

ESPERIOPSIS DESMOPHORA N.SP. (PORIFERA: DEMOSPONGIAE): A DESMA-BEARING  
POECILOSCLERIDA

JOHN N.A. HOOPER AND CLAUDE LEVI

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A new species of *Esperiopsis* from the continental shelf of Queensland, Australia contains spiculation typical of the genus (styles, palmate isochelae and sigmas) in addition to desmas otherwise characteristic of 'Lithistida'. The affinities of the species are discussed, particularly in relation to Topsent's nominal desma-bearing poecilosclerid genera *Desmatiderma* and *Helophloeina*. Those genera are synonymised here with the genera *Euchelipluma* and *Meliiderma* respectively and also referred to Esperiopsidae, and structural and geometric similarities with the Ordovician group *Saccospongia* are noted.

□ Taxonomy, new species, Porifera, Demospongiae, Poecilosclerida, Esperiopsidae, Esperiopsis, Lithistida, Queensland, continental slope.

John N.A. Hooper, Division of Natural Science, Northern Territory Museum of Arts and Sciences, PO Box 4646 Darwin, Northern Territory 0801, Australia; Claude Levi, Laboratoire de Biologie des Invertébrés Marins et Malacologie, Muséum National d'Histoire Naturelle, 57 Rue Cuvier, Paris Cedex 05, France (U.A. 699 C.N.R.S.); 15 November, 1988.

Recent deep-water collections made along the continental shelf of northeastern Australia, in the vicinity of Flinders Reefs, produced a remarkable poecilosclerid demosponge which contained spiculation typical of Esperiopsidae (viz. styles, palmate isochelae and sigmas) as well as desmas characteristic of Lithistida. The species is described below, and contrasted with other lithistids and esperiopsids. We are grateful to Prof. Michel Pichon (Australian Institute of Marine Science, Townsville) for the opportunity to examine the small collection of deep-water sponges, presently housed in the LBIM at the Paris Museum, and we thank Dr. Charles Webb (University College of the Northern Territory) for assisting with scanning electron microscopy. The holotype is deposited in the Queensland Museum (QM), North Queensland Branch, Townsville. Due to the very small and fragile nature of the specimen we include the coated stubs used in SEM studies in the type-lot deposition. Methods of spicule preparation for light and scanning electron microscopy are described elsewhere (Hooper 1986). Cross-sections through the sponge were examined under SEM untreated, whereby air-dried, preserved sections were mounted directly onto stubs and vacuum coated.

Order POECILOSCLERIDA Topsent, 1928  
Family ESPERIOPSIDAE Hentschel, 1923  
Genus *Esperiopsis* Carter, 1882

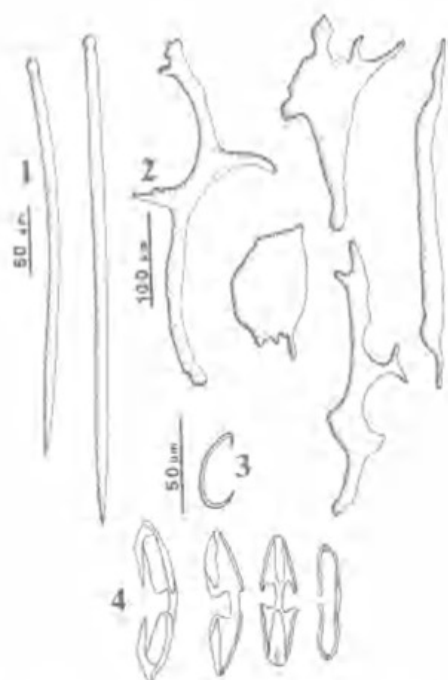
*Esperiopsis desmophora* n.sp.

MATERIAL EXAMINED

HOLOTYPE: QM G25001, Continental slope, off Townsville, Queensland, Australia, vicinity of Flinders Reefs, 17° 22' 099" S, 147° 48' 27" E, 1187-1210m depth, 11 May 1986, M. Pichon, A. Birtles, and P. Arnold, 'Cidarid I' expedition, stn 24.3, sledge (field number 051).

