Deep-sea "lithistid" assemblages from the Norfolk Ridge (New Caledonia), with description of seven new species and a new genus (Porifera, Demospongiae)

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ABSTRACT
Some seamounts are regarded as deep sea "island systems" of extraordinary biomass and richness, containing assemblages of highly unique taxa, often with restricted species ranges. Here we report on some unique "lithistid" sponges from South Pacific seamounts along the Norfolk Ridge (New Caledonia). The polyphyletic "lithistid" Demospongiae are characterized by the presence of choanosomal articulated spicules (desmas), which form an extremely rigid skeleton in most genera. Sponge assemblages were sampled from 10 seamounts over a depth range that straddles the subtidal-bathyal transition (236-583 m) using a beam trawl and Warén dredge (average sampling time 2.25 hrs per seamount), yielding a diverse "lithistid" fauna of 16 species belonging to 10 genera (one new) and six families. "Spot endemics" (species restricted to a single site) dominated the fauna. Species richness per seamount varied considerably. Of these 16 species found seven were new to science (*Corallistes australis* n. sp., *Herengeria vasiformis* n. sp., *Isabella mirabilis* n. gen., n. sp., *Neoschrammeniella norfolkii* n. sp., *N. castrum* n. sp., *Homophymia pollubrum* n. sp., *Reidispongia tuberculata* n. sp.) including the new genus *Isabella* n. gen. within the family Corallistidae. In addition, the genera *Herengeria* and *Neoschrammeniella* (family Corallistidae) were redefined based on new findings from this study.

KEY WORDS
Porifera,
Demospongiae,
"lithistids",
deep sea,
bathyal,
seamounts,
New Caledonia,
Norfolk Ridge,
new genus,
new species.

RÉSUMÉ

Assemblages profonds de « lithistides » de la Ride de Norfolk (Nouvelle-Calédonie) et description de sept espèces nouvelles et d'un genre nouveau (Porifera, Demospongiae).

Les monts sous-marins sont fréquemment vus en tant que « systèmes d'îles » d'eau profonde de biomasse et de richesse extraordinaires, contenant des assemblages de taxa uniques avec un éventail d'espèces restreint. Quelques éponges démosponges « lithistides » des monts sous-marins du Pacifique sud le long de la Ride de Norfolk (Nouvelle-Calédonie) sont présentées. Les Demospongiae polyphylétiques « lithistides » sont caractérisés par la présence de spicules articulés choanosomaux (desmas), qui forment un squelette extrêmement rigide dans la plupart des genres. Des assemblages d'éponges de 10 monts sous-marins ont été prélevés sur une gamme de profondeurs subtidales-bathyales (236-583 m) avec un chalut à perche et une drague « Warén ». Le temps moyen de prélèvement a été de 2,25 heures par mont pour une faune de « lithistides » riche de 16 espèces appartenant à 10 genres (dont un nouveau) et à six familles. Les espèces restreintes à un seul site (« spot endemics ») dominent les récoltes. La richesse d'espèces par mont sous-marin varie considérablement. Des 16 espèces trouvées, sept sont nouvelles pour la science (*Corallistes australis* n. sp., *Herengeria vasiformis* n. sp., *Isabella mirabilis* n. gen., n. sp., *Neoschrammeniella norfolkii* n. sp., *N. castrum* n. sp., *Homophymia pollubrum* n. sp., *Reidispongia tuberculata* n. sp.) ainsi que le genre *Isabella* n. gen. dans la famille Corallistidae. Les genres *Herengeria* et *Neoschrammeniella* (Corallistidae) sont redéfinis sur la base des nouveaux résultats de cette étude.

MOTS CLÉS
Porifera,
Demospongiae,
« lithistides »,
eau profonde,
bathyal,
monts sous-marins,
Nouvelle-Calédonie,
Ride de Norfolk,
nouveau genre,
nouvelles espèces.

INTRODUCTION

The deep-sea environment, including seamounts, is the world's largest ecological unit (*c.* 3×10^8 km^2) but remains the most poorly known of earth biomes. Long thought to be species-poor, recent evidence (Wilson & Kaufmann 1987) suggests that seamounts, particularly those of the southern Pacific, are unique environments characterized by extremely high biodiversity and endemism (up to 34-36% of the fauna; Richer de Forges *et al.* 2000), faunistically isolated irrespective of whether or not they are spatially contiguous (Poore & Wilson 1993; Richer de Forges *et al.* 2000), and that generalizations made from studies of northern hemisphere seamounts are not necessarily applicable to southern hemisphere marine patterns and processes (Richer de Forges *et al.* 2000). Our knowledge of the western Pacific seamount sponge faunas is still very rudimentary (Lévi 1991; Kelly *et al.* 1999; Richer de Forges *et al.* 2000; Pomponi *et al.* 2001; Kelly 2003) where most previous effort on sponge biodiversity surveys has nearly exclusively focused on shallow-waters (e.g., Lévi *et al.* 1998; Schlacher *et al.* 1998; Hooper *et al.* 2002). Nevertheless, the few data available so far for deeper waters indicate that southern seamounts are remarkably species rich and highly endemic, and it is further hypothesized that existing estimates of seamount faunal diversity and endemism for all sponge taxa are conservative given that many sponge collections remain largely unsorted and unidentified.

This present contribution describes the taxonomy and biodiversity of some of new and known "lithistid" demosponges from the seamounts of

the Norfolk Ridge. Although "lithistids" are acknowledged as "appallingly taxonomically difficult" (Lévi & Lévi 1983, 1989; Kelly 2000), and much more diverse than previously recognised (Lévi & Lévi 1983, 1989; Pomponi *et al.* 2001; Hooper *et al.* 2002), the order is now more taxonomically accessible to the non-specialist (Pisera & Lévi 2002a-f) allowing other important questions concerning discoveries of marine patterns, processes, biogeography and conservation biology to be addressed using these taxa as models (Table 2). The fundamental underpinning of these biodiversity issues – a sound taxonomic knowledge of the fauna including a detailed description of new species – is the basis of this first paper on this remarkable seamount fauna. Aspects of their ecological and biogeographic distributions will be discussed elsewhere (Schlacher & Schlacher-Hoenlinger in prep.).

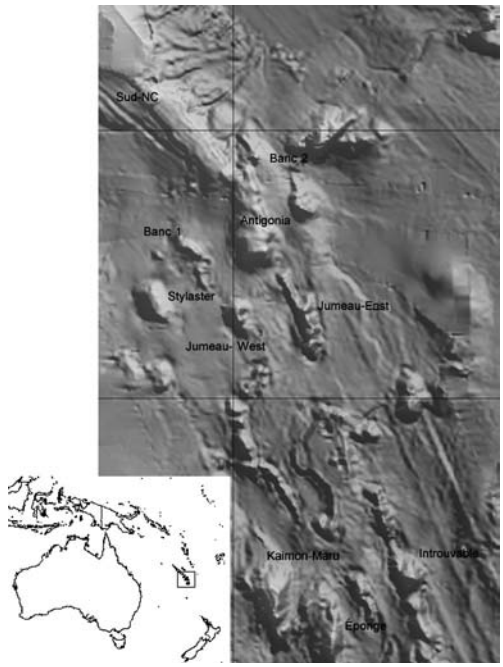

FIG. 1. — Geographic position of the Norfolk Ridge south of New Caledonia and detailed map of individual deep-water collection sites dredged for sponges.

MATERIAL AND METHODS

Sponges were sampled from seamounts within the Norfolk Ridge region (New Caledonia), extending between 22°52'22"-24°54'72"S to 167°12'27"-168°39'23"E (Table 1). Ten sites ranging in depth from 236 to 583 m were sampled at the "Norfolk Cruise 1" in June 2001. The sampling area can be divided broadly in three different geographical regions: 1) the southern slope of the main island of Grande Terre; 2) a cluster of seamounts in the central part; and 3) three seamounts in the southern section of the ridge system (Fig. 1). The total sampling coverage spanned *c.* 250 km in a north-south direction. At each site, two to six replicate trawls were undertaken, with a mean trawling time of 135 minutes per site (Table 1). Benthic samples were collected using a Beam trawl and/or a Warén dredge, sorted on deck into different phyla and then deep-frozen or stored in 70% ethanol until documentation, identification and registration in the collection of the Queensland Museum (QM). Histological and scanning electron microscopy techniques followed the methods described in Hooper (1996).

ABBREVIATIONS

etoh	70% ethanol;
BMNH	Natural History Museum, London;
MNHN	Muséum national d'Histoire naturelle, Paris;
QM	Queensland Museum, South Brisbane.

SPECIES LIST

SCLERITODERMIDAE
Aciculites orientalis Dendy, 1905
Scleritoderma sp.
Scleritoderma flabelliforme Sollas, 1888
Scleritoderma camusi Lévi & Lévi, 1983

CORALLISTIDAE
Corallistes australis n. sp.
Herengeria vasiformis n. sp.
Herengeria auriculata Lévi & Lévi, 1988
Isabella mirabilis n. gen., n. sp.
Neoschrammeniella moreti (Lévi & Lévi, 1988)
Neoschrammeniella norfolkii n. sp.
Neoschrammeniella castrum n. sp.

PLEROMIDAE
Anaderma rancureli Lévi & Lévi, 1983

TABLE 1. — Summary of site characteristics for one station at the southern slope of the main island of Grande Terre and nine seamounts surveyed for sponge communities within the Norfolk Ridge, New Caledonia.

Date	Seamount	Average latitude (S)	Average longitude (E)	Predominate bottom type	Repeats (trawls/ site)	Average depth/ site (m)	Total trawling time/ site (min)	Total trawling length/ site (m)
19.VI.2001	Banc 1	23°26'87"	167°50'94"	mixed	6	478	195	14117
20.VI.2001	Stylaster	23°39'31"	167°42'36"	hard	5	652	185	17075
21.VI.2001	Jumeau-West	23°40'33"	168°00'43"	mixed	5	310	165	12315
22.VI.2001	Kaimon-Maru	24°43'83"	168°09'34"	hard	4	243	125	10137
23.VI.2001	Éponge	24°54'72"	168°21'87"	hard	3	527	95	8295
24.VI.2001	Introuvable	24°39'69"	168°39'23"	coarse sand	4	589	150	7229
25.VI.2001	Jumeau-East	23°44'06"	168°16'41"	mixed	2	420	62	617
26.VI.2001	Antigonia	23°21'54"	168°01'37"	hard	6	360	175	12784
27.VI.2001	Banc 2	23°18'77"	168°15'20"	coarse sand	4	487	100	7665
28.VI.2001	Sud-NC	22°52'22"	167°12'27"	coarse sand	3	387	95	6922

THEONELLIDAE
Discodermia proliferans Lévi & Lévi, 1983

NEOPELTIDAE
Homophymia pollubrum n. sp.

PHYMATELLIDAE
Reidispongia coerulea Lévi & Lévi, 1988
Reidispongia tuberculata n. sp.

SYSTEMATICS

Phylum PORIFERA Grant, 1836
Class DEMOSPONGIAE Sollas, 1885
"Lithistids" Demospongiae *sensu* Pisera & Lévi, 2002

Family SCLERITODERMIDAE Sollas, 1888

DEFINITION. — Polymorphic lithistids with rhizoclone desmas, ectosomal spicules when present are acanthorhabds/strongyles, styles or smooth strongyloxeas; microscleres when present are spinose sigmaspires (Pisera & Lévi 2002a).

Genus *Aciculites* Schmidt, 1879

Aciculites Schmidt, 1879: 29, pl. 2:1, 4, 13.

Sympyla Sollas, 1888: 353.

TYPE SPECIES. — *Aciculites higginsi* Schmidt, 1879 by monotypy.

DEFINITION. — Sponges with rhizoclone desmas bearing strong blunt spines, acanthose anisostrongyles and/or styles and no microscleres (Pisera & Lévi 2002a).

Aciculites orientalis Dendy, 1905
(Figs 2A; 5; 21)

Aciculites orientalis Dendy, 1905: 101, pl. 4, fig. 3. — Lévi & Lévi 1989: 47, fig. 16.

HOLOTYPE. — Ceylon Seas (BMNH "RN 50").

MATERIAL EXAMINED (see Table 1). — Introuvable, 562-589 m (QM G318596, QM G318637, QM G318638).

DESCRIPTION

Growth form

Massive cushion shape to cylindrical/spherical sponges with a broad base and a flattened upper surface which bears a large raised oscular area with numerous, evenly distributed openings. The lower part under the flattened summit including the widely spread base, is smooth. Specimens are approximately 4 to 6 cm high and 5 to 7 cm wide.

Colour

Beige in etoh.

TABLE 2. — Lithistids from the New Caledonian area found in former studies (+) in comparison to species collected from the New Caledonian slope and seamounts during the "Norfolk Cruise 1" (June 2001). Six species are common (×), seven species are new to science (*), two known species are reported for the first time from this area (○), and one species is left undetermined in this study (●).

Species	Lévi & Lévi (1983, 1988); Lévi (1993)	This study
Pleroma menoui Lévi & Lévi, 1983	+	
Pleroma turbinatum Sollas, 1888	+	
Anaderma rancureli Lévi & Lévi, 1983	+	×
Coralistes fulvodesmus Lévi & Lévi, 1983	+	
Coralistes multituberculatus Lévi & Lévi, 1983	+	
Coralistes undulatus Lévi & Lévi, 1983	+	
Coralistes australis n. sp.	+	*
Coralistes microstylifer Lévi & Lévi, 1983	+	
Macandrewia spinifoliata Lévi & Lévi, 1983	+	
Callipelta punctata Lévi & Lévi, 1983	+	
Neosiphonia superstes Sollas, 1888	+	
Discodermia proliferans Lévi & Lévi, 1983	+	×
Aciculites oxytylota Lévi & Lévi, 1983	+	
Aciculites orientalis Dendy, 1905		○
Aciculites papillata Lévi & Lévi, 1983	+	
Scleritoderma sp.		●
Scleritoderma flabelliforme Sollas, 1888		○
Scleritoderma camusi Lévi & Lévi, 1983	+	×
Microcleroderma herdmani (Dendy, 1905)	+	
Microscleroderma stoneae Lévi & Lévi, 1983	+	
Jereicopsis graphidiphora Lévi & Lévi, 1983	+	
Neoaulaxinia clavata (Lévi & Lévi, 1988)	+	
Reidispongia coerulea Lévi & Lévi, 1988	+	×
Reidispongia tuberculata n. sp.		*
Neosiphonia superstes Sollas, 1888	+	
Neoschrameniella moreti Lévi & Lévi, 1988	+	×
Neoschrameniella norfolkii n. sp.		*
Neoschrameniella castrum n. sp.		*
Herengeria auriculata Lévi & Lévi, 1988	+	×
Herengeria vasiformis n. sp.		*
Neopelta plinthosellina Lévi & Lévi, 1988	+	
Costifer wilsoni Lévi, 1993	+	
Isabella mirabilis n. sp.		*
Homophymia pollubrum n. sp.		*
Total **34**	**25**	**16**

Oscules
Numerous raised oscula are scattered over the flattened upper summit of the sponge surface. The oscula on the surface of the choanosomal skeleton are up to 1.7 mm diameter. Canal openings of the inhalant area (on the surface of the choanosomal skeleton) are 237-279 µm diameter.

Texture
Hard, stony.

Surface ornamentation
Predominantly smooth, but papillate with visible drainage canals.

Ectosomal skeleton
Tangential layer of acanthostrongyles.

Choanosomal skeleton
Relatively dense skeleton consists of spinose rhizoclones which form a very regular choanosomal skeleton.

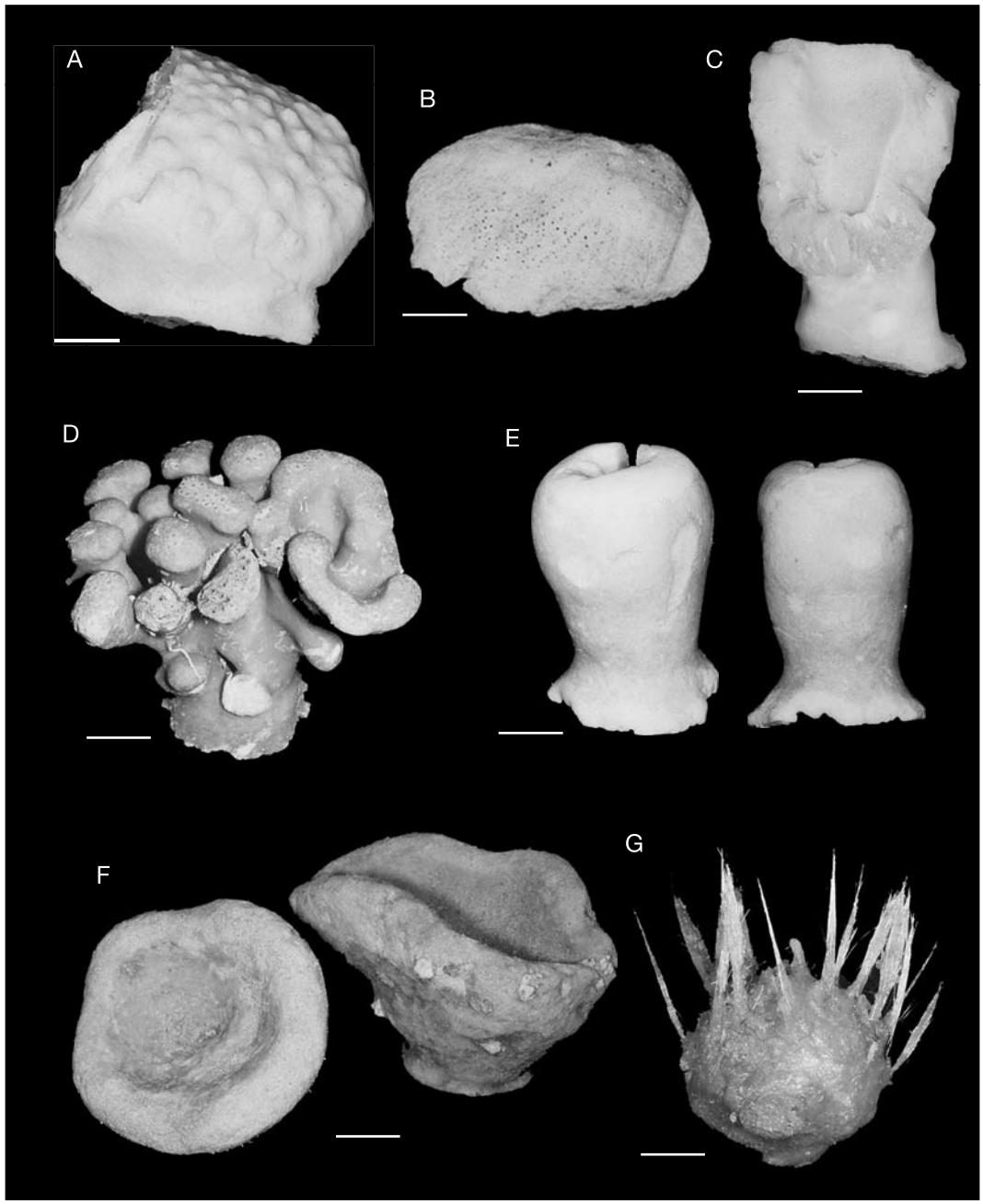

FIG. 2. — **A**, *Aciculites orientalis* Dendy, 1905; **B**, *Scleritoderma* sp.; **C**, *S. camusi* Lévi & Lévi, 1983; **D**, *S. flabelliforme* Sollas, 1888; **E**, *Corallistes australis* n. sp.; **F**, *Herengeria vasiformis* n. sp.; **G**, *H. auriculata* Lévi & Lévi, 1988. Scale bars: 1 cm.

Megascleres
Desmas extremely spinose rhizoclone, with long and pointed rays: 180-280 µm/15-20 µm.
Strongyles and tylostyles: 240-463 × 8.8-14.6 µm. Strongyles and tylostyles are straight or curved with spined to smooth heads and tips.

Microscleres
None.

REMARKS
The present specimens are larger than the holotype, with larger oscules, but otherwise conform perfectly to the original material. The species closely resembles *Aciculites higginsi* Schmidt, 1879, from the Caribbean, in general form, as noted previously by Van Soest & Stentoft (1988), but is less regular and flatter. Desmas of this species differ in having long and pointed spines, as compared with desmas of *A. higginsi* which have short and blunt spines. The styles and tylostyles of *A. orientalis* are larger, less curved and have, on average, less pronounced heads than in *A. higginsi*. It differs from *A. papillata* Lévi & Lévi, 1983, known from the same area, in lacking papillae, and in size and morphology of ectosomal strongyles and tylostyles (strongyles and tylostyles are slightly larger, are less spinose, and have more pronounced heads in *A. orientalis*). Two other species of *Aciculites* are also recorded for this region (Lévi & Lévi 1983), *A. oxytylota* Lévi & Lévi, 1983 and *A. papillata* Lévi & Lévi, 1983 (Table 2).

