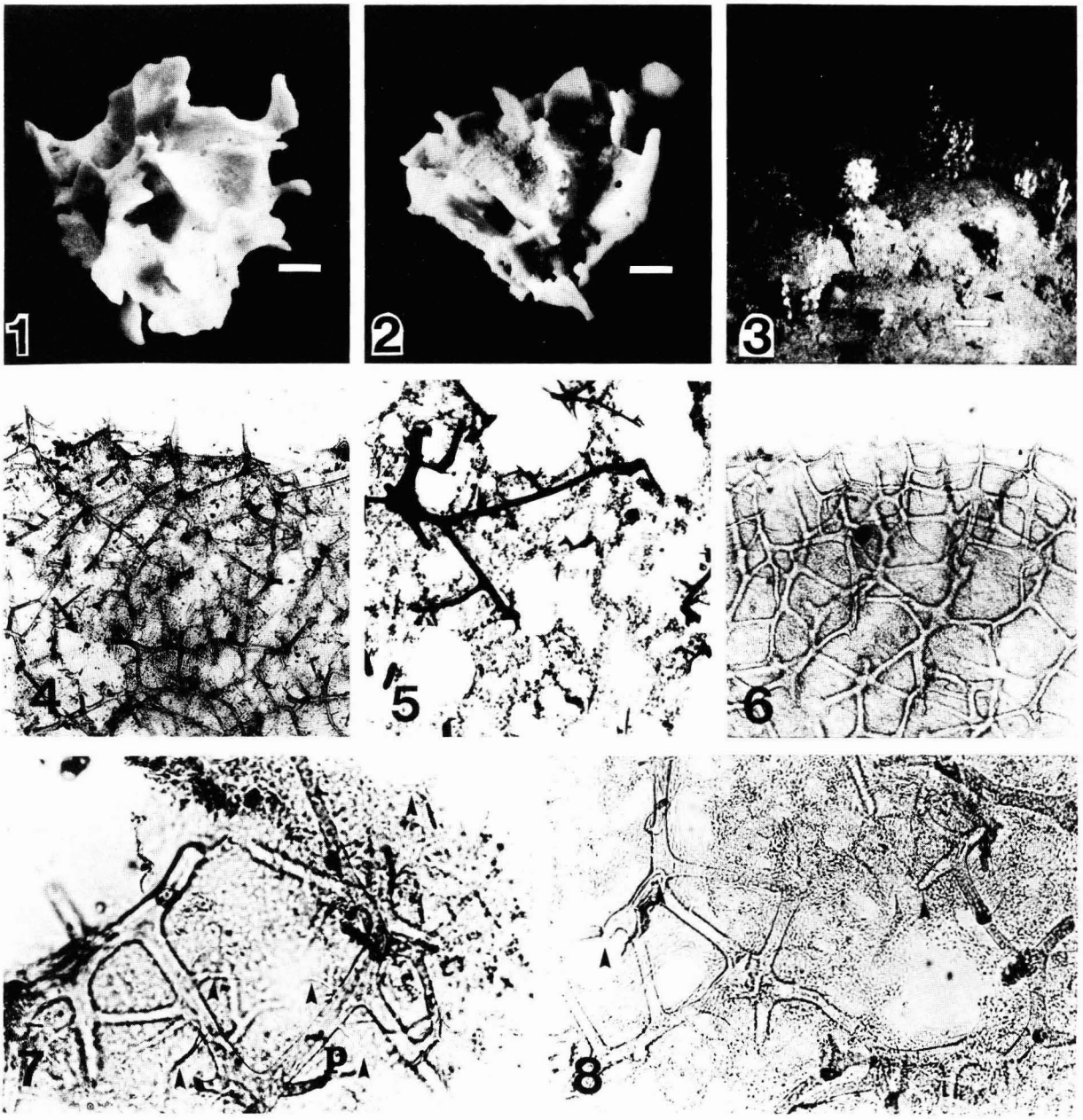


FIG. 1. — *Spongionella foliascens* n. sp.: preserved holotype viewed from the upper surface showing spreading lamellae (Scale = 1.0 cm). FIG. 2. — *Spongionella foliascens* n. sp.: side view of the preserved holotype showing restricted base (Scale = 1.0 cm). FIG. 3. — *Spongionella foliascens* n. sp.: hard bottom habitat at Desoto Canyon, 60m. Arrow indicates live specimen (Scale = 10 cm). FIG. 4. — *Spongionella foliascens* n. sp.: perpendicular section of fiber skeleton through surface showing arrangement of primary and secondary fibers and projecting tips of the primary fibers (40 x). FIG. 5. — *Spongionella foliascens* n. sp.: stained histological section showing eurypylous choanocyte chambers and fibers (250 x). FIG. 6. — *Spongionella pulchella*: perpendicular section through surface showing detail of the arrangement of primary and secondary fibers (40 x). FIG. 7. — *Spongionella foliascens* n. sp.: primary and secondary fibers showing concentric lamination and pith (arrow). Note also fine tertiary fibers (400 x). FIG. 8. — *Spongionella pulchella*: fiber network showing short rounded tertiary fibers (arrow) (400 x).