DESCRIPTION

Morphology: The single specimen has the form of an erect stem with total height of 24mm high and 2mm in diameter. Colour in ethanol is yellow-grey. The sponge body is slightly fusiform, measuring 14mm long, and is fixed to a spiculous pedicel, 8-10mm minimum length, which bifurcates near to the point of attachment with the substrate. Apart from the pedicel the entire surface of the sponge is strongly hispid. The pedicel is solid and friable, composed of a central or axial column of styles loosely surrounded by desmas. This axial column runs throughout the central core of the sponge, and is clearly homologous with the condensed axial skeleton of typical members of the order Axinellida. The distal portion of the sponge body is more flexible. Diverging perpendicular to the axis is a complex radial series of extra-axial bundles of styles. These bundles protrude through the ectosome, forming diverging brushes which produce the prominent hispid appearance of the sponge. Surrounding the axial skeleton, lying in loose tracts in the extra-axial skeleton, and forming a prominent layer on the ectosome are regular or irregular deposits of desmas and microscleres (Fig. 5). The sponge body, i.e. the



FIGS 1-4. Megascleres and microscleres of *Esperiopsis desmophora* n.sp. 1, subtylostyles; 2, desmas; 3, sigma; 4, isochelae.

area bounded by the ectosomal tracts of desmas, comprises approximately 50% of the sponge diameter. Spongin is very scarce and appears to be concentrated around the extra-axial bundles of styles and ectosomal layer of desmas.

**Spicules:** Structural styles are slightly curved, invariably smooth, with evenly rounded to slightly subtylote bases. The longest styles usually occur in the axial region, measuring between  $450\text{--}510 \times 8\text{--}10\mu\text{m}$ , whereas the shortest occur predominantly as subdermal plumose brushes with dimensions  $320\text{--}420 \times 6\text{--}8\mu\text{m}$ , but this regional localisation of spicule length classes is not absolutely rigid.

Desmas may vary considerably in morphology (Figs 2, 8-10): most can be characterised as being generally cylindrical, embossed, often bifurcate or trifurcate at one extremity, measuring  $320\text{--}420 \times 10\text{--}20\mu\text{m}$ , whereas some are distinctly much shorter. Desma diameter is very irregular, and some have plate-like forms attaining  $80\mu\text{m}$  in length (Fig. 9).

Isochelae are palmate, with slightly arcuate tendencies of the alae, possessing well curved wings and large, tapering and sharp teeth: dimensions range from  $60\text{--}85\mu\text{m}$  (averaging around  $70\mu\text{m}$ ) long.

Sigmas are relatively large, thin, and evenly curved,  $30\text{--}40 \times 2\mu\text{m}$ .

#### ETYMOLOGY

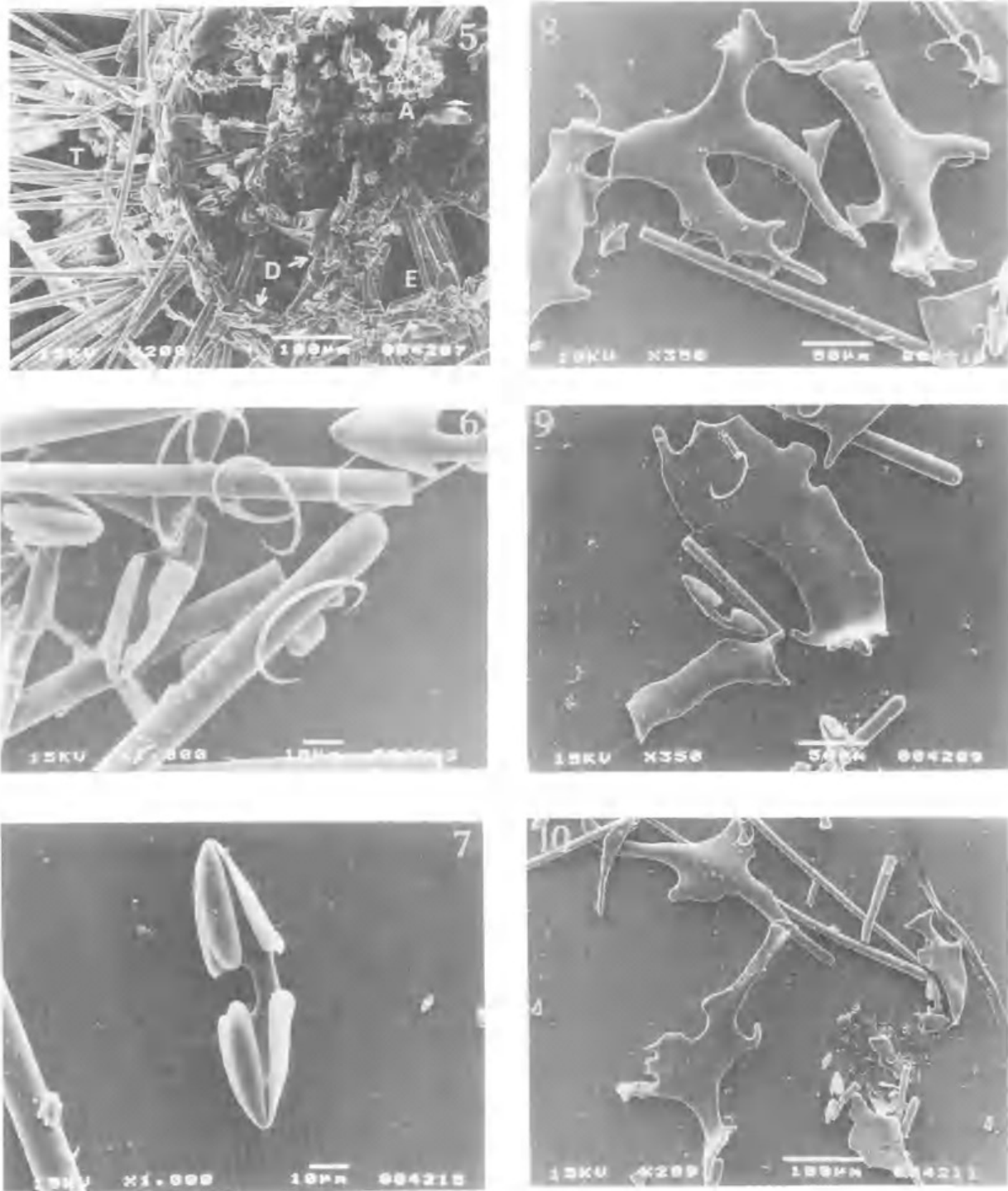
The species is named for the unique possession of desmas.