Genus *Scleritoderma* Sollas, 1888

Scleritoderma Sollas, 1888: 316, pl. 35: 26-50.

TYPE SPECIES. — *Scleritoderma flabelliforme* Sollas, 1888 by subsequent designation (Pisera & Lévi 2002a).

DEFINITION. — Sponges with spinose rhizoclone desmas and ectosomal acanthostrongyles/rhabds forming a dense tangential layer on the surface; microscleres are sigmaspires (Pisera & Lévi 2002a).

Scleritoderma sp.
(Figs 2B; 6; 21)

MATERIAL EXAMINED (see Table 1). — Kaimon-Maru, 380 m (QM G318716).

DESCRIPTION
Growth form
Small pillow to subspherical/ovoid sponge with a broad base and a flattened upper surface which bears a large pore area with numerous, evenly distributed openings. The examined specimen is 1.2 cm high and 4.5 cm wide.

Colour
Beige in etoh.

Oscules
Numerous, evenly distributed, very small (0.1-0.3 mm diameter). The larger pores are mainly scattered on one side of the sponge.

Texture
Hard, stony.

Surface ornamentation
Rough to touch, slightly uneven with canals and tiny pores.

Ectosomal skeleton
No special distinction.

Choanosomal skeleton
Choanosomal skeleton consists of rhizoclones, which are branched and are covered with numerous branched spines, with tips divided into smaller spine-like processes. Large openings on the surface of the choanosomal skeleton are present.

Megascleres
Desmas spinose rhizoclone, with short and blunt rays: 220-300 µm/30-40 µm.
Oxeas large, protruding from around oscular openings, always broken.

Microscleres
Acanthorhabds (curved, common): 45.8-51.0 × 2.24 µm.
Sigmaspires also present.

REMARKS
This specimen possibly belongs to a new taxon, but was dead on collection, with only some

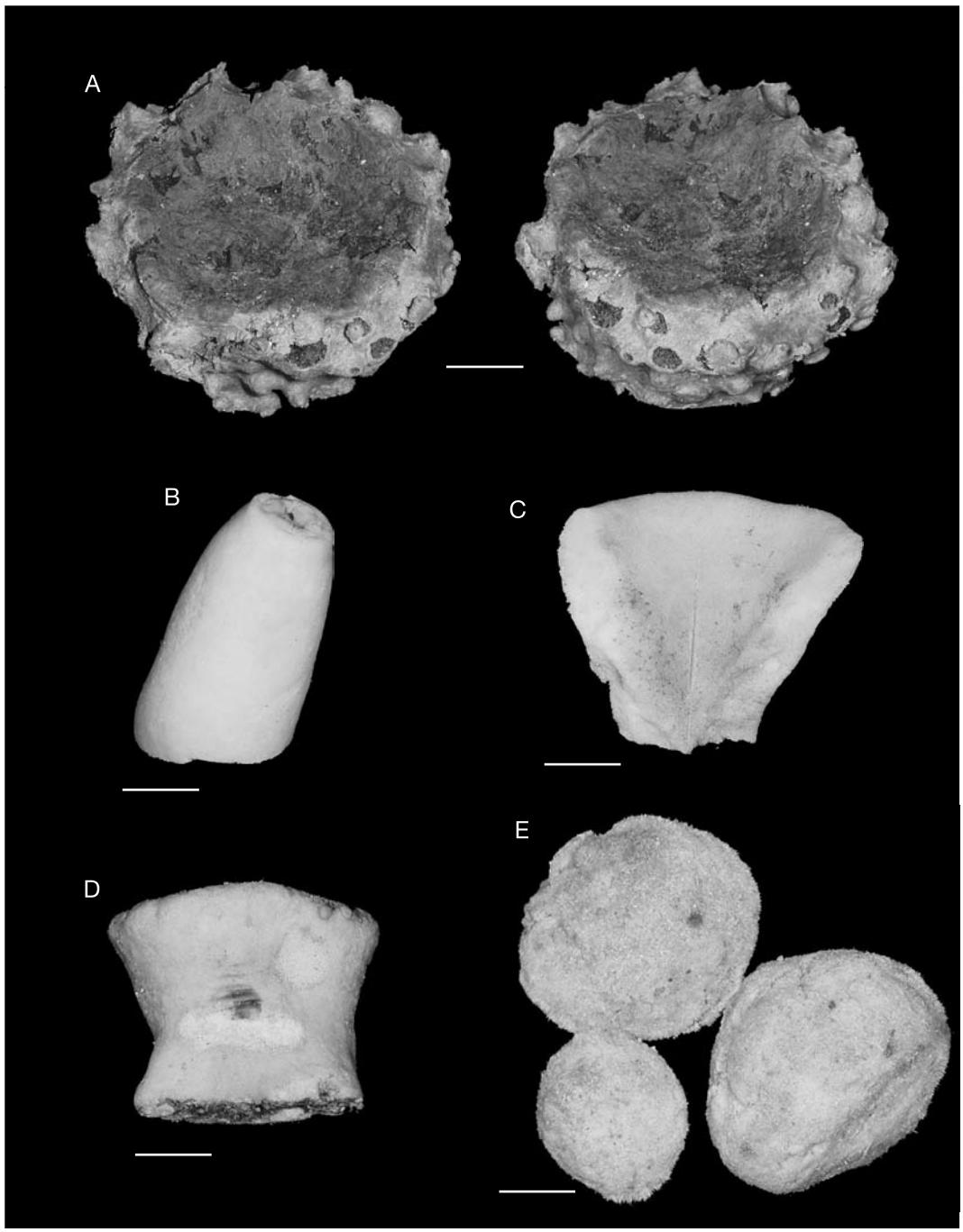

FIG. 3. — **A**, *Isabella mirabilis* n. gen., n. sp.; **B**, *Neoschrammeniella moreti* (Lévi & Lévi, 1988); **C**, *N. norfolkii* n. sp.; **D**, *N. castrum* n. sp.; **E**, *Anaderma rancureli* Lévi & Lévi, 1983. Scale bars: 1 cm.

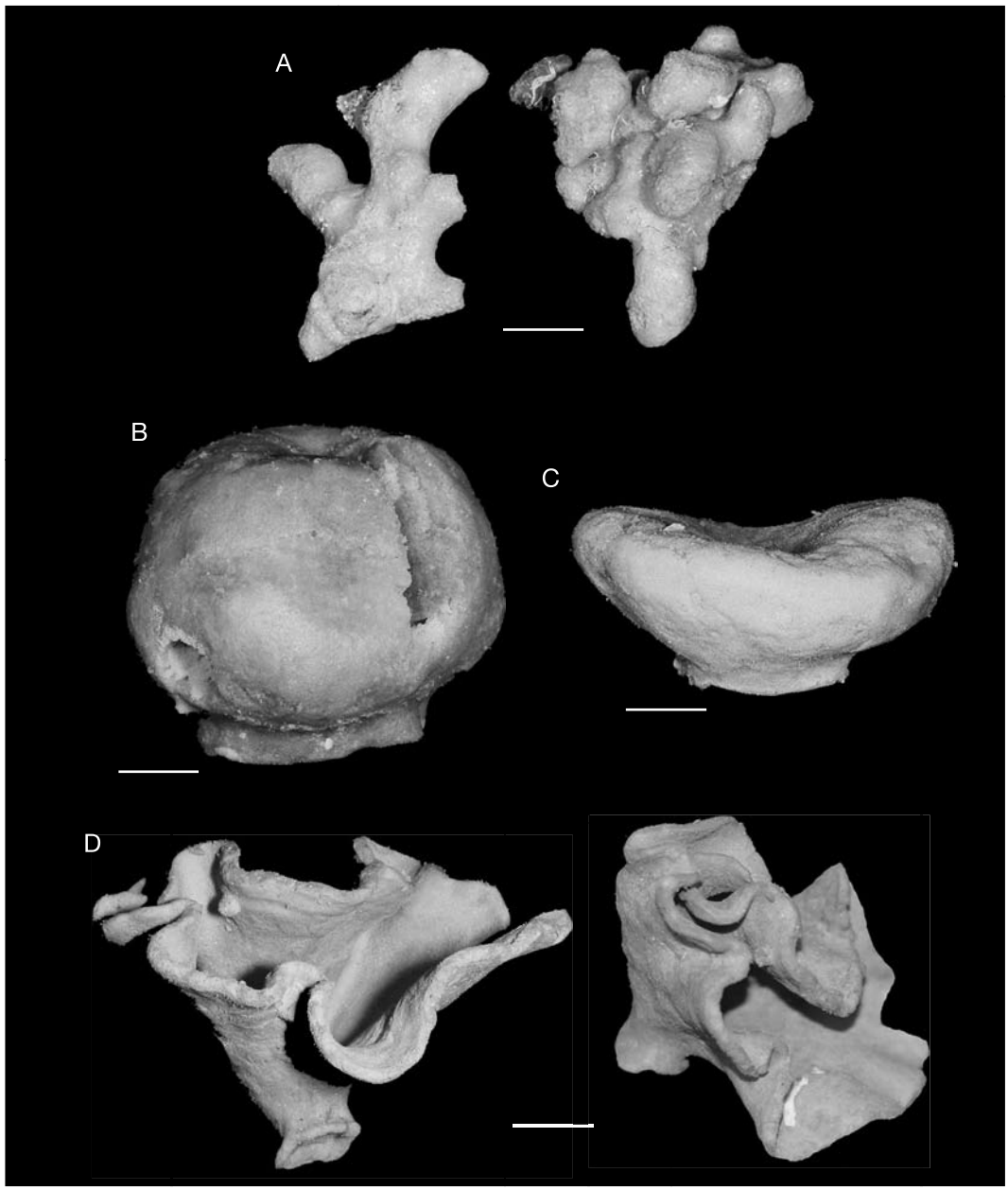

FIG. 4. — **A**, *Discodermia proliferans* Lévi & Lévi, 1983; **B**, *Homophymia pollubrum* n. sp.; **C**, *Reidispongia tuberculata* n. sp.; **D**, *R. coerulea* Lévi & Lévi, 1988. Scale bars: 1 cm.

microscleres preserved; its specific determination remains uncertain. The presence of acanthorhabds excludes it from *Leiodermatium* and places it within the genus *Scleritoderma*, which is also confirmed by the typical appearance of the ectosomal spicules and the presence of sigmaspires.

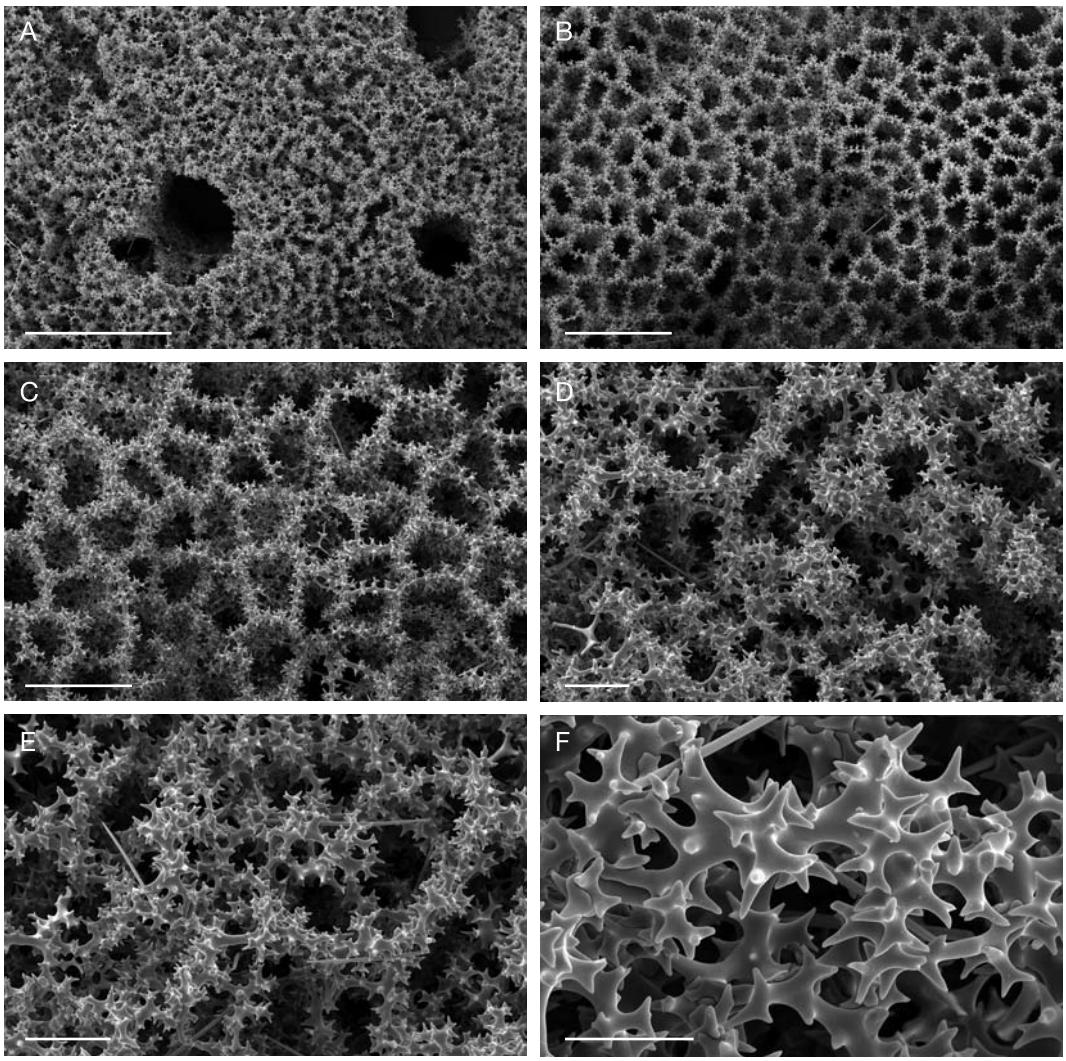

FIG. 5. — *Aciculites orientalis* Dendy, 1905; **A**, outer surface of the choanosomal skeleton with canal openings leading to oscules; **B**, **C**, outer surface of the choanosomal skeleton from inhalating area; **D**, **E**, details of choanosomal skeleton of rhizoclones; **F**, details of articulation between rhizoclone choanosomal desmas. Scale bars: A, 2 mm; B, 1 mm; C, 500 µm; D, E, 200 µm; F, 100 µm.

Due to the degraded state of the animal only few sigmaspires were detected. Its pillow or subspherical shape makes it different from other so far described species of *Scleritoderma*.

Scleritoderma flabelliforme Sollas, 1888
(Figs 2D; 7; 22A, B)

Scleritoderma flabelliformis Sollas, 1888: 316, pl. 35: 26-50. — Lévi & Lévi 1989: 47, fig. 15, pl. 2: 3.

HOLOTYPE. — Ki Island, Indonesia, S of West Papua (BMNH 1891.5.4.10).

MATERIAL EXAMINED (see Table 1). — Éponge, 508-541 m (QM G318641). — Antigonia, 540 m (QM G318658). — Banc 1, 458-680 m (QM G318664).

DESCRIPTION

Growth form

Norfolk Ridge specimens were consistently massive, flabelliform sponges, or tree-like digitate

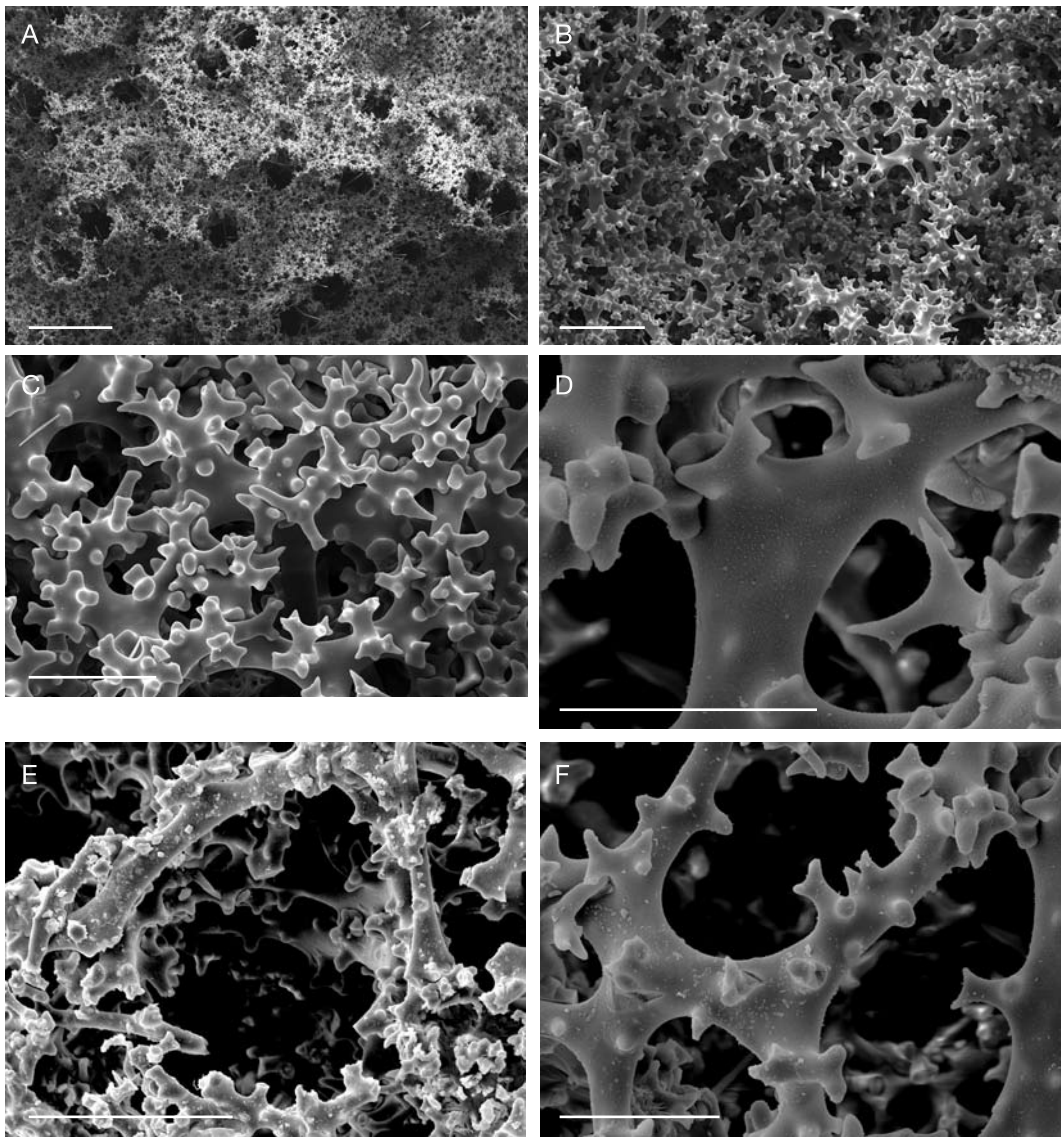

FIG. 6. — *Scleritoderma* sp.; **A**, outer surface of the choanosomal skeleton with canal openings leading to oscules; **B**, choanosomal skeleton; **C**, details of choanosomal skeleton of rhizoclones; **D**, details of articulation between choanosomal desmas; **E**, details of choanosomal skeleton of rhizoclones; **F**, detail of spinose rhizoclone. Scale bars: A, 1 mm; B, E, 200 µm; C, D, F, 100 µm.

masses with nodes, whereas Sollas (1888) and Lévi & Lévi (1989) described the species as highly polymorphic, ranging from flabellate/digitate forms to cup-ear- to vase-shaped or curved plates. Present specimens are approximately 4 to 5 cm high and 2.5 to 5 cm wide, with a 1.5 to 2.5 cm broad base.

Colour

Dirty white to grey in etoh.

Oscules

Oscules are distributed at the tops of the nodes, and/or one or both sides are covered with small pore-like, raised oscules (0.3 mm diameter).