Description: The sponge body is 4 cm high, 6 cm wide on the upper surface, and 2 cm wide at the base, composed of loosely interconnected, extremely thin, leaf-like lamellae, 1-2 mm thick, with wavy and occasionally digitate margins (Figs. 1, 2). The sponge is attached along several margins of the basal lamellae. The texture is fleshy and compressible but resilient. The surface is velvety to the touch because of projecting fibers that are separated by 0.2-0.5 mm and extend 0.2 mm beyond the surface. The oscules are small (0.1-1.0 mm in diameter), abundant, and located on the upper surfaces of the outspread lamellae. The lower ostial surfaces are micropunctiform. The color of the sponge in life is cadmium yellow (2.5Y8/12) and is light orange (7.5YR7/6) in ethanol preservative.

Skeleton: The skeleton is a compact reticulation of size-differentiated primary and secondary fibers that

together form a relatively regular mesh (Fig. 4). The mesh size ranges from 180 to 350 μm wide and from 80 to 250 μm deep. The primary fibers are 20-37 μm wide and extend 150-200 μm beyond the sponge surface in fine, tapered projections. Primary fibers radiate from the base of the lamella to the apex of each fan. Slim secondary fibers, 12-18 μm wide, interconnect the primary fibers. Fine curved fibers, 8-30 μm long, rise from the primary and secondary fibers to form an incomplete tertiary skeleton. The tertiary fibers are 2.5-8 μm wide and are single or branched (Fig. 7). All fibers are concentrically laminated and almost always contain a pith that occupies about half the fiber diameter (Fig. 7).

Choanosome: The choanosome is loosely arranged with eurypylous choanocyte chambers, 60-80 μm in diameter, and little collagen reinforcement of the surrounding matrix (Fig. 5). Where it has not been abraided from the surface, the dermal membrane is delicate and stretched between the termini of the protruding primary fibers.

Ecology: The sponge was collected by dredge from a ridge that runs northeast-southwest along Desoto Canyon in the Gulf of Mexico. This ridge has a hard substrate and high relief. The sponge was rare, found growing as a solitary bush on rock covered with a fine sand veneer. The dominant organisms in this habitat are bushy coralline algae, erect soft corals, and choristid sponges (Fig. 3) (CONTINENTAL SHELF ASSOCIATES, 1989).

Etymology: The species name emphasizes the foliose morphology of the sponge.

## DISCUSSION

*Spongionella foliascens* is differentiated from the type species *S. pulchella* (Sowerby) in aspects of morphology and details of the skeleton. *S. pulchella* is found in the deep northern Atlantic, including waters off Britain, and in the Mediterranean (VACELET, 1959). The type specimen (BMNH 30.7.3.454) is lamellate and fan-shaped in overall morphology (BERGQUIST, 1980; Fig. 19c), but smaller specimens are cushion-shaped (DE LAUBENFELS, 1948). Although the morphologies of both species are fan-shaped, *S. pulchella* is 1 cm thick, lamellate in one plane only, and actually consists of coalesced adjacent tubes, as indicated by the presence of oscules along the margins of the fan (DE LAUBENFELS, 1948). In *S. foliascens*, the body consists of multiple loosely interconnected lamellae, the thickness of which never exceeds 2 mm. Although the fiber mesh size is approximately equivalent in the two species, the fibers are stouter (30-50 μm) and the mesh shape of *S. pulchella* is more regular than in *S. foliascens*. There is a lesser distinction between primary and secondary fibers in *S. pulchella* than there is in the new species (Fig. 6).

*Spongionella foliascens* is differentiated from *S. gracilis* and *S. tubulosa*, which are tubular with an encrusting base (PULITZER-FINALI and PRONZATO, 1976; BURTON, 1937). *Spongionella nigra* is large and thickly lamellate (BERGQUIST, 1980).

An unusual feature of *Spongionella foliascens* is the presence of an incomplete tertiary skeleton in the form of abundant slim, single or branched, tapered fibers, arising mainly from the secondary fibers (Fig. 7). This is also apparent in the type specimen of *S. pulchella*, figured in BERGQUIST (1980; Fig. 19f, p. 483), and in a specimen of *S. pulchella* from Portugal (Fig. 8), although to a lesser degree. In *S. pulchella,* the tertiary fibers are short, rounded protuberances.

The term "foliose" or "foliaceous" is most frequently applied to a group of closely related dictyoceratid genera within the Spongiidae, including *Phyllospongia*, *Carteriospongia*, and *Strepsichordaia* (BERGQUIST *et al.*, 1988). Species of these genera contain symbiotic cyanobacteria, and the sponges occur in relatively shallow water (0-22m). The leaflike morphology of these sponges is suitable to the interception of light for photosynthesis of the symbionts (WILKINSON, 1983).

Dysideid species such as *Dysidea herbacea* also adopt a lamellodigitate morphology in shallow water. *Spongionella foliascens* is the only species of *Spongionella* known to possess a foliose morphology. Without information on the upper depth limit of this species and some idea of whether it contains symbiotic cyanobacteria, it is impossible to determine whether nutrition could be obtained through algal symbiosis in this foliose species as well.

## ACKNOWLEDGMENTS

The specimen of *Spongionella foliascens* was provided with the permission of Conoco Inc., by Bruce Graham of Continental Shelf Associates Inc., Jupiter, Florida. We thank Klaus Kelly-Borges for preparing histological sections and Tom Smoyer for providing photographic assistance. This is Harbor Branch Oceanographic Institution contribution number 973.

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