#### HIGHER SYSTEMATIC RELATIONSHIPS

In having a skeleton composed of styles, palmate isochelae and sigmas this new poecilosclerid sponge is obviously related to the *Esperiopsidae*, and apart from the presence of desmas the species has characteristics which resemble typical members of the genus *Esperiopsis* Carter. We include *E. desmophora* with that genus, in preference to erecting a new taxon for the species, (and in preference to including it with the polyphyletic order Lithistida), since we consider the presence of skeletal desmas is probably an ancestral character, (providing rigidity to an otherwise flexible skeleton) which has been retained in relatively sheltered deep-water taxa, whereas *Esperiopsis*, which have invaded the more turbid shallow-coastal waters, have probably shed their desmas. Two groups of species have been included in the genus *Esperiopsis*. Typical forms, such as the type species *Esperia villosa* Carter, 1874, and the present species, are usually stipitate, erect, sometimes branching, quill-like, and live in deep water. The second group contains atypical species such as *E. fucorum*, *E. normanni* and others, which are massive, live in shallow water, and possess a renieroid skeletal architecture. This feature is considered to have been produced as a response to littoral existence.

Typical *Esperiopsis* (viz. *E. villosa*) has a skeleton composed of tracts of styles forming branches with anastomoses. Initially referred to the Desmacidonidae Mycalinae by Ridley and Dendy (1887), the group was subsequently placed in section Protorhabdina, family *Esperiopsidae* (Hentschel, 1923). That family was supposedly clearly defined by its skeletal architecture, the absence of ectosomal spicules, and in having isochelae and sigmas. However, van Soest (1984) suggested that the group is presently a dust-bin family, containing species with monactinal or with diactinal megascleres; with myxillid-like reticulate skeletons; or with plume-reticulate skeletal tracts composed of very fine megascleres, and in which megascleres may sometimes become vestigial or even be replaced entirely by sand grains (the latter group fitting with the old concept of *Stylotellinae* Lendenfeld).

The present species, and the genus *Esperiopsis* is returned here to the family *Esperiopsidae*, in preference to using the more widely used group *Desmacididae* Schmidt (or *Desmacidonidae* Gray,



FIGS 5-10. Scanning electron micrographs of *Esperiopsis desmophora* n.sp. 5, cross-section through sponge, showing condensed central or axial skeleton (A), plumose extra-axial skeleton (E) protruding through the axial cover of desmas and the ectosomal layer, and forming radial tufts of spicules (T), and showing choanosomal tracts and a peripheral (ectosomal) layer composed of desmas and microscleres (D); 6, sigmas; 7, palmate isochela; 8-10, desmas.