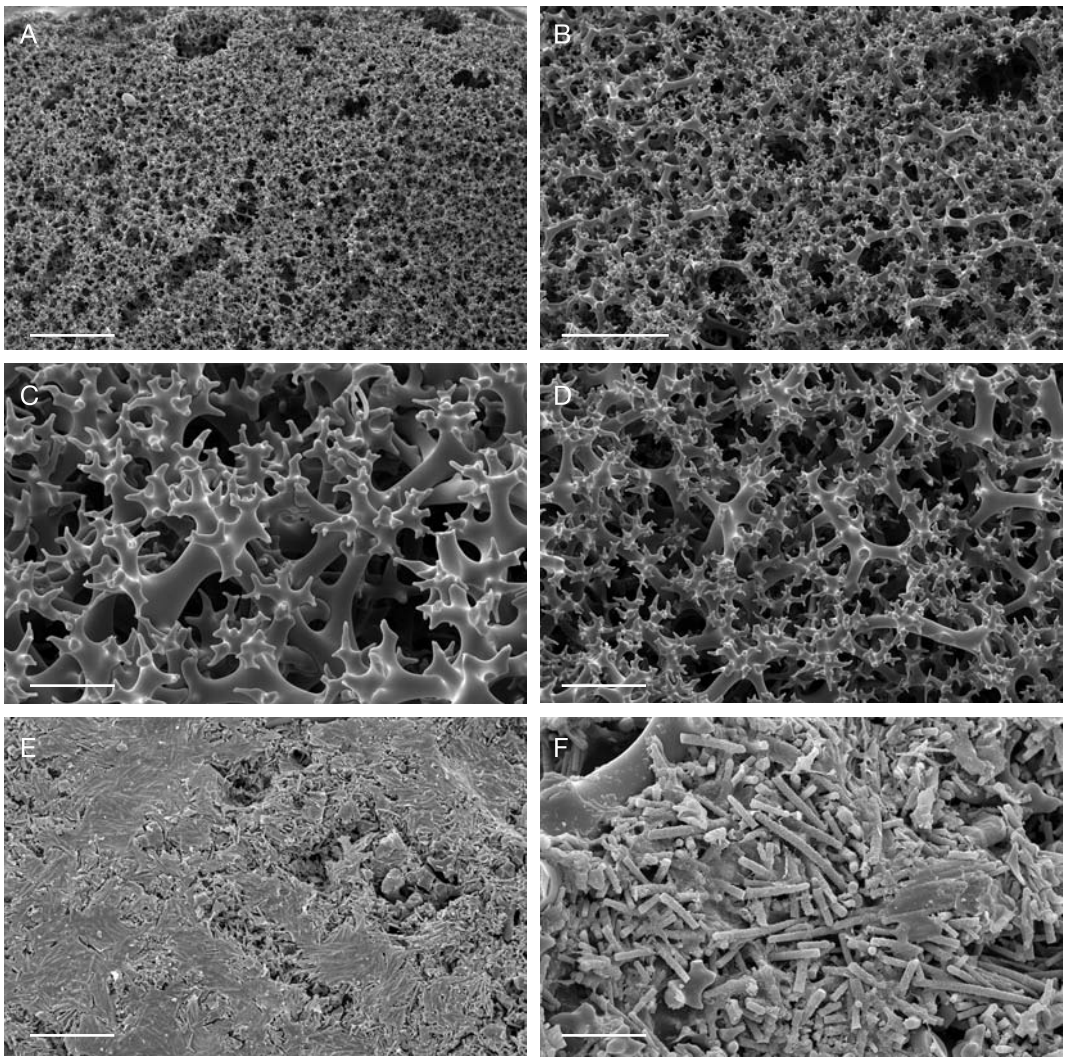

FIG. 7. — *Scleritoderma flabelliforme* Sollas, 1888; **A**, outer surface of the choanosomal skeleton with large openings; **B**, choanosomal skeleton; **C**, details of choanosomal skeleton of rhizoclones; **D**, details of choanosomal skeleton of rhizoclones; **E**, outer surface with crust of curved microstrongyles; **F**, detail of outer surface with crust of curved microstrongyles. Scale bars: A, 1 mm; B, 500 µm; C, 100 µm; D, E, 200 µm; F, 50 µm.

Texture
Hard, stony.

Surface ornamentation
Smooth.

Ectosomal skeleton
Ectosomal spicules are acanthostrongyles/rhabds which form a dense tangential layer on the surface.

Choanosomal skeleton
The very dense choanosomal skeleton with large opening on the surface is composed of thorny rhizoclones.

Megascleres
Desmas spinose, thorny rhiziclone, with short, blunt rays: 400-500 µm/30-45 µm.

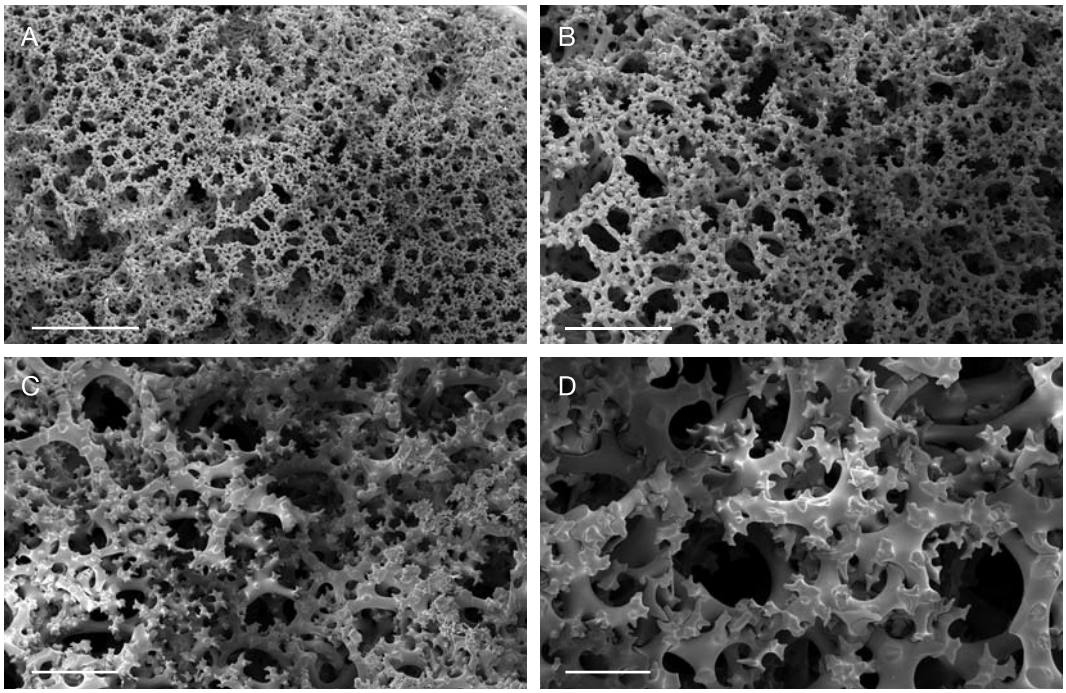

FIG. 8. — *Scleritoderma camusi* Lévi & Lévi, 1983; **A**, outer surface of the choanosomal skeleton with canal openings; **B**, details of the outer surface of the choanosomal skeleton; **C**, details of choanosomal skeleton of rhizoclones; **D**, details of choanosomal skeleton of rhizoclones. Scale bars: A, 1 mm; B, 500 µm; C, 200 µm; D, 100 µm.

Microscleres
Microrhabds (curved): 61.6-101 × 5.66-7.72 µm.
Sigmaspires (spinose): 8.25-11.5 × 1.86-2.22 µm.

REMARKS
The material described here differs morphologically from the holotype in being massive digitate or flabelliform, and in having oscules located mostly at the top of the branches, but it strongly resembles specimens of *S. flabelliforme* from the China Sea described by Lévi & Lévi (1988). Furthermore, this species is described in the literature as being highly polymorphic, ranging from flabelliform, encrusting, massive with nodes to cup- to vase-shaped (Pisera & Lévi 2002a). In its spicule characteristics and size these specimens closely resemble the holotype, and there is no hesitation in assigning this material to this taxon.

Scleritoderma camusi Lévi & Lévi, 1983
(Figs 2C; 8; 22C, D)

Scleritoderma camusi Lévi & Lévi, 1983: 125, pl. VI, 2, pl. VIII, 7-9, fig. 13.

HOLOTYPE. — New Caledonian Slope (MNHN DCL 2787).

MATERIAL EXAMINED (Table 1). — Jumeau-East, 278-410 m (QM G318549, QM G318706).

DESCRIPTION
Growth form
Massive vase-shaped and pedunculate, 3 cm high, 2 cm wide at vase opening and 1.5 cm broad at base.

Colour
Blue to light grey in etoh.

Oscules
Not visible.

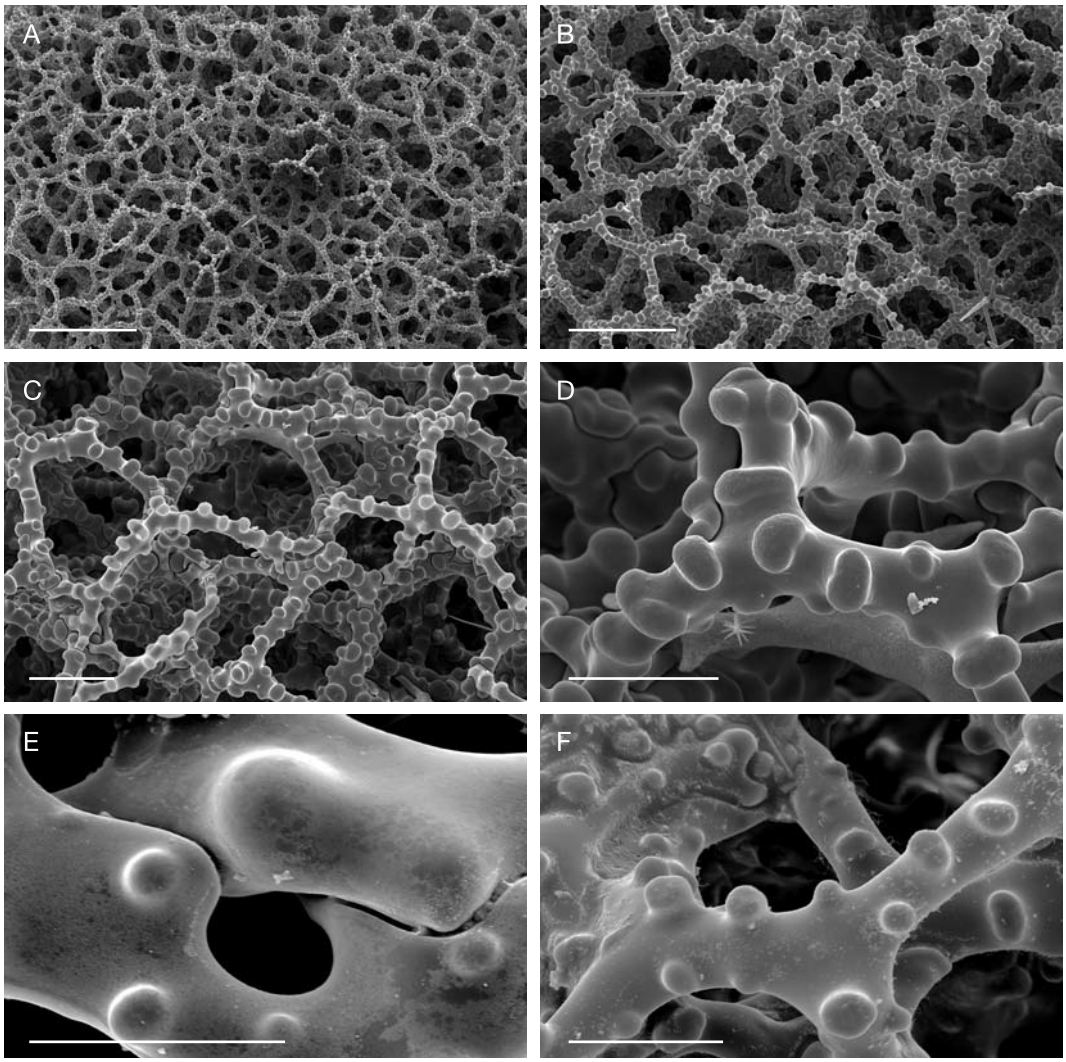

FIG. 9. — *Corallistes australis* n. sp.; **A**, surface of the choanosomal skeleton; **B**, details of the surface of the choanosomal skeleton; **C**, details of dicranoclone desmas; **D**-**F**, details of articulation between dicranoclone choanosomal desmas. Scale bars: A, 1 mm; B, 500 µm; C, 200 µm; D-F, 100 µm.

Texture
Hard, stony.

Surface ornamentation
Smooth, slightly sculptured at the rim of the vase.

Ectosomal skeleton
Ectosomal spicules are acanthostrongyles/rhabds which form a tangential layer on the surface.

Choanosomal skeleton
Extremely dense choanosomal skeleton of rhizoclone desmas.

Megascleres
Desmas branched, thorny rhizoclone, with numerous short, blunt rays: 250-300 µm/20-40 µm.

Microscleres
Microrhabds (acanthose): 43.7-68.3 × 5.5-6.46 µm.

Sigmaspires (curved, not very abundant): 9.1-11.3 × 1.27-1.65 µm.

REMARKS
Our specimens agree well with the holotype, in morphology as well as geometry and size of spicules. The species has been previously recorded from the slope off New Caledonia.

Family CORALLISTIDAE Sollas, 1888

DEFINITION. — Polymorphic lithistids with dicranoclone choanosomal desmas and ectosomal dichotriaenes; microscleres are spirasters (usually two types), streptasters/amphiasters, microxeas and microstrongyles (Pisera & Lévi 2002b).

Genus *Corallistes* Schmidt, 1870

Corallistes Schmidt, 1870: 22, pl. 3: 3.

Coscinospongia Lendenfeld, 1903: 135.

TYPE SPECIES. — *Corallistes typus* Schmidt, 1870 by subsequent designation (Pisera & Lévi 2002b).

DEFINITION. — Lithistids with smooth upper surface and with smooth ectosomal dichotriaenes and tuberculated monocrepidial dicranoclones; microscleres are spirasters (usually two types) (Pisera & Lévi 2002b).

Corallistes australis n. sp.
(Figs 2E; 9; 23)

HOLOTYPE. — Jumeau-West seamount, Norfolk Ridge, 23°40'33''S, 168°00'43''E, 237-250 m, RV *Alis*, 21.VI.2001, Warén dredge, coll. T. Schlacher (MNHN DCL 3901, a fragment of the holotype in QM [G318559]).

ETYMOLOGY. — Named for the southerly location of the study area (*australis*, Latin for southern).

OTHER MATERIAL EXAMINED (see Table 1). — Banc 2, 267-266 m (QM G318567); 200-291 m (QM G318698, QM G318702). — Jumeau-West, 237-250 m (QM G318760); 234-261 m (QM G318776).

DESCRIPTION

Growth form
Wide cylindrical/massive club-shaped to cylindrical/spherical sponges with narrow axial cavity, extending half its height, and located at the opening of the conical sponge summit with a single osculum, which is closed in most specimens. Specimens all have closed oscula, are approximately 4 to 5 cm high and 2 to 3 cm wide, with a base approximately 3 cm broad.

Colour
Greyish white in etoh.

Oscules
Not visible.

Texture
Hard, stony.

Surface ornamentation
Optically smooth.

Ectosomal skeleton
Ectosomal skeleton contains smooth dichotriaenes and abundant amphiasters/streptasters with blunt rays.

Choanosomal skeleton
The choanosomal skeleton consists of dicranoclone desmas which are covered with prominent slightly mushroom-shaped and smooth tubercles. Articulation is chiefly terminal and relatively weak. Choanosomal microscleres consist mainly of amphiasters/streptasters with long pointed rays.

Megascleres
Dicranoclone desmas covered with prominent, very regular rounded or slightly mushroom-shaped and smooth tubercles: 450-750 µm/35-50 µm.
Dichotriaenes: 375-822 µm long × 179-209 µm diameter (cladome).
Oxeas: 700-4000 × 10-15 µm.

Microscleres
Streptaster (spiraster) with long pointed rays: 40.3-49.2 × 36.0-50.9 µm.
Massive spiraster with short blunt rays: 16.8-25.7 × 8.1-12.4 µm.
Massive spiraster with long blunt rays: 26.2-34.2 × 18.8-22.6 µm.

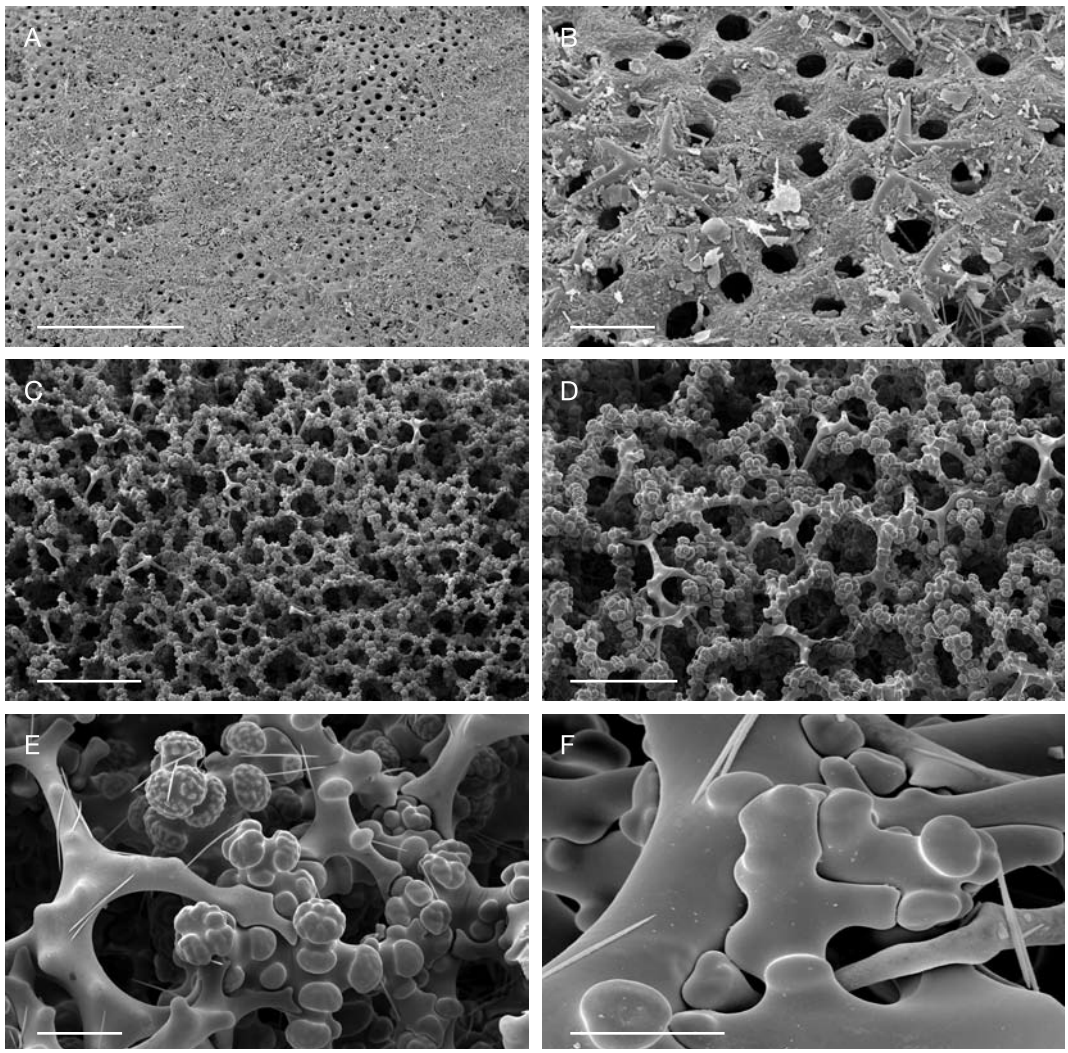

FIG. 10. — *Herengeria vasiformis* n. sp.; **A**, outer surface with pores; **B**, detail of same outer surface with pores and ectosomal dichotriaenes and dense crust of microscleres; **C**, outer surface of the choanosomal skeleton; **D**, outer surface of the choanosomal skeleton with numerous young desmas (not tuberculated); **E**, details of dicranoclone desmas, note the young nearly smooth desma on the left; **F**, details of articulation between choanosomal desmas. Scale bars: A, C, 1 mm; B, E, F, 100 µm; D, 500 µm.

Spirasters with short blunt rays and spiraster with long blunt rays probably intergrade into a single category.

REMARKS

This new species resembles to some extent *C. fulvodesmus* (Lévi & Lévi, 1983), to which it may be closely related, as suggested by the diversity of microscleres and geometry of ectosomal dichotriaenes, which are very similar in both species. Oxeas, present in both species, are much thicker and are usually longer than in *C. fulvodesmus*.

The new species differs from *C. fulvodesmus* in shape as well as in desma structure, showing slight resemblance to juvenile (small) specimens of *C. fulvodesmus* but differing considerably from adult (large) specimens (which are vase-

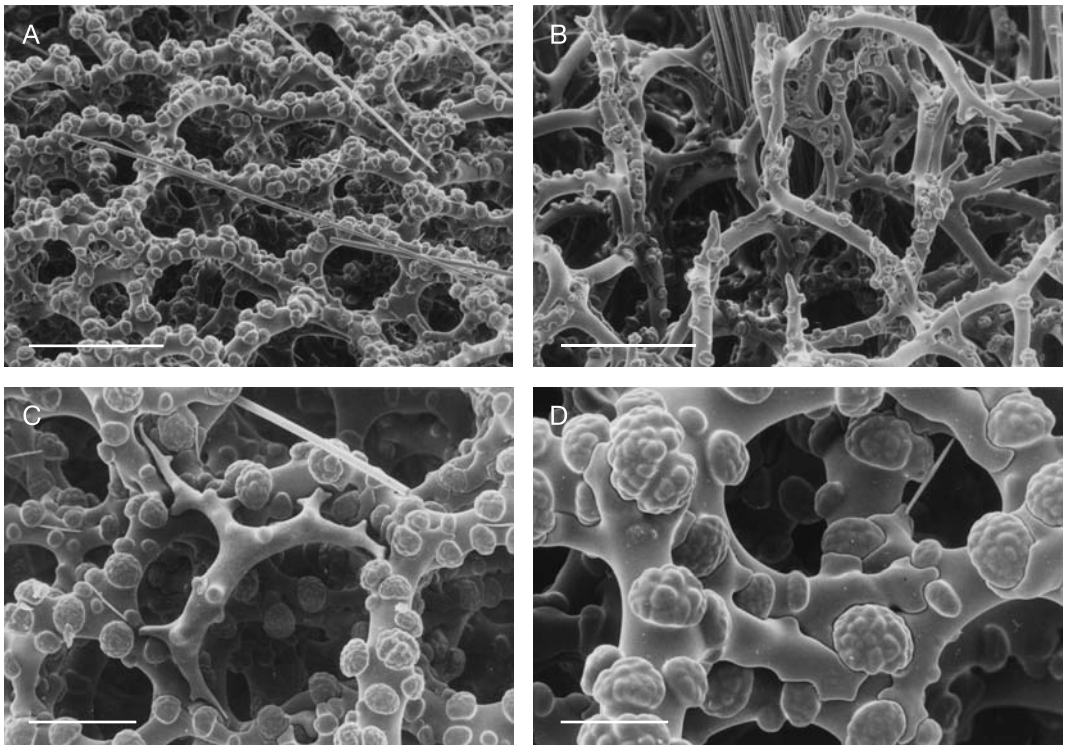

FIG. 11. — *Herengeria auriculata* Lévi & Lévi, 1988; **A**, outer surface of the choanosomal skeleton; **B**, modified choanosomal desmas in the central part of the sponge; **C**, details of dicranoclone desmas; **D**, details of articulation between choanosomal desmas. Scale bars: A, D, 100 µm; B, 500 µm; C, 200 µm.

shaped in *C. fulvodesmus* and cylindrical/club-shaped in the new species). In comparison with the holotype of *C. fulvodesmus* the desmas of this species are much less massive and less densely covered with tubercles.

Genus *Herengeria* Lévi & Lévi, 1988

Herengeria Lévi & Lévi, 1988: 250, fig. 5, pl. 5: 5.

TYPE SPECIES. — *Herengeria auriculata* Lévi & Lévi, 1988 by monotypy.

DEFINITION. — Massive spherical or cup-shaped lithistids with smooth ectosomal dichotriaenes and endosomal dicranoclone desmas; microscleres are microxeas and two types of spirasters (spirasters with long pointed rays and rhabd-like spirasters) (here emended from Pisera & Lévi 2002b).

Herengeria auriculata Lévi & Lévi, 1988 (Figs 2G; 11; 25)

Herengeria auriculata Lévi & Lévi, 1988: 250, fig. 5, pl. 5: 5.

HOLOTYPE. — New Caledonian Slope (MNHN DCL 3543).

MATERIAL EXAMINED (see Table 1). — Introuvable, 572-605 m (QM G318566); 508-541 m (QM G318575). — Éponge, 508-541 m (QM G318643, QM G318651).

DESCRIPTION

Growth form

Globular, ovoid sponge, with choanosomal bundles of large oxeas protruding from the upper surface. Sponges are approximately 15 mm high and 10 mm wide.

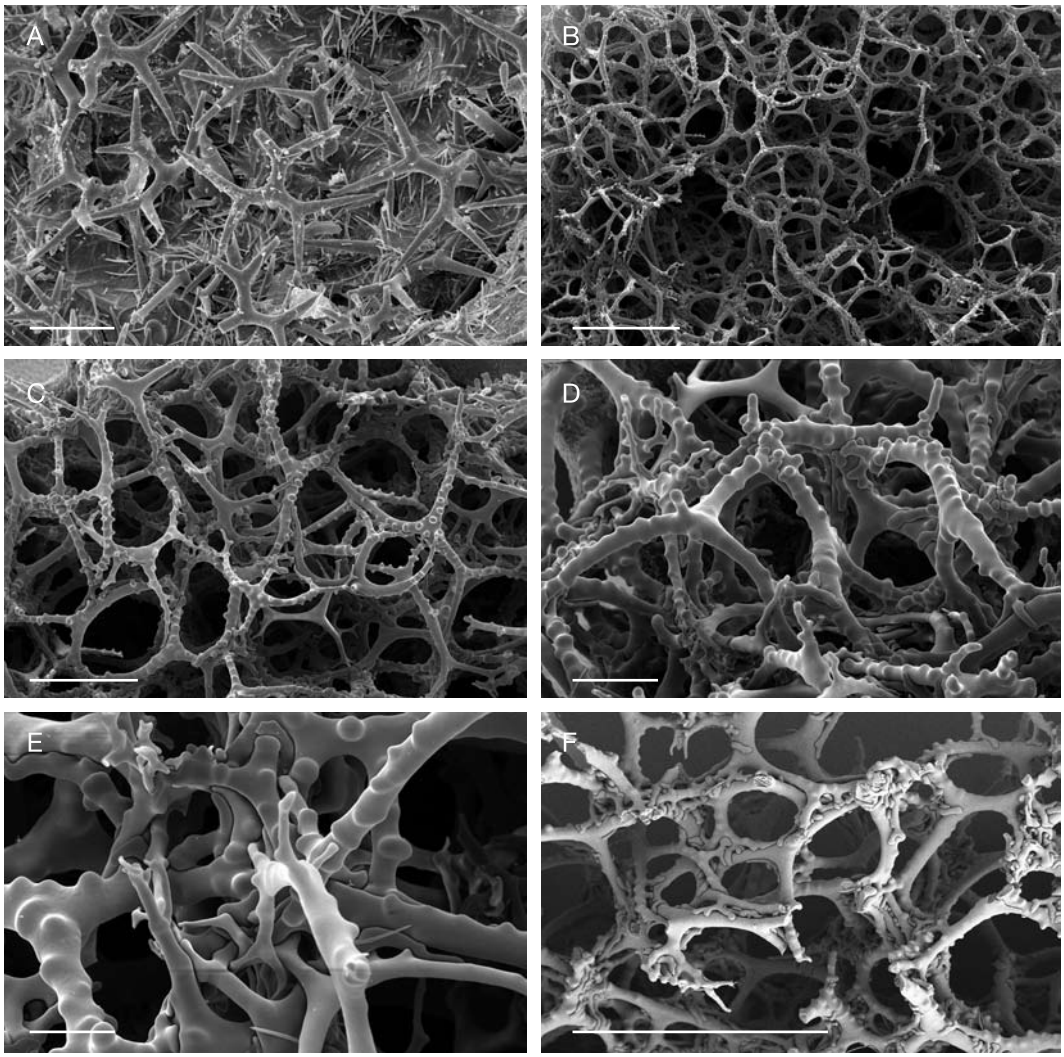

FIG. 12. — *Isabella mirabilis* n. gen., n. sp.; **A**, outer surface with ectosomal dichotriaenes; **B**, **C**, outer surface of the choanosomal skeleton; **D**, details of dicranoclone desmas; **E**, details of articulation between choanosomal desmas; **F**, articulation between dicranoclone desmas from the interior of the choanosomal skeleton. Scale bars: A, D, 200 µm; B, F, 1 mm; C, 500 µm; E, 100 µm.

Colour
Brown in etoh.

Oscules
Not visible.

Texture
Hard.

Surface ornamentation
Rough.

Ectosomal skeleton
Ectosomal layer contains smooth dichotriaenes and abundant microscleres. Large oxeas occur in bundles about 10 mm long. The skeleton around these bundles at this apical part of the sponge is

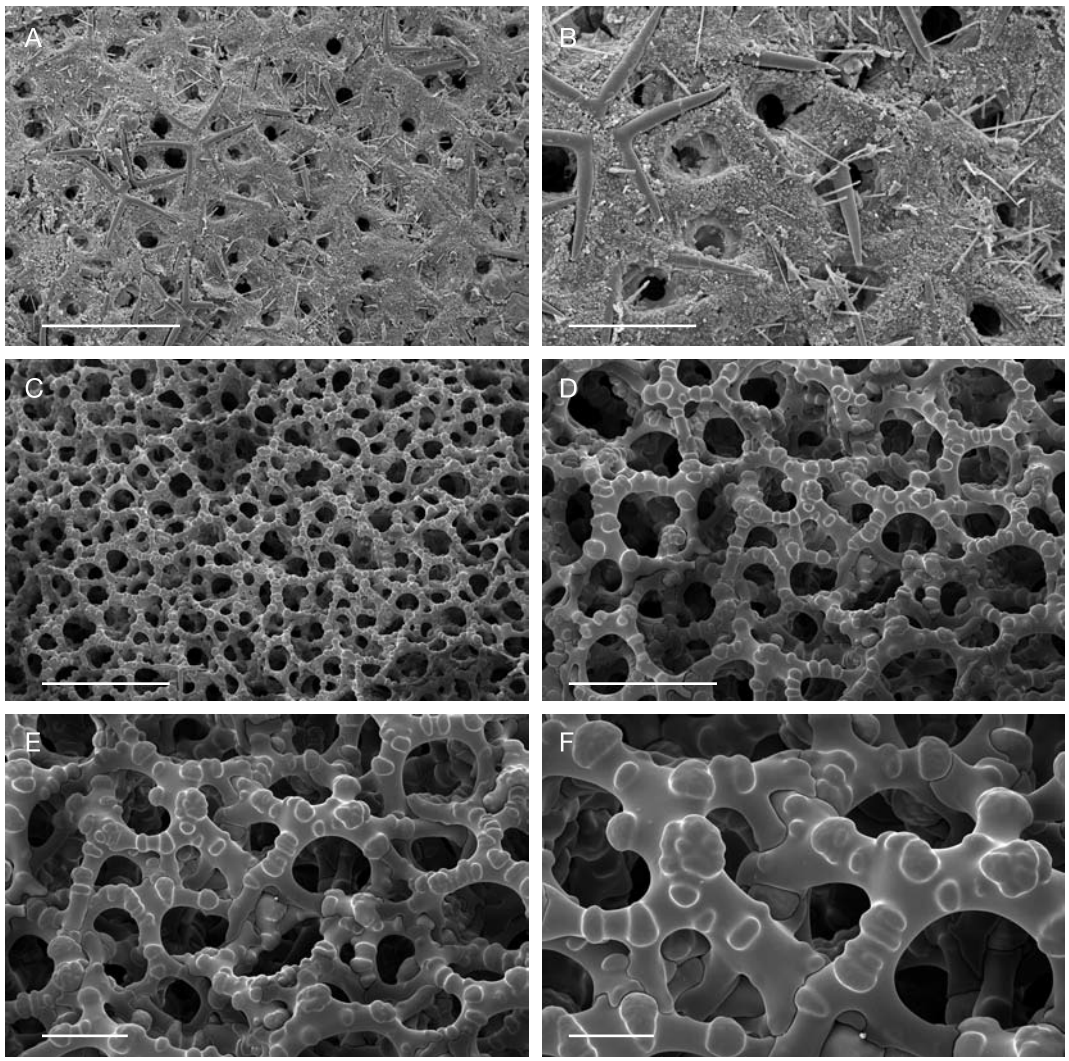

FIG. 13. — *Neoschrammeniella moreti* Lévi & Lévi, 1988; **A**, outer surface with inhalating pores and ectosomal dichotriaenes; **B**, detail of same outer surface with pores and ectosomal dichotriaenes, note a dense crust of ectosomal microscleres; **C**, outer surface of the choanosomal skeleton; **D**, details of the outer surface of the desmas of choanosomal skeleton; **E**, morphology and articulation of choanosomal desmas; **F**, details of articulation between choanosomal desmas. Scale bars: A, D, 500 µm; B, E, 200 µm; C, 1 mm; F, 100 µm.

less dense and consists of more slender, more arched, and less regular, less tuberculate desmas, and often supplied with long spine-like outgrowths. Microscleres at the surface are numerous consisting of microspinose microxeas (often centrotylote, often curved), and rhabd-like spirasters.

Choanosomal skeleton

Choanosomal skeleton consists of regular and slightly curved dicranoclones. Choanosomal microscleres are typically microspinose spirasters with long, more or less pointed rays.

Megascleres

Dicranoclone desmas bearing numerous mushroom-shaped tubercles, which are in turn covered with small, low, densely packed tubercles. Young desmas can be smooth or bear smooth tubercles: 450-800 µm/50-75 µm.

Dichotriaenes smooth, often with tips of the bent downwards: 300-475 µm long × 245-500 µm diameter (cladome).
Oxeas: 10 mm × 10-18 µm.

Microscleres
Microspinose microxeas (centrotylote, curved): 70-100 × 5-8 µm.
Rhabd-like spirasters (irregular, covered with low microspines): 32-40 × 5 µm.
Microspinose spirasters with pointed rays: 19-25 × 15-19 µm.

REMARKS
This material conforms exactly in shape and spicule geometry to the holotype, the only difference being the possession of longer rhabd-like spirasters, which should be regarded as a new characteristic of this taxon.

Herengeria vasiformis n. sp.
(Figs 2F; 10; 24)

HOLOTYPE. — New Caledonian Slope, 22°52'22"S, 167°12'27"E, 340-381 m, RV *Alis*, 28.VI.2001, coll. T. Schlacher, Warén dredge (MNHN DCL 3902, a fragment of the holotype in QM [G318678]).

ETYMOLOGY. — Named for the vase-shaped morphology.

OTHER MATERIAL EXAMINED (see Table 1). — New Caledonian Slope, 383-407 m (QM G318594). — Éponge, 509-564 m (QM G318699); 508-541 m (QM G318771).

DESCRIPTION
Growth form
Massive cup-shaped sponges with thick walls and ovoid to round cup openings and rounded margins. Specimens are approximately 3 to 4.5 cm high and 4-5 × 3-6 cm wide with an approximately 3 to 4 cm broad base.

Colour
Dark brown exterior, lighter brown interior in etoh.

Oscules
Not visible.

Texture
Hard, stony, brittle.

Surface ornamentation
Rough.

Ectosomal skeleton
Contains smooth dichotriaenes perpendicular to the surface and abundant microscleres. The latter forming a crust and consisting of microspinose, often centrotylote, curved microxeas and rhabd-like spirasters. Ostia are 42-53 µm and are sparsely but evenly distributed on the outer surface of the sponge. Ostia are not visible in every specimen thus producing smooth inner and outer surfaces.

Choanosomal skeleton
Dense skeleton of regular, slightly curved, tripodal dicranoclone desmas. Choanosomal microscleres are typically microspinose spirasters with long, more or less pointed rays and some centrotylote microxeas.

Megascleres
Dicranoclone desmas consist of numerous mushroom-shaped tubercles, which are in turn covered with numerous, small, low, densely packed tubercles. The latter not obvious in some cases as young desmas are smooth or bear smooth tubercles. Tubercles are more numerous at the articulation points. Articulation of desmas is usually head-to-shoulder or terminal and not very strong: 400-600 µm/40-60 µm.
Dichotriaenes smooth, with straight tips: 162-209 µm long × 452-606 µm diameter (cladome).
Oxeas: there are some thin long oxeas, but always broken in histological preparations.

Microscleres
Acanthoxeas (centrotylote, curved): 82.6-111 × 2.37-3.38 µm.
Spirasters with slender rays: 14.7-20.5 × 10.1-12.9 µm.
Rhabd-like spirasters: 12.5-17.1 × 3.52-7.14 µm.

REMARKS
Based on microsclere and desma morphology these specimen undoubtedly belong to the genus

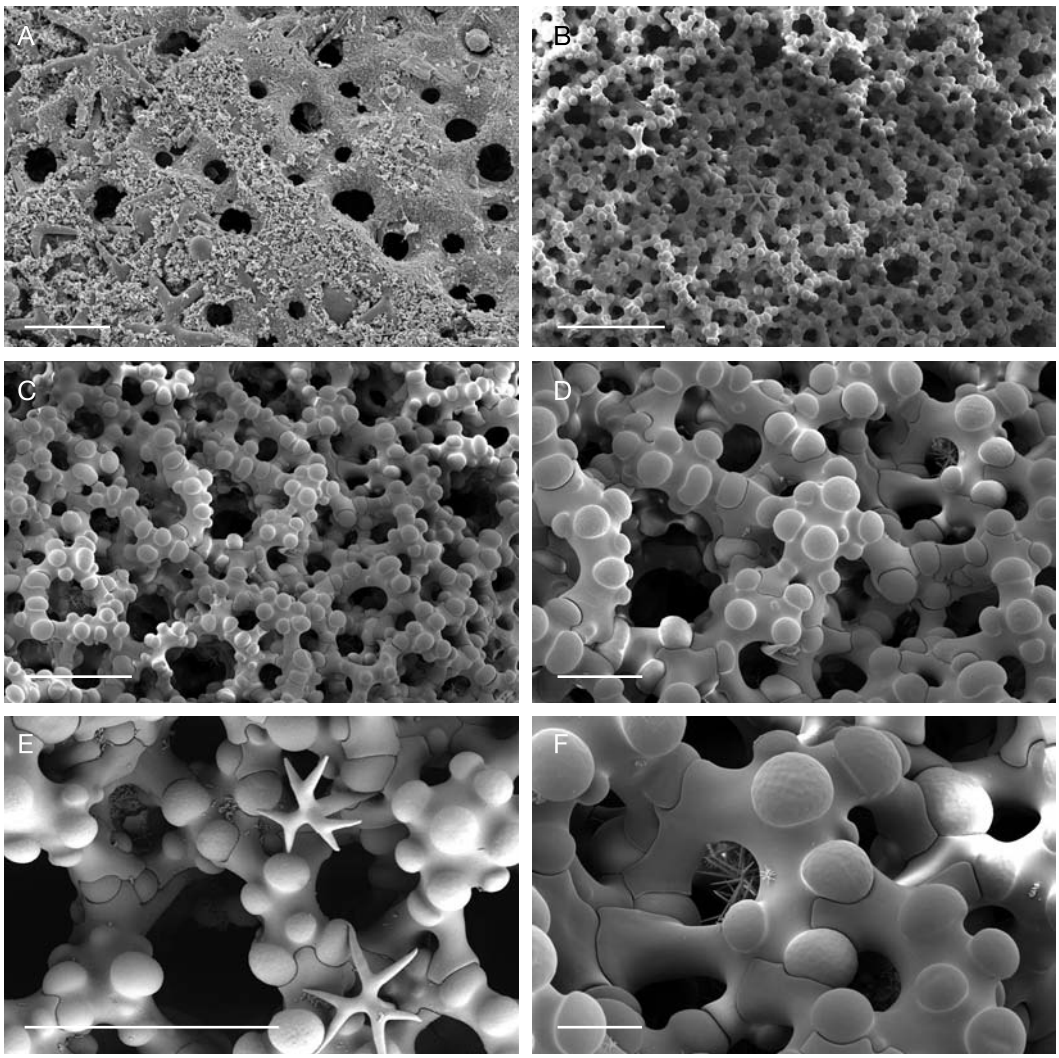

FIG. 14. — *Neoschrammeniella norfolkii* n. sp.; **A**, outer surface with inhalating pores, ectosomal dichotriaenes and dense crust of microscleres; **B**, outer surface of the choanosomal skeleton; **C**, desmas of choanosomal skeleton; **D**, details of choanosomal desmas; **E**, details of articulation between choanosomal desmas and dichotriaenes; **F**, details of articulation between choanosomal desmas. Scale bars: A, D, 200 µm; B, 1 mm; C, E, 500 µm; F, 100 µm.

Herengeria. Consequently, a redefinition of the genus is required based on the very different morphology of this new species compared to the only known type species, *H. auriculata* (see above), which is a massive sponge with lateral inhalant lamella. By comparison the new species is a vase-shaped sponge with thick walls. This new species differs also in having thicker microxeas, shorter, more massive and less regularly developed rhabd-like spirasters, and in having smaller spirasters with slender rays.

Genus *Isabella* n. gen.

TYPE SPECIES. — *Isabella mirabilis* n. sp. here designated.

ETYMOLOGY. — Named for the distinct artichoke flower-like appearance and the extremely distinct, filigree, complex skeletal network which is formed by

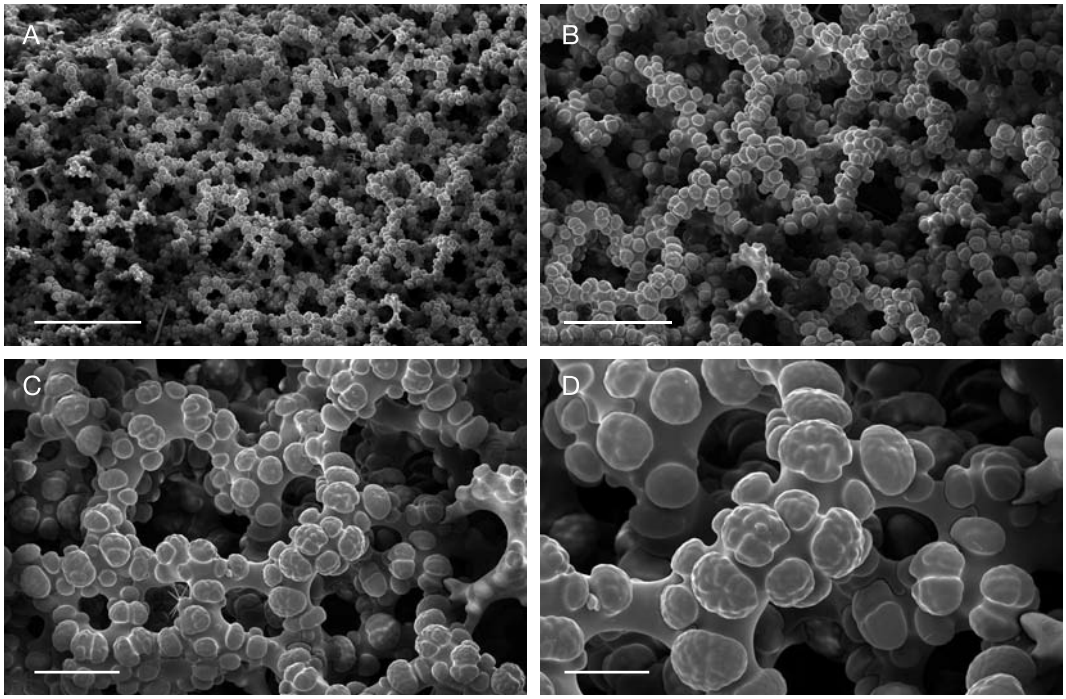

FIG. 15. — *Neoschrammeniella castrum* n. sp.; **A**, outer surface of the choanosomal skeleton; **B**, details of outer surface of the choanosomal skeleton; **C**, **D**, details of choanosomal desmas. Scale bars: A, 1 mm; B, 500 µm; C, 200 µm; D, 100 µm.

smooth, root/vine-like adjacent desmas via entanglement of their extremities with their lateral extension (*is*-, Latin adjectival suffix meaning "having nature of"; *bella*, Latin for beautiful, pretty).

DEFINITION. — Massive shallow cup-shaped "lithistids" with, abundant smooth ectosomal dichotriaenes and endosomal root/vine-like dicranoclone desmas; microscleres are centrotylote microxeas and two types of spirasters (variable spirasters with slender arms and asymmetrical euaster-like streptasters with long rays).

Isabella mirabilis n. sp.
(Figs 3A; 12; 26)

HOLOTYPE. — Jumeau-West seamount, Norfolk Ridge, 23°40'33"S, 168°00'E, 237-250 m, RV *Alis*, 21.VI.2001, Warén dredge, coll. T. Schlacher (MNHN DCL 3903, a fragment of the holotype in QM [G318560]).

ETYMOLOGY. — Named for the intense, dark purple stain excreted by this species (*mirabilis*, Latin for wonderful, strange, causing wonder).

OTHER MATERIAL EXAMINED (see Table 1). — Antigonia, 180-250 m (QM G318737). — Jumeau-West, 237-250 m (QM G318751, QM G318765). — Banc 2, 185-207 m (QM G318803).

DESCRIPTION

Growth form

Massive, shallow cup-shaped, artichoke-like sponge with broad base and an uneven margin, and outer surface bearing numerous, blind, very short, evenly distributed fistules. Dimensions are approximately 4 to 5 cm high and 5 to 7 cm wide with an approximately 3 to 5.5 cm broad base.

Colour

Dark brown in etoh, discolours alcohol deep purple-brown.

Oscules

Not visible.

Texture

Hard, but not stony, brittle, with some compressible parts.

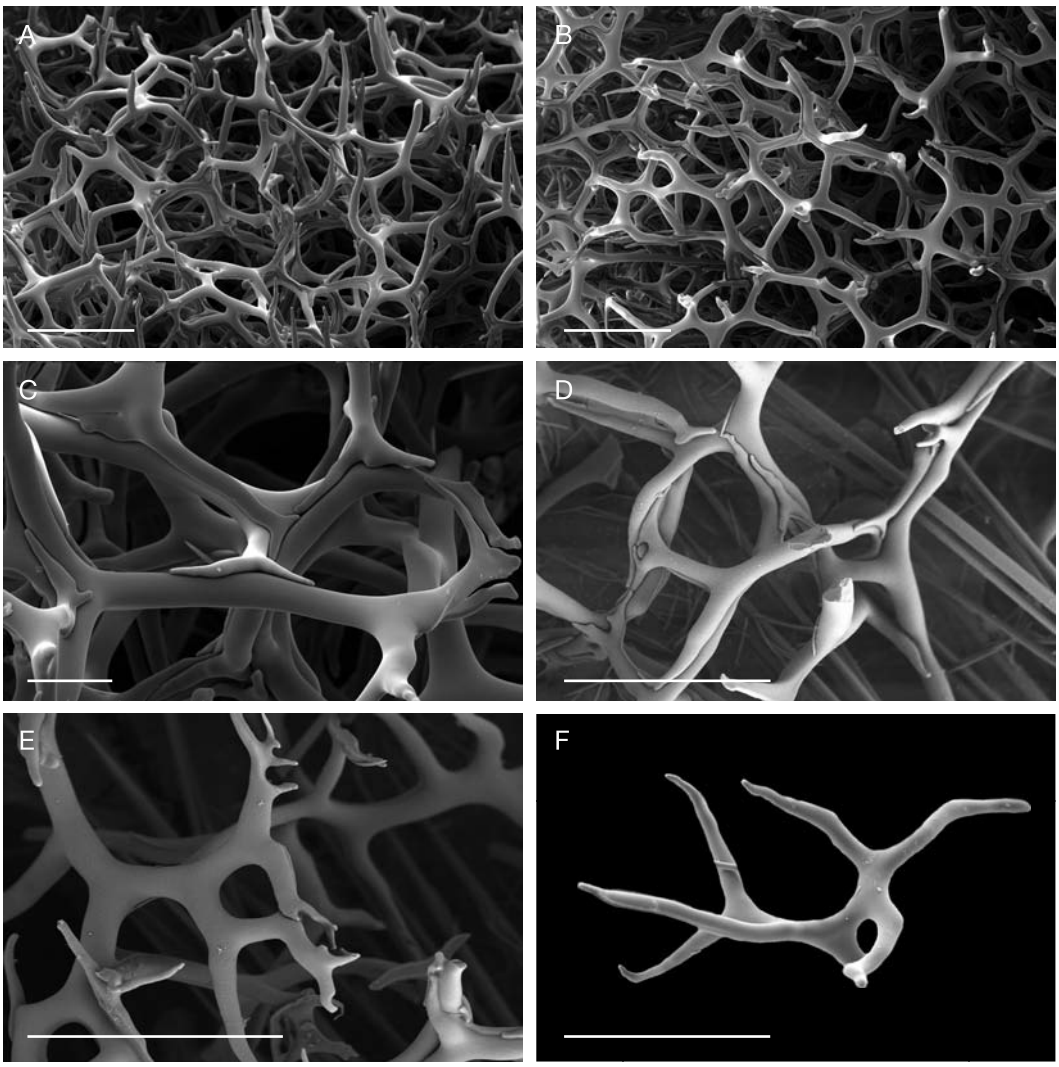

FIG. 16. — *Anaderma rancureli* Lévi & Lévi, 1983; **A**, **B**, outer surface of the choanosomal skeleton; note long spines of megaclones; **C**, **D**, details of articulation of megaclones; **E**, **F**, smooth megaclone choanosomal desma. Scale bars: A-C, E, F, 500 µm; D, 100 µm.

Surface ornamentation
Uneven, fistulose.

Ectosomal skeleton
Contains a layer of very abundant smooth dichotriaenes perpendicular to the surface and abundant microscleres. Microscleres at the surface are numerous forming a crust and consist of microspinose, often centrotylote and curved, microxeas and asymmetrical euaster-like streptasters.

Choanosomal skeleton
Composed of regular and slightly curved dicranoclones. These desmas form an extremely distinct root/vine-like mesh. Choanosomal microscleres are typically microspinose spirasters with long, more or less pointed rays. There are also thick bundles of long oxeas.

Megascleres
Dicranoclone desmas are regular, slightly curved, tripodal slender dicranoclone desmas which are

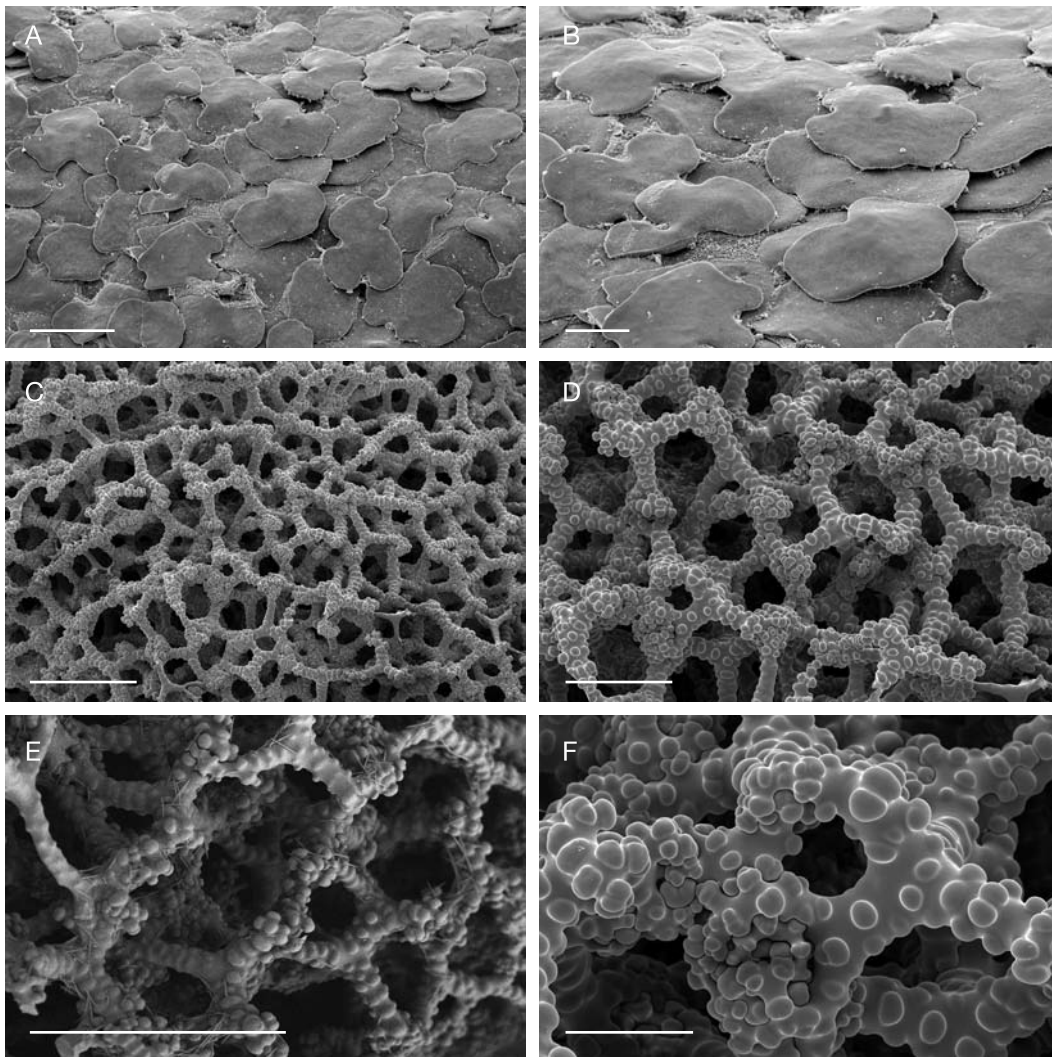

FIG. 17. — *Discodermia proliferans* Lévi & Lévi, 1983; **A**, **B**, outer surface with ectosomal discotriaenes; **C**, outer surface of the choanosomal skeleton; **D**, **E**, details of the outer surface of the choanosomal skeleton of tetraclone desmas; **F**, details of articulation between choanosomal desmas. Scale bars: A, D, 500 µm; B, F, 200 µm; C, E, 1 mm.

completely smooth or bear numerous low, indistinct, smooth tubercles. Often the centrally located tubercle is higher than the others. Adjacent desmas produce a complex skeletal network via entanglement of their extremities, which is aided by the root/vine-like lateral extension of the desmas: 520-610 µm/25-45 µm.

Dichotriaenes smooth, often with tips of the cladome bent in an angle and lower third of the rhabdome with several grooves: 523-784 µm long × 297-479 µm diameter (cladome).

Oxeas very long, but all broken, some shorter unbroken ones measure 468 × 7-8 µm, but it is unsure if they are native or foreign.

Microscleres

Microacanthoxeas (centrotylote): 65.9-107 × 3.86-5.6 µm.

Streptaster (spiraster) very variable, with slender arms: 17.5-25.9 × 15-20.8 µm.
Streptaster (resembling euaster, but asymmetrical with long, thick rays), diameter: 8.2-15.0 µm.

REMARKS
This species has a very distinctive gross morphology, very characteristic dicranoclones and euaster-like streptaster microscleres. No similar combination of microscleres is known so far in any described lithistids. All these characteristics suggest that the new species belong to a new genus within the family Corallistidae.

Genus *Neoschrammeniella* Pisera & Lévi, 2002

Neoschrammeniella Pisera & Lévi, 2002b: 318, figs 12-15.

TYPE SPECIES. — *Iouea moreti* Lévi & Lévi, 1988 by monotypy.

DEFINITION. — Polymorphic sponges (cylindrical to cup/vase-shaped) with two to three types of spirasters (short blunt rays and different size classes of short pointed rays) as microscleres and smooth ectosomal dichotriaenes. Desmas are dicranoclones with two to four clones (definition emended here from Pisera & Lévi 2002b).

Neoschrammeniella moreti (Lévi & Lévi, 1988) (Figs 3B; 13; 27)

Iouea moreti Lévi & Lévi, 1988: 248, pl. 4: 4, fig. 4.

Neoschrammeniella moreti – Pisera & Lévi 2002b: 319, figs 12-15.

HOLOTYPE. — New Caledonian Slope (MNHN DCL 3541).

MATERIAL EXAMINED (see Table 1). — Introuvable, 562-576 m (QM G318597).

DESCRIPTION
Growth form
Columnar, erect, cylindrical sponges with an axial cavity, which extends to half the height of the sponge and ends at the conical summit. The summit may bear a single oscule as terminal extension of the axial cavity or may be closed. The examined specimen has an osculum and is about 3 cm high.

Colour
Beige with yellow and pinkish areas in etoh.

Oscules
One large apical oscule; ostia 67-83 µm.

Texture
Hard, stony.

Surface ornamentation
Smooth.

Ectosomal skeleton
Ectosomal skeleton contains a layer of very abundant smooth dichotriaenes perpendicular to the surface and abundant microscleres. Microscleres at the surface are numerous, forming a crust and consist of microspinose blunt spiraster streptasters.

Choanosomal skeleton
Skeleton consists of strongly tuberculated, irregular dicranoclones, producing a very dense structure. Within the choanosome microscleres are long pointed spirasters.

Megascleres
Dicranoclone desmas thick, mushroom-shaped tubercules are slightly subdivided into smaller very low callosities and sometimes appear smooth: 650-750 µm/70-100 µm.
Dichotriaenes smooth; conical, straight rhabdome and cladome: 395-617 µm long × 377-509 µm (diameter of the cladome).
Oxeas large, protruding from the surface, but invariably broken.
Anisoxeas: 169-466 × 3.86-4.66 µm.

Microscleres
Massive (rhabd-like) spirasters: 15.6-19.1 × 7.45-9.07 µm.
Spirasters with slender arms: 29.3-35.1 × 15.7-20.1 µm.

REMARKS
This new material conforms closely to the holotype, with the exception of having slightly smaller microscleres.

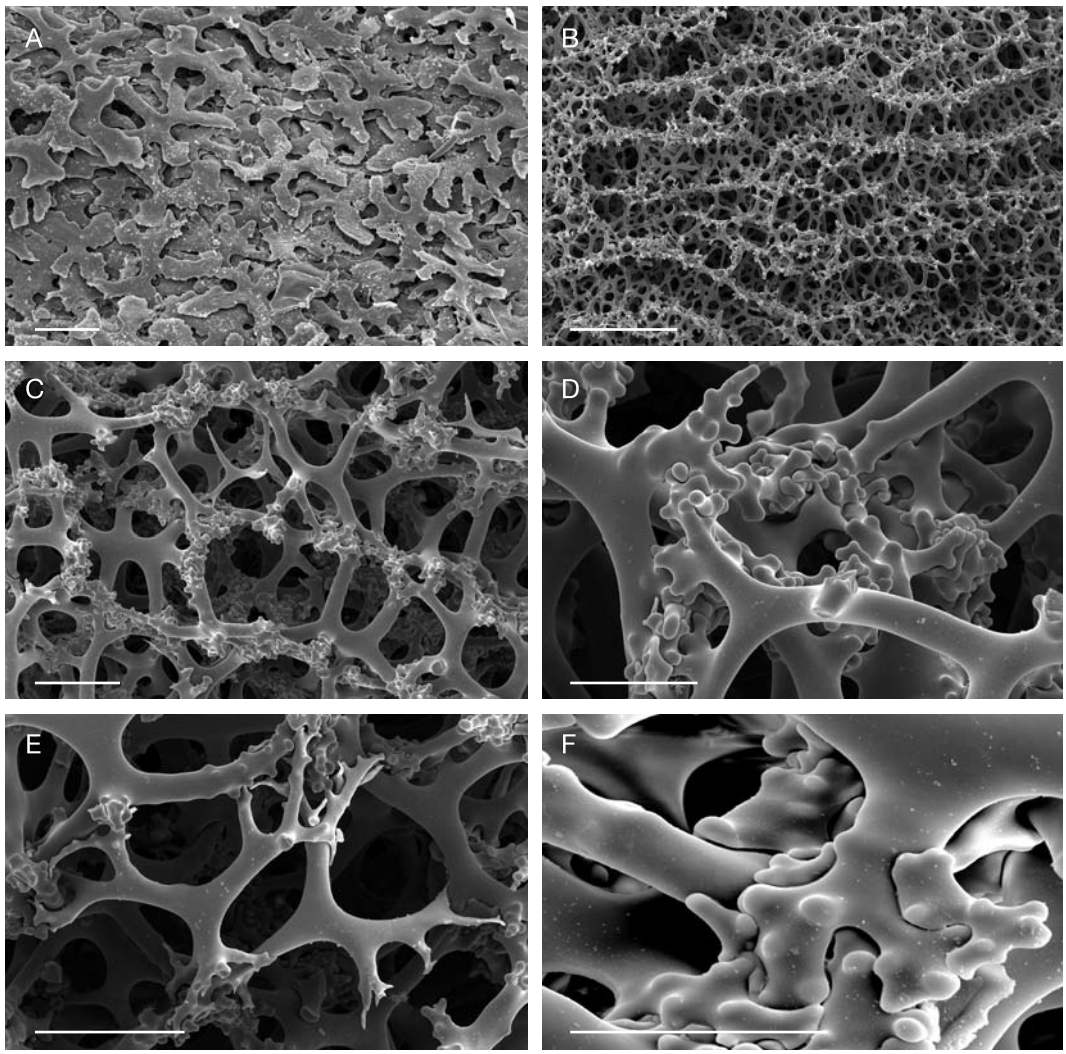

FIG. 18. — *Homophymia pollubrum* n. sp.; **A**, details of the outer surface with ectosomal pseudophyllotriaenes; **B**, outer surface of the choanosomal skeleton; **C**, choanosomal skeleton; **D**-**F**, details of desma terminal articulation. Scale bars: A, C, E, 200 µm; B, 1 mm; D, 100 µm; F, 10 µm.

Neoschrammeniella norfolkii n. sp.
(Figs 3C; 14; 28)

HOLOTYPE. — Introuvable seamount, Norfolk Ridge, 24°39'69"S, 168°39'23"E, 569-616 m, RV *Alis*, 24.VI.2001, Warén dredge, coll. T. Schlacher (MNHN DCL 3904, a fragment of the holotype in QM [G318555]).

ETYMOLOGY. — Named for the type locality.

OTHER MATERIAL EXAMINED (see Table 1). — Jumeau-West, 386-950 m (QM G318552).

DESCRIPTION

Growth form

Massive vase-shaped sponge with a thick wall and round vase opening and rounded margin. Specimens are approximately 4 cm high and 5 cm wide at the vase opening and are attached to the substratum by simple bases approximately 2.5 cm wide.

Colour

Dirty white to beige/light brown in etoh.

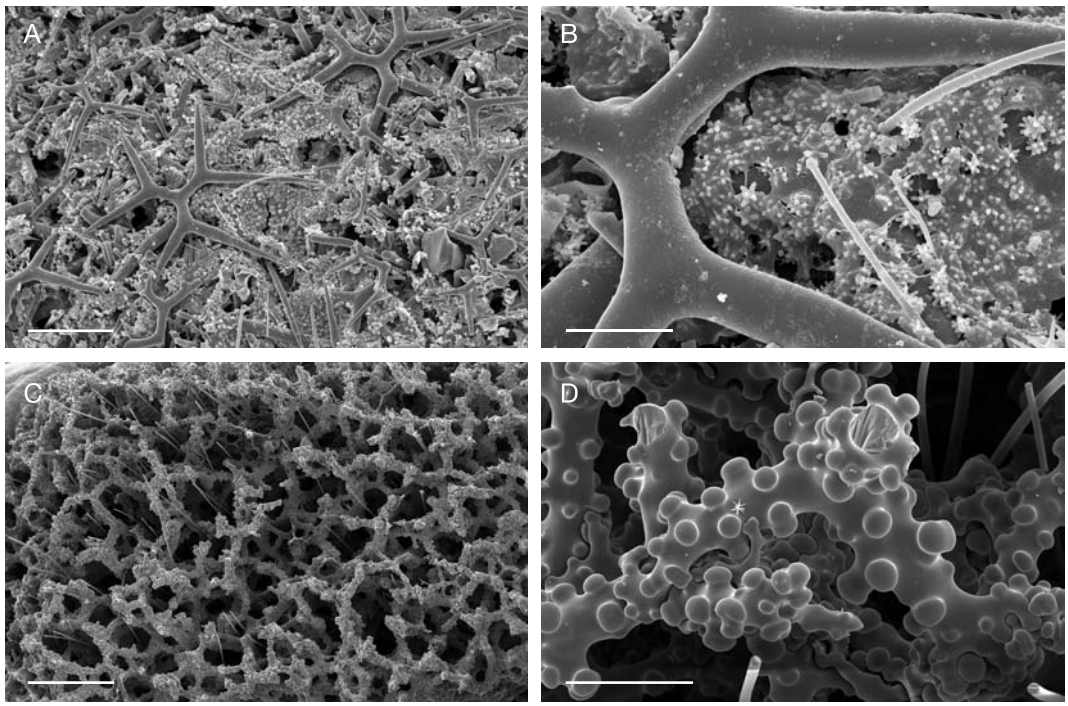

FIG. 19. — *Reidispongia tuberculata* n. sp.; **A**, detail of outer surface with ectosomal dichotriaenes, oxeas and microscleres; **B**, detail of the same outer surface with ectosomal dichotriaenes showing thick crust of ectosomal streptaster/amphiasters; **C**, choanosomal skeleton; **D**, detail of choanosomal skeleton composed of branched tetraclone desmas. Scale bars: A, D, 200 µm; B, 50 µm; C, 1 mm.

Oscules
Not visible.

Texture
Hard, stony.

Surface ornamentation
Optically smooth.

Ectosomal skeleton
Ectosomal skeleton contains smooth dichotriaenes and abundant spirasters with short blunt rays.

Choanosomal skeleton
The choanosomal skeleton is extremely dense and consists of strongly tuberculated dicranoclones with strong zygoses. Outer surface of the choanosomal skeleton with numerous simple pores. Within the choanosome microscleres are present consisting of two types of spiraster/streptasters with long pointed rays.

Megascleres
Dicranoclone desmas very thick, short, dicranoclones, which bear nearly smooth, mushroom-shaped to very regular rounded tubercles with strong zygoses: 330-400 µm/90-100 µm.
Dichotriaenes smooth; laterally flattened rays of cladome and conical, straight rhabdome: 302-369 µm long × 362-421 µm (diameter of the cladome).

Microscleres
Massive spirasters with short blunt rays: 15.4-17.6 × 6.37-793 µm.
Long pointed rays type I (spirasters): 21.8-26 × 13-19.6 µm.
Long pointed rays type II (streptasters): 78.4-99.2 × 63.7-81.4 µm.

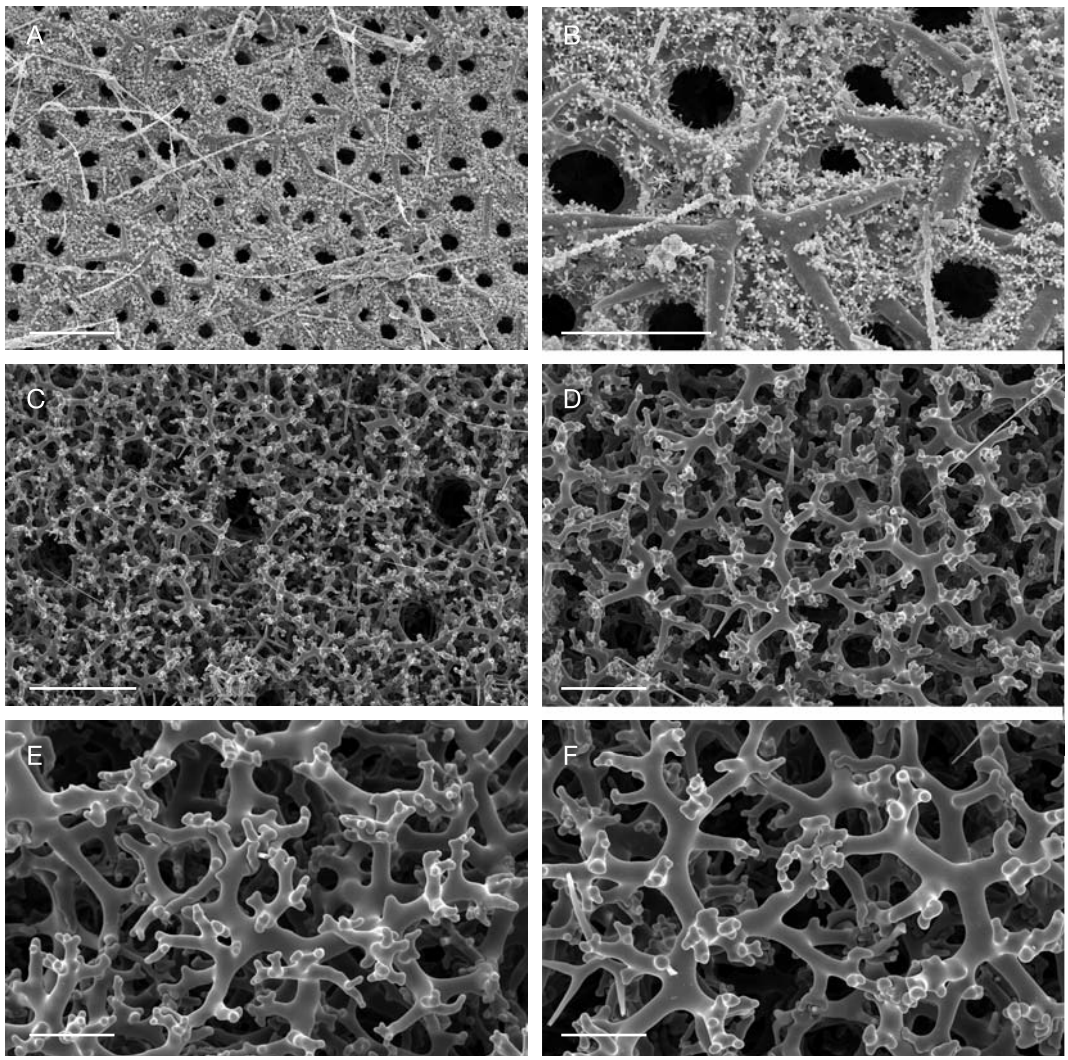

FIG. 20. — *Reidispongia coerulea* Lévi & Lévi, 1988; **A**, outer surface with inhalant pores and oxeas; **B**, detail of outer surface with inhalant pores, ectosomal dichotriaenes, oxeas and dense crust of microscleres; **C**, surface of the choanosomal skeleton with canal openings; **D**, choanosomal skeleton; **E**, **F**, detail of choanosomal skeleton composed of branched tetraclone desmas. Scale bars: A, D, 200 µm; B, E, F, 100 µm; C, 500 µm.

REMARKS

Based on microsclere and desma geometries this material undoubtedly belongs to the genus *Neoschrammeniella*, but differs considerably in shape from the type species. Consequently a redefinition of the genus *Neoschrammeniella* within the family Corallistidae is necessary as the original diagnosis is based predominantly on the morphology of the type species. The new species *N. norfolkii* n. sp. is a massive vase-shaped sponge, in contrast to club-shaped *N. moreti*. It differs from *N. moreti* in morphology of dicranoclones (which bear very regular, nearly round and smooth tubercles), as well in having two types of spirasters with pointed rays. The new species has spirasters with long, slender, nearly smooth, pointed rays which are absent in *N. moreti*.

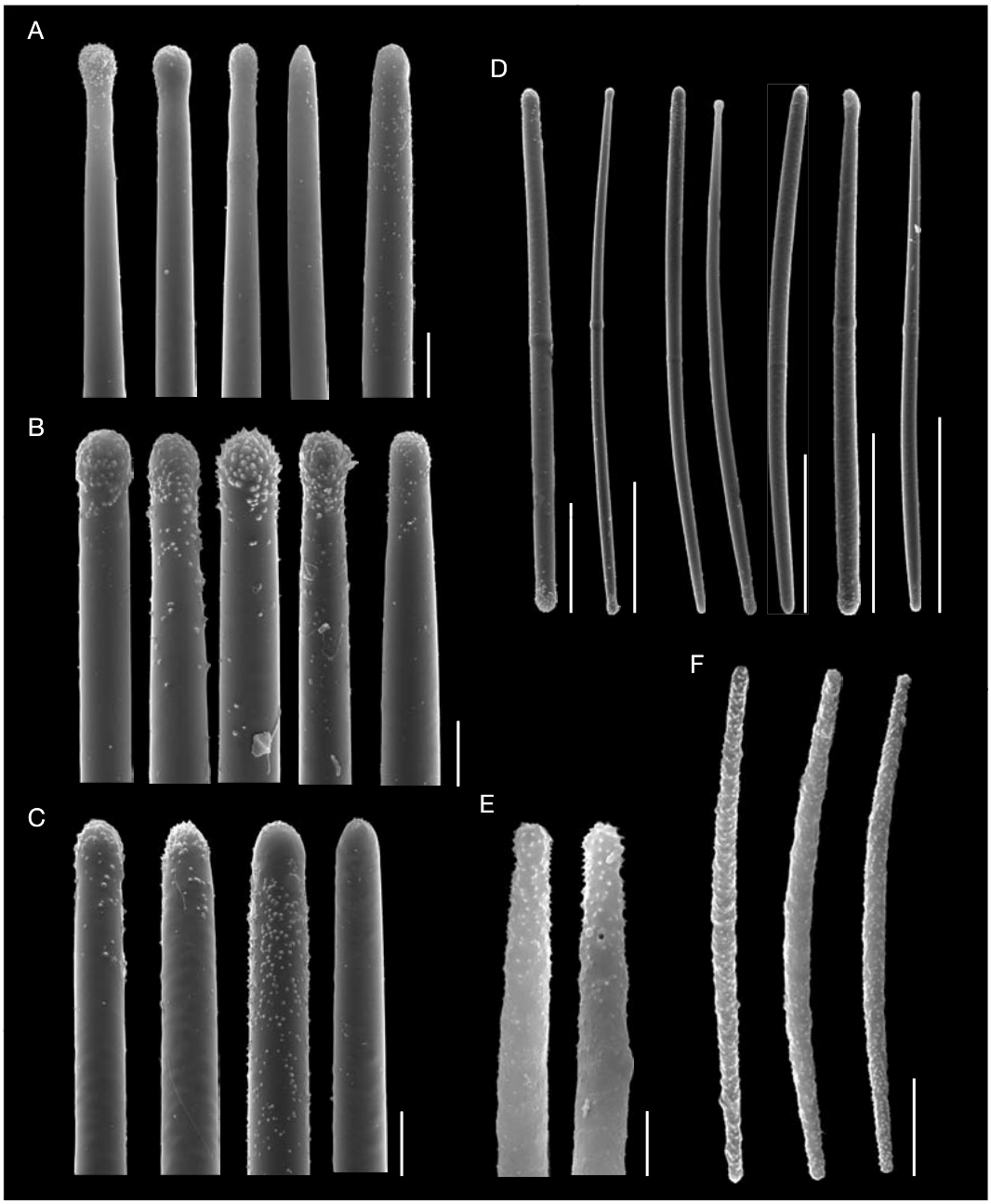

FIG. 21. — **A**-**D**, *Aciculites orientalis* Dendy, 1905; **A**-**C**, heads of strongyles; **D**, strongyles; **E**, **F**, *Scleritoderma* sp.; **E**, heads of strongyles; **F**, strongyles. Scale bars: A-C, F, 10 µm; D, 100 µm; E, 5 µm.

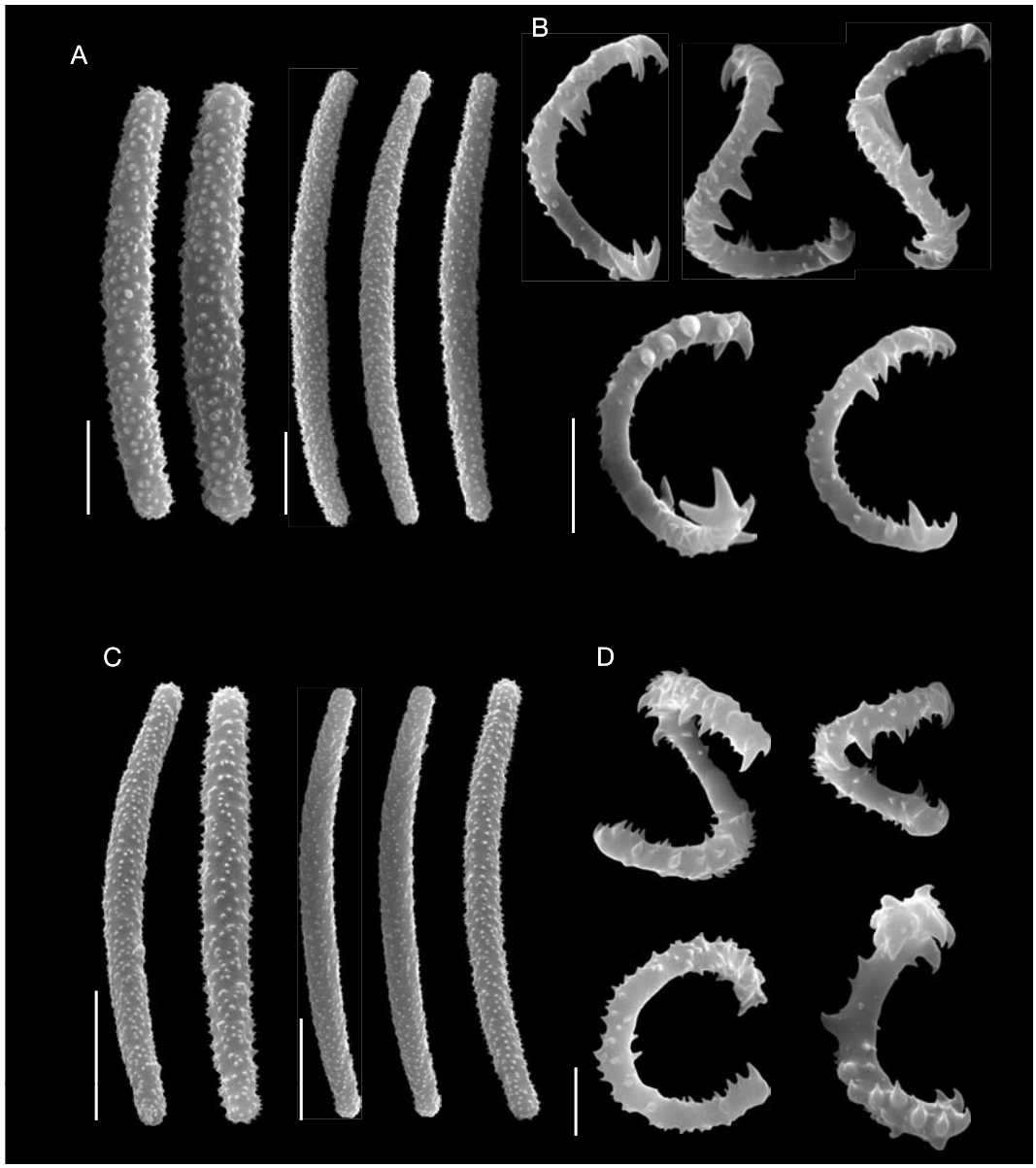

FIG. 22. — **A**, **B**, *Scleritoderma flabelliforme* Sollas, 1888; **A**, acanthorhabds; **B**, sigmaspires; **C**, **D**, *S. camusi* Lévi & Lévi, 1983; **C**, acanthorhabds; **D**, sigmaspires. Scale bars: A, C, 20 µm; B, D, 2 µm.

Neoschrammeniella castrum n. sp.
(Figs 3D; 15; 29)

HOLOTYPE. — Éponge seamount, Norfolk Ridge, 24°54'72"S, 168°21'87"E, 508-541 m, RV *Alis*, 23.VI.2001, Warén dredge, coll. T. Schlacher (MNHN DCL 3905, a fragment of the holotype in QM [G318564]).

ETYMOLOGY. — Named for the massive and thick walled gross morphology (*castrum*, Latin for fort, walled town, stronghold).

OTHER MATERIAL EXAMINED (see Table 1). — Éponge, 539-545 m (QM G318586).

DESCRIPTION

Growth form

Massive, short, cup-shaped sponges with a broad base, thick walls and round cup openings and rounded margins. Specimens are approximately 3 cm high and 3 cm wide with an approximately 2.5 cm broad simple base.

Colour

Beige to light brown in etoh.

Oscules

Not visible.

Texture

Hard, stony.

Surface ornamentation

Smooth.

Ectosomal skeleton

Ectosomal skeleton contains smooth dichotriaenes perpendicular to the surface and abundant microscleres. Microscleres at the surface are numerous forming a crust and consist of microspinose spirasters with short, blunt rays.

Choanosomal skeleton

Choanosomal structure composed of strongly tuberculated, irregular dicranoclones, resulting in a very dense skeleton. Choanosomal microscleres are streptasters/spirasters with long pointed rays.

Megascleres

Dicranoclone desmas are very thick, and are densely covered with mushroom-shaped tubercles, which are clearly subdivided into smaller callosities: 520-700 µm/70-85 µm.

Dichotriaenes smooth; conical, curved rhabdome and conical rays of cladome: 457-693 µm long × 293-350 µm diameter (cladome).

Microscleres

Streptasters (spirasters) with long pointed rays: 85.3-114 × 69.1-90.2 µm.

Massive spirasters with short blunt rays: 12.4-14.6 × 6.95-8.57 µm.

REMARKS

As for the new *Neoschrammeniella* species described above (*N. norfolkii* n. sp.), this new species undoubtedly belongs to the genus *Neoschrammeniella* on the basis of its characteristic microscleres and desmas, but differs considerably in shape from the type species. The new species *N. castrum* n. sp. is similar in shape to *N. norfokii* n. sp. but differs in having only two types of microscleres instead of three types, and in having more massive but shorter spirasters with a blunt rays, which are much less regularly developed. It differs also in having tubercles on the desmas which are further subdivided into smaller callosities, while *N. norfolkii* n. sp. has smooth tubercles.

Family PLEROMIDAE Sollas, 1888

DEFINITION. — Polymorphic lithistids with megaclone (usually smooth) choanosomal desmas and ectosomal dichotrianes; sometimes additionally anatriaenes; microscleres are spirasters or amphiasters, microxeas and/or styles (Pisera & Lévi 2002c).

Genus *Anaderma* Lévi & Lévi, 1983

Anaderma Lévi & Lévi, 1983: 107, figs 1-4.

TYPE SPECIES. — *Anaderma rancureli* Lévi & Lévi, 1983 by monotypy.

DEFINITION. — Anatriaenes among ectosomal spicules; microscleres include styles and amphiasters (Pisera & Lévi 2002c).

Anaderma rancureli Lévi & Lévi, 1983 (Figs 3E; 16; 30)

Anaderma rancureli Lévi & Lévi, 1983: 107, pl. 3: 4-5, pl. 13: 2, 3, fig. 3. — Pisera & Lévi 2002c: 322-324, figs 1-4.

HOLOTYPE. — New Caledonian Slope (MNHN DCL 2767).

MATERIAL EXAMINED (see Table 1). — Banc 1, 276-350 m (QM G318561, QM G318832); 305-332 m (QM G318611); 290-378 m (QM G318722, QM G318725); 328-340 m (QM G318821). — Jumeau-West, 302-325 m (QM G318781).

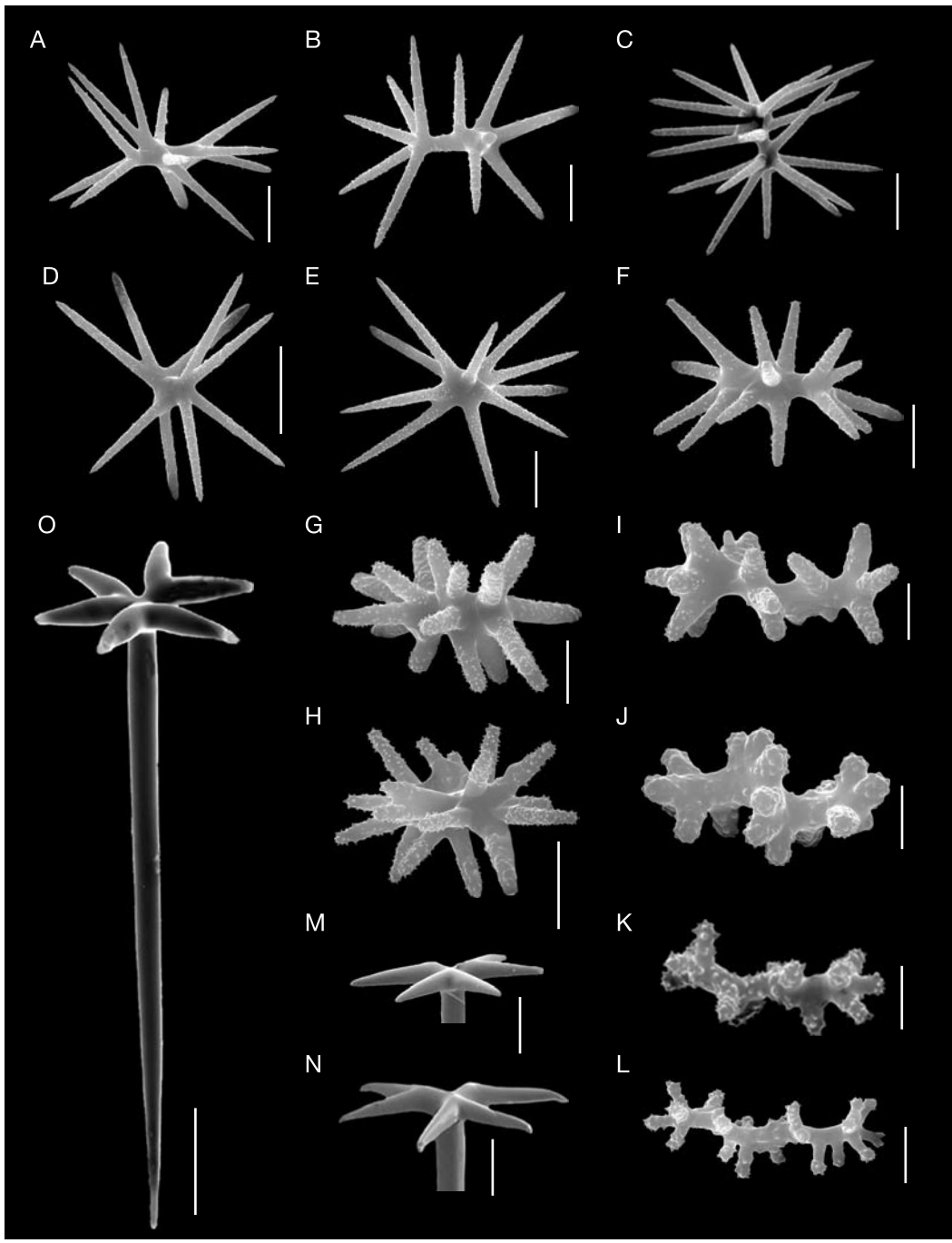

FIG. 23. — *Corallistes australis* n. sp.; **A**-**E**, spirasters with long pointed rays; **F**-**H**, massive spiraster with long blunt rays; **I**-**L**, massive spiraster with short blunt rays; **M**, **N**, cladome of ectosomal dichotriaenes; **O**, ectosomal dichotriaene. Scale bars: A-H, 10 µm; I-L, 5 µm; M-O, 100 µm.

DESCRIPTION

Growth form

Massive conical to subspherical sponges with a simple base and a flattened upper surface with or without a shallow depression at the top. The examined specimens are about 3 to 6 cm high and 3 to 6 cm wide at the top.

Colour

Beige in etoh.

Oscules

Dispersed oscules on the upper surface, 2 mm in diameter.

Texture

Hard.

Surface ornamentation

Velvety.

Ectosomal skeleton

Outer surface of the sponge is covered by 1-3 mm thick layer without desmas which is composed of densely packed radial bunches of long oxeas and anatriaenes, which are deeply rooted in the choanosome. Sparsely distributed dichotriaenes and numerous microscleres occur in the dermal region. Microscleres also occur in great numbers in the subdermal region, which is characterised by large interconnected spaces and rare desmas.

Choanosomal skeleton

Choanosomal skeleton consists of megaclone desmas with long zygomes. The zygoses are rather weak and therefore produce a delicate skeleton. Apart from desmas there are numerous radially oriented, long oxeas.

Megascleres

Megaclone desmas smooth, slender, and poorly branched, with long zygomes and weak zygoses: 1000-1500 µm/70-100 µm.
Oxeas: 2.29 mm × 23.9 µm.
Dichotriaenes: 1.34 mm long × 741 µm (diameter of the cladome).
Anatriaenes: 91-104 µm long × 738-775 µm.

Microscleres

Microxeas (spinose, curved): 141-157 × 6.27-7.24 µm.
Streptasters/amphiasters (pointed to blunt): 12.3-14.4 × 8.36-10.2 µm.
Microstyles (spinose): 105-120 × 10-15 µm.

REMARKS

This new material conforms closely in shape and spicule geometry with material already described from the region.

Family THEONELLIDAE Lendenfeld, 1903

DEFINITION. — Polymorphic lithistids with tetraclone choanosomal desmas and phyllo- to discotriaenes as ectosomal spicules; microscleres are spinose microrhabds and/or microxeas, and streptasters and/or pseudospherasters (Pisera & Lévi 2002d).

Genus *Discodermia* du Bocage, 1870

Discodermia du Bocage, 1870: 15, pl. 11: 1.

TYPE SPECIES. — *Dactylocalyx polydiscus* Bowerbank, 1869 by subsequent designation (Pisera & Lévi 2002d).

DEFINITION. — Exclusively discotriaenes as ectosomal spicules and acanthoxeas and acanthorhabds as microscleres (Pisera & Lévi 2002d).

Discodermia proliferans Lévi & Lévi, 1983 (Figs 4A; 17; 31)

Discodermia proliferans Lévi & Lévi, 1983: 121, fig. VI, 4, pl. VII, 1-2, 4-9.

HOLOTYPE. — New Caledonian Slope (MNHN DCL 2781).

MATERIAL EXAMINED (see Table 1). — Éponge, 508-541 m (QM G318557). — Introuvable, 575-589 m (QM G318639). — Stylaster, 469-860 m (QM G318697).

DESCRIPTION

Growth form

Arborescent, digitate sponges. The examined specimens are approximately 4 cm high.

Colour

Light beige in etoh.

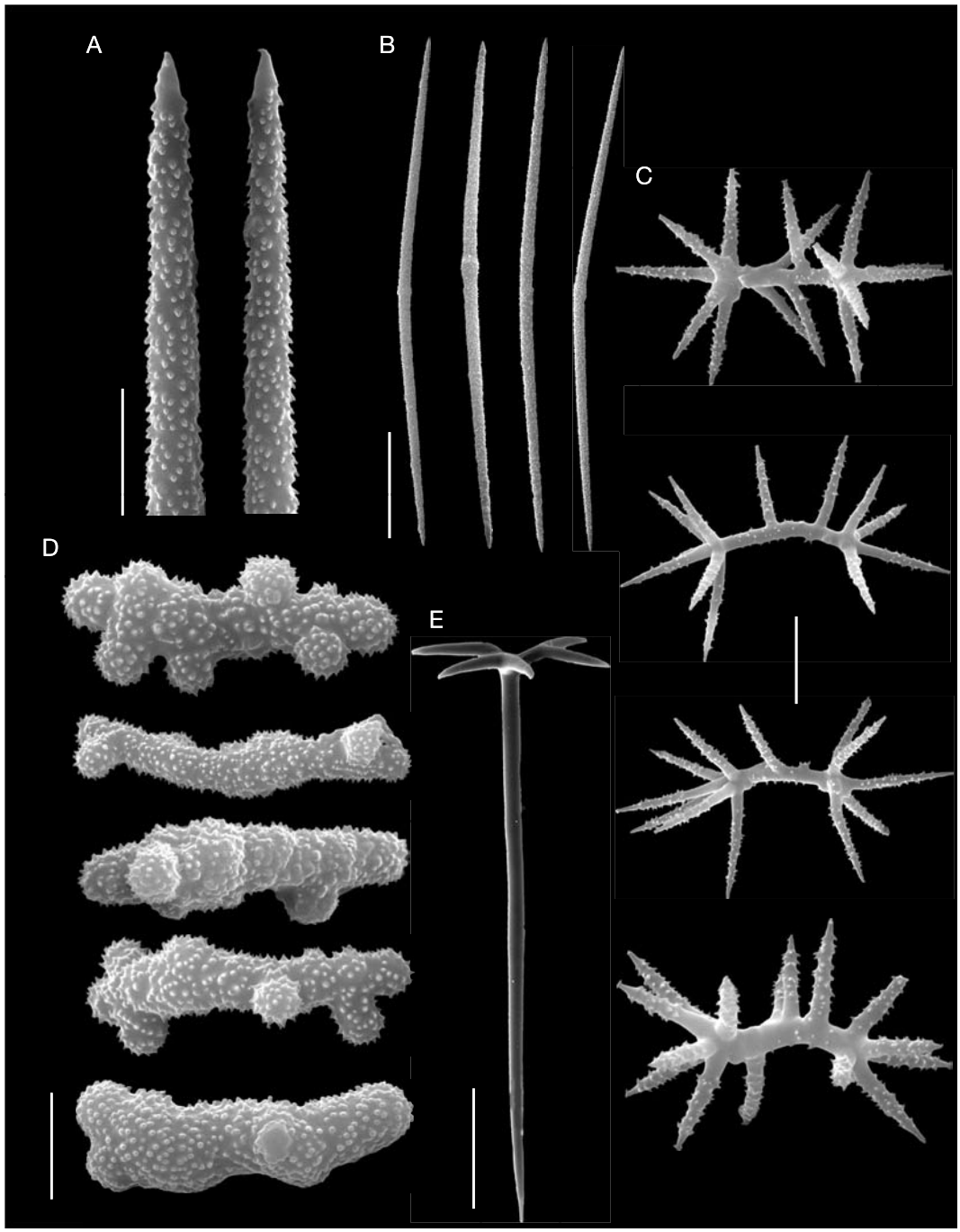

FIG. 24. — *Herengeria vasiformis* n. sp.; **A**, detail of microxea; **B**, microxeas; **C**, choanosomal spirasters with slender rays; **D**, subectosomal rhabd-like spirasters; **E**, ectosomal dichotriaene. Scale bars: A, C, D, 5 µm; B, 20 µm; E, 100 µm.

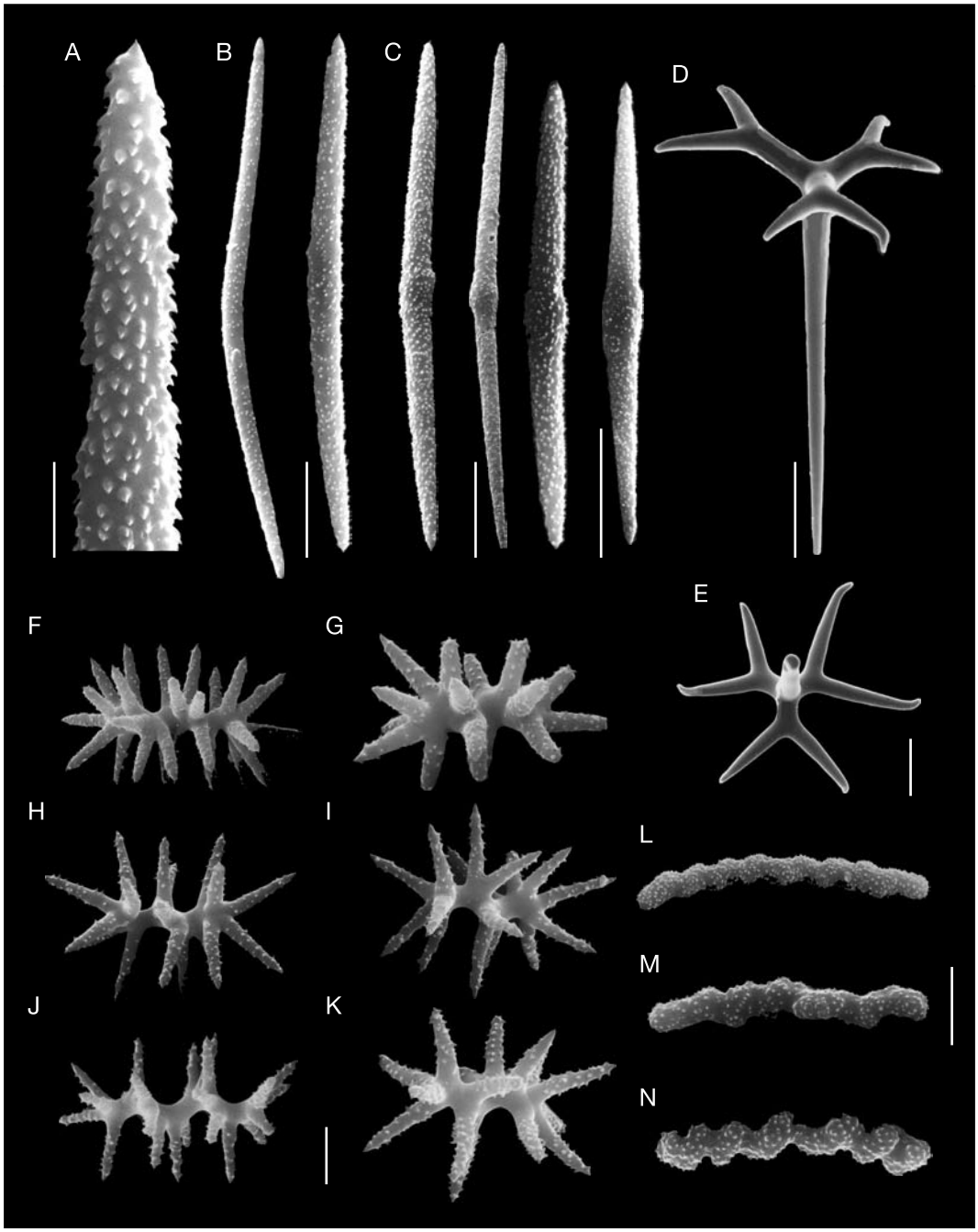

FIG. 25. — *Herengeria auriculata* Lévi & Lévi, 1988; **A**, detail of microxea; **B**, **C**, microxeas; **D**, ectosomal dichotriaene; **E**, cladome of ectosomal dichotriaene; **F**-**K**, choanosomal spirasters with slender rays; **L**-**N**, subectosomal rhabd-like spirasters. Scale bars: A, 5 µm; B, C, 20 µm; D, E, 100 µm; F-N, 10 µm.

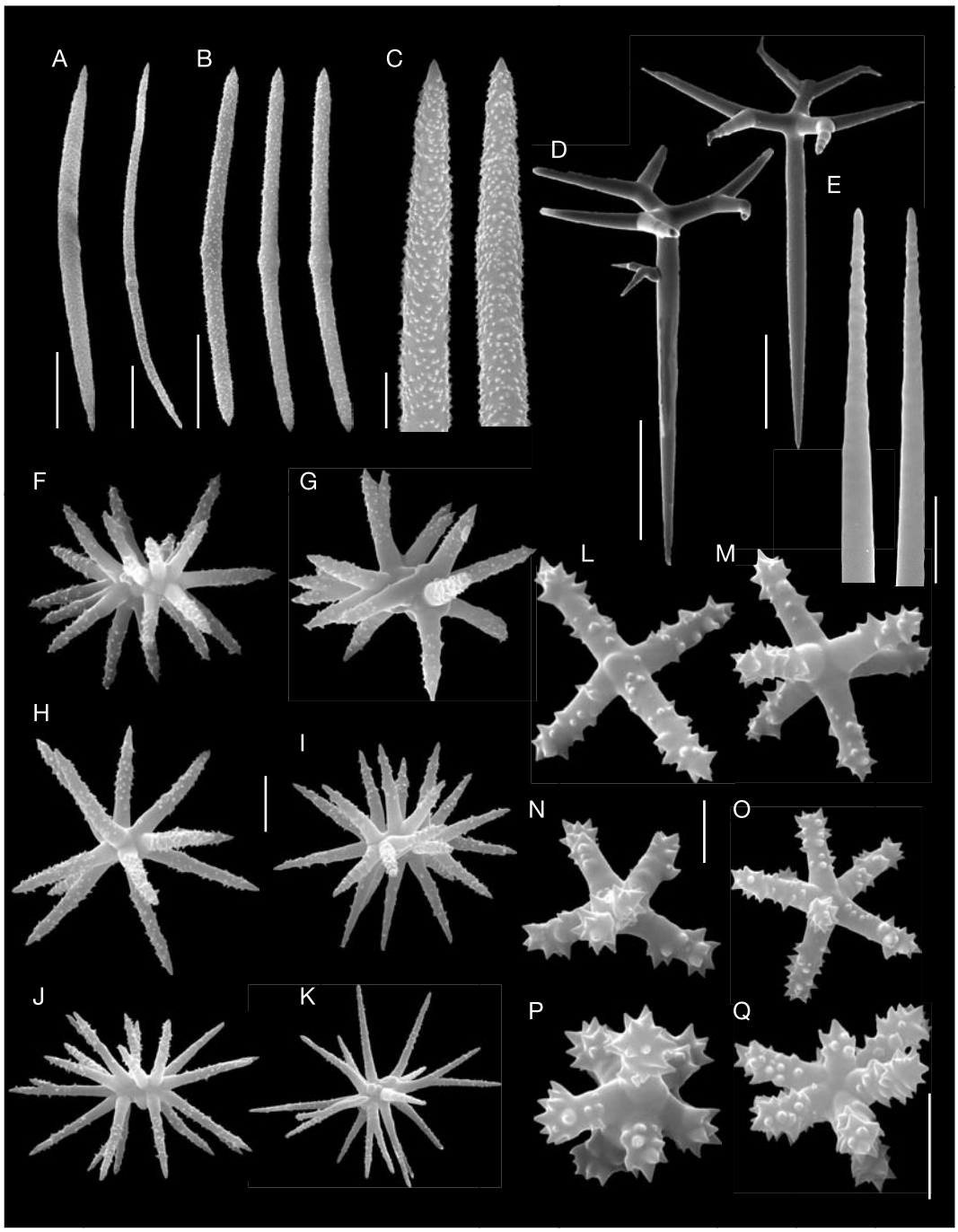

FIG. 26. — *Isabella mirabilis* n. gen., n. sp.; **A**, **B**, microxeas; **C**, detail of microxea; **D**, ectosomal dichotriaenes; **E**, tips of ectosomal dichotriaenes; **F**-**K**, variable spiraster with slender arms; **L**-**Q**, thick streptaster. Scale bars: A, B, 20 µm; C, F-Q, 5 µm; D, 100 µm; E, 10 µm.

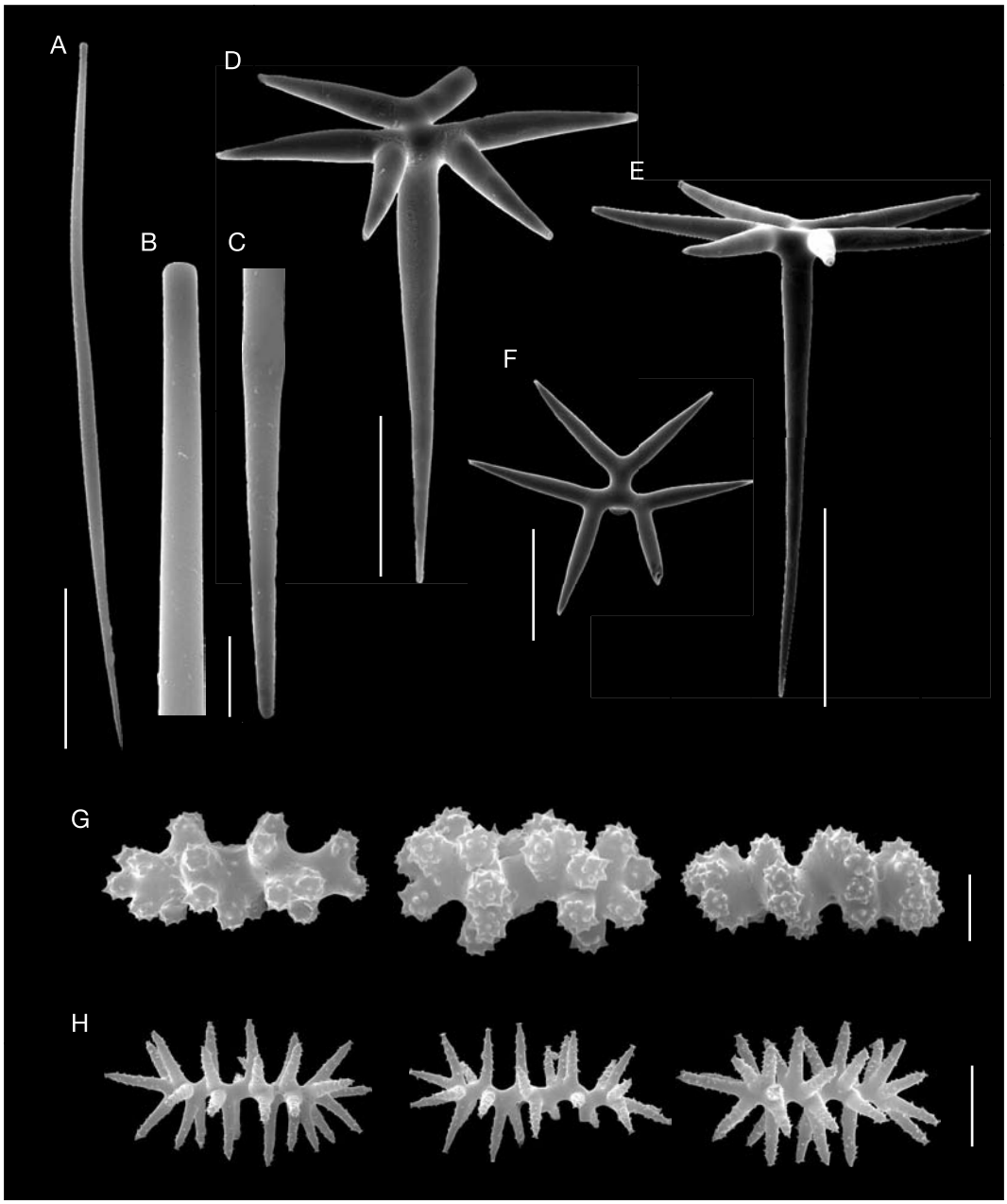

FIG. 27. — *Neoschrammeniella moreti* Lévi & Lévi, 1988; **A**, choanosomal microanisoxea; **B**, head of choanosomal microanisoxea; **C**, tip of choanosomal microanisoxea; **D**, **E**, ectosomal dichotriaene; **F**, cladome of ectosomal dichotriaene; **G**, ectosomal rhabd-like spirasters; **H**, choanosomal spirasters with slender arms. Scale bars: A, H, 10 µm; B, C, G, 5 µm; D-F, 200 µm.

Oscules
Not visible.

Texture
Hard, stony.

Surface ornamentation
Smooth with surface striation (subdermal canals).

Ectosomal skeleton
Ectosomal skeleton consists of a dense crust of round to oval discotriaenes with slightly incised margins and with short conical rhabds.

Choanosomal skeleton
Choanosomal skeleton consists of a dense skeleton of regular massive tetraclone desmas which bear strong, round and smooth tubercles. Desmas connected by strong zygoses. Acanthoxeas scattered throughout the choanosome.

Megascleres
Tetraclone desmas are thick, and strongly tuberculated, with very regular rounded and smooth tubercles: 500-600 µm/80-90 µm.
Discotriaenes: 492-673 µm.

Microscleres
Microacanthoxeas (centrotylote): 83.7-117 × 5.6-6.85 µm.
Acanthorhabds or strongyles (ovoid): 9.53-13.9 × 4.8-5.84 µm.

REMARKS
This new material is identical to the holotype in morphology and desma geometry, differing only in the larger diameter of discotriaenes, and in having larger microxeas.

Family NEOPELTIDAE Sollas, 1888

DEFINITION. — Polymorphic lithistids with monocrepid desmas of complex morphology (often resembling tetraclones) and monaxial ectosomal pseudophyllotriaenes and/or pseudodiscotriaenes; microscleres are amphiasters and/or spinose oxeas (Pisera & Lévi 2002e).

Genus *Homophymia* Vacelet & Vasseur, 1971

Homophymia Vacelet & Vasseur, 1971: 63, fig. 6, pl. 1: 4-7.

TYPE SPECIES. — *Homophymia lamellosa* Vacelet & Vasseur, 1971 by monotypy.

DEFINITION. — Smooth pseudophyllotriaenes as ectosomal spicules and one type of amphiaster as microscleres (Pisera & Lévi 2002e).

Homophymia pollubrum n. sp.
(Figs 4B; 18; 32)

HOLOTYPE. — Kaimon-Maru seamount, Norfolk Ridge, 24°43'83"S, 168°09'34"E, 233-246 m, RV *Alis*, 22.VI.2001, Warén dredge, coll. T. Schlacher (MNHN DCL 3906, a fragment of the holotype in QM [G318659]).

ETYMOLOGY. — Named for the shallow bowl shape (*pollubrum*, Greek for washbasin).

DESCRIPTION
Growth form
Known only from the holotype. Massive spherical sponge with a short, broad peduncle and a flattened upper surface and an axial cavity, which extends throughout the spherical part of the sponge and ends as a small opening as terminal extension at the flattened summit. The examined specimen is about 2.5 cm high, 3 cm wide and has a 2 cm broad base.

Colour
Beige in etoh.

Oscules
One large oscule at one side of the sponge (0.6 mm) and a small opening at the flattened summit of the spherical sponge (1 mm).

Texture
Hard.

Surface ornamentation
Rough with surface striations (subdermal canals).

Ectosomal skeleton
Ectosomal surface is composed of pseudophyllotriaenes, which are partially fused by their zygoses

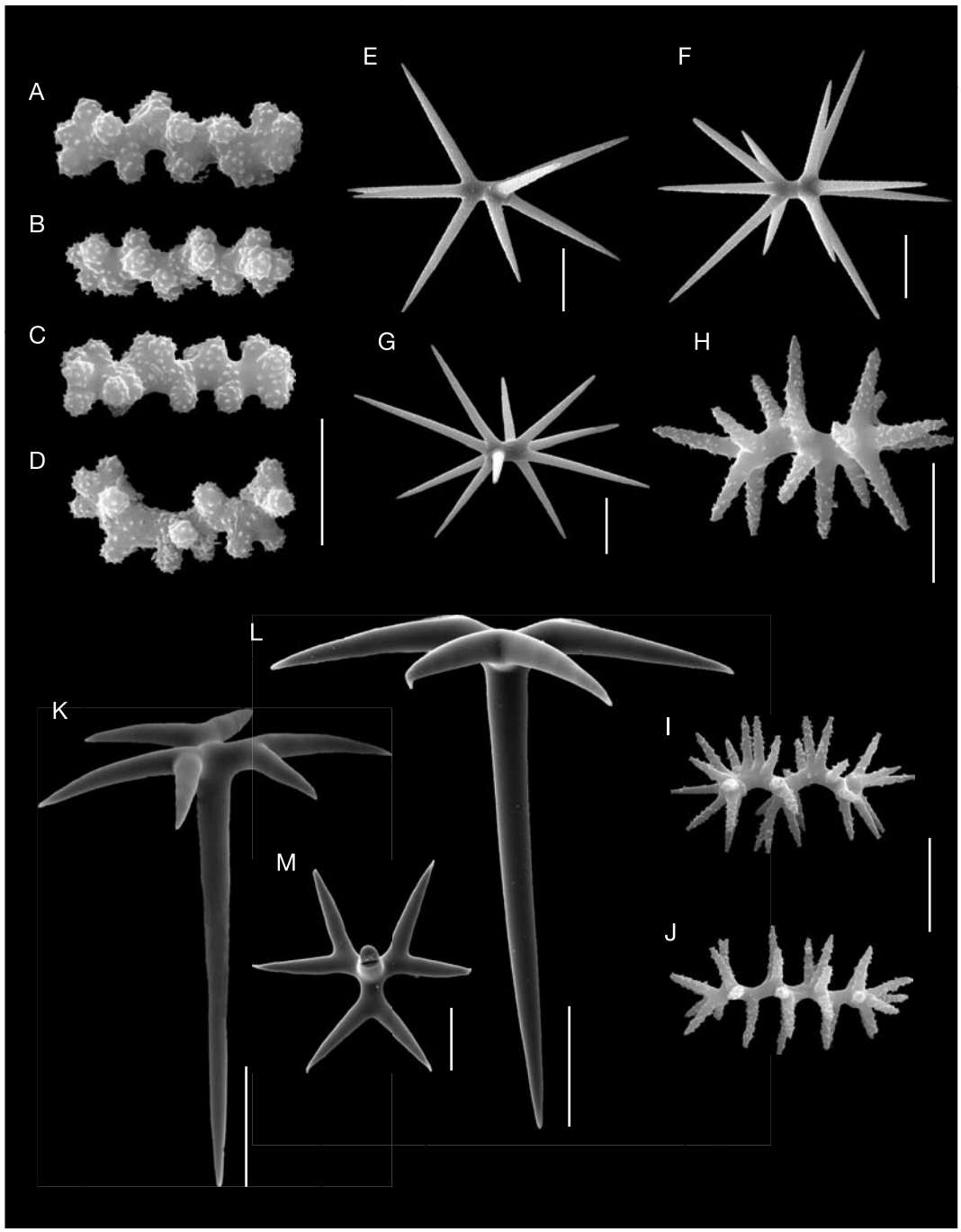

FIG. 28. — *Neoschrammeniella norfolkii* n. sp.; **A**-**D**, massive ectosomal rhabd-like spirasters; **E**-**G**, choanosomal spirasters with long pointed rays; **H**-**J**, choanosomal spirasters with long pointed rays; **K**, **L**, ectosomal dichotriaene; **M**, cladome of ectosomal dichotriaene. Scale bars: A-D, H-J, 10 µm; E-G, 20 µm; K-M, 100 µm.

with neighbouring ectosomal megascleres and choanosomal desmas below the surface. Rhabdomes of the pseudophyllotriaenes, which are shorter than the cladomes, are orientated perpendicular to the surface. Amphiasters are very abundant in the ectosome.

Choanosomal skeleton
Dense network of highly irregularly branched desmas with root-like termini. Clones are smooth. Zygomes bear smooth mushroom-shaped tubercules which are tightly wrapped and composed of the sinuous interlocking fingers of the desmas termini. Heavy zygome development. Amphiasters are abundant and regularly dispersed throughout the choanosome. Microscleres are scattered throughout the choanosome.

Megascleres
Desmas are monocrepid, and highly irregularly branched with smooth clones and tightly wrapped, root-like termini. The latter bear numerous, mushroom-shaped tubercles. Adjacent desmas are heavily zygosed and build a complex skeletal network via entanglement of their extremities, which is aided by the sinuous interlocking fingers of the zygome termini: 400-500 µm/35-45 µm. Pseudophyllotriaenes: 395-541 µm in diameter; in other places 244-270 µm in diameter; rhabd shorter than diameter of the cladome 120-150 long µm.

Microscleres
Amphiasters: 12.7-18.8 × 11.7-16.2 µm.

REMARKS
This species differs clearly from the type species *Homophymia lamellosa* in shape and spiculation. It resembles more closely *H. stipitata* Kelly, 2000, in being semiglobular, but differs in having a deep narrow spongocoel and a very short and wide peduncle. It differs also from this species in having less branched pseudophyllotrienes which have wide clades. Amphiasters in both species are similar, but in *H. pollubrum* they are slightly larger, have longer rays and are less massive in appearance.

Family PHYMATELLIDAE Schrammen, 1910

DEFINITION. — Polymorphic lithistids with large, regular, usually smooth tetraclone desmas as choanosomal spicules and smooth ectosomal dichotriaenes; microscleres are amphiasters/streptasters (Pisera & Lévi 2002f).

Genus Reidispongia Lévi & Lévi, 1988

Reidispongia Lévi & Lévi, 1988: 245, figs 11-14.

TYPE SPECIES. — *Reidispongia coerulea* Lévi & Lévi, 1988 by monotypy.

DEFINITION. — Lamellar or cup-shaped Phymatellidae (Pisera & Lévi 2002f).

Reidispongia coerulea Lévi & Lévi, 1988
(Figs 4D; 20; 34)

Reidispongia coerulea Lévi & Lévi, 1988: 245, pl. 2, fig. 2.

HOLOTYPE. — New Caledonian Slope (MNHN DCL 3538).

MATERIAL EXAMINED (see Table 1). — Éponge, 508-541 m (QM G318563, QM G318600, QM G318601, QM G318642).

DESCRIPTION
Growth form
Cup-shaped sponges with thin folded walls or contorted lamellae with a smooth surface and a simple base. Cup openings mainly ovoid. This new material is approximately 5 cm high and 8 × 5 cm wide with a 1.5 cm broad base.

Colour
Blue to dark bluish grey in etoh.

Oscules
Not obvious. Canal openings on the surface of the choanosomal skeleton: I surface: 197-250 µm; II surface: 135-140 µm.

Texture
Hard, but brittle.

Surface ornamentation
Smooth.

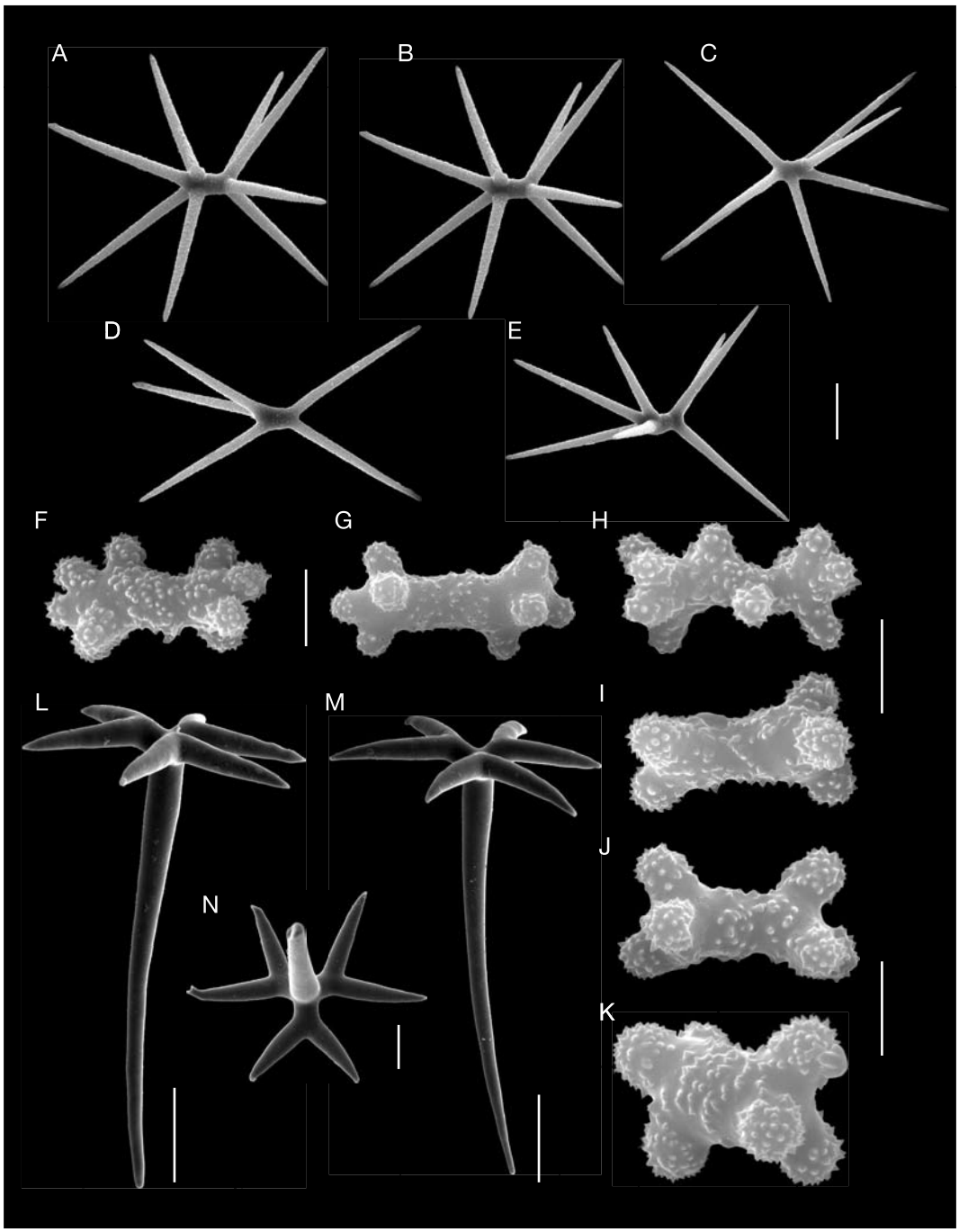

FIG. 29. — *Neoschrammeniella castrum* n. sp