sensu Bergquist, 1978) (cf. van Soest, 1984; Wiedenmayer, 1989). In this restricted sense of Hentschel (1923), *Esperiopsidae* includes only taxa like *Esperiopsis*, *Euchelipluma* Topsent, *Meliiderma* Ridley and Dendy and incrusting species such as *Crambe* Vosmaer, which have megascleres of only monactinal origin and possess clearly delineated axial (or basal) and extra-axial components of the skeleton. In contrast, megascleres of typical *Desmacididae* (i.e. sensu Levi, 1973; van Soest, 1984), such as *Desmacidon* Bowerbank, *Guitarra* Carter, *Strongylacidon* Lendenfeld and others, are well developed and have obvious diactinal origins, and skeletal structure has a tendency towards reticulate or plumo-reticulate patterns. Desmacidids associated with the group *Stylotellinae* (including the genera *Stylotella* Lendenfeld, *Tetrapocillon* Brøndsted, and sand-bearing taxa such as *Phoriospongia* Marshall, *Psammoclemma* Marshall) have weakly developed skeletal tracts, often approaching a plumose arrangement, with predominantly monactinal megascleres. All three groups (*Desmacididae*, *Stylotellinae*, *Esperiopsidae*) have sigmoid microscleres and isochelae, which may or may not possess structural modifications (e.g. *Guitarra* (cf. Lee, 1987), *Tetrapocillon* (cf. van Soest, 1988), *Meliiderma* (cf. Ridley and Dendy, 1987), respectively). In general, both the spiculation and skeletal architecture of typical *Desmacididae* (e.g. *Desmacidon*) is suggestive of affinities with the *Myxillidae*, and the group lacks only a specialized ectosomal skeleton of diactinal megascleres (which is apomorphic for the *myxillids*). By comparison, typical *Esperiopsidae* (e.g. *Esperiopsis*) appear to have closer structural affinities with the *axinellids* and with some *Mycalidae*.

#### AFFINITIES BETWEEN DESMA-BEARING SPECIES

Three other desma-bearing esperiopsid groups are known: members of the genus *Crambe* (with a basal layer of desmas, a choanosomal and an ectosomal category of subtylostyles, arcuate isochelae, and raphides), *Desmatiderma arbuscula* Topsent, from Sagami Bay, Japan, and *Helophloeina stylivarians* Topsent, from the vicinity of the Canary Is. The latter two are deep-water species, from 1530 and 1340m depth, respectively. Both were assigned to monotypic genera created by Topsent (1928, 1929), *Desmatiderma* and *Helophloeina*, but these species are probably better considered as desma-bearing forms of *Euchelipluma* Topsent and *Meliiderma* Ridley and Dendy, respectively. Topsent assigned those taxa to the

*Mycalinae*, which was at the time a subfamily of *Desmacidonidae* sensu Ridley and Dendy (1987). *Desmatiderma arbuscula* is an erect ramose sponge, in which the styles are aligned equally along the axis of branches. In the terminal buds of branches styles (and strongylote styloids) occur in oblique bundles which form the superficial hispidation. The presence of placochelae, isochelae, sigmancistras and sigmas in that species bring it close to *Guitarra*, *Tetrapocillon* and particularly *Euchelipluma*, of which it is undoubtedly a member. In *Helophloeina stylivarians* in the fragments of the stem, at the point of attachment, there are anisochelae similar to those usually found in *Asbestopluma*, whereas the microstrongyles at the top, which cover the pedicel, resemble those of *Meliiderma*, to which the species should be referred. The skeleton of the present species resembles that of *Desmatiderma* in particular, in which the axial styles are also enclosed in a covering of desmas, of identical morphology, and these data suggest a possible common ancestry for *Esperiopsis* and desma-bearing *Euchelipluma* (or *Desmatiderma*) in particular, and for all those sponges formerly included in Ridley and Dendy's (1987) concept of *Mycalinae* in general.

Similarities between the skeletal architecture of *E. desmophora* and the Ordovician sponge *Saccospongia laxata* Bassler are remarkable (compare Fig. 5 present contribution and text-fig. 1, pl. 145-6, Finks, 1967). The geometry of styles is similar (cf. Fig. 6 and Finks, 1967, text-fig. 2); the axis of branches in both species is supported by bundles of longitudinal styles; extra-axial tracts (viz the plumose spicule bundles diverging from the axis) cross a covering of desmas which surround the axial skeleton. However, the desmas of *Saccospongia* are very short and their form does not easily convey their origin, whereas those of desma-bearing *Euchelipluma* (or *Desmatiderma*) and the present species have a monaxial origin, which Topsent (1928) suggested were similar to modified styles. Nevertheless, similarities between *E. desmophora* and the Ordovician species are quite marked and more obvious than any differences between them.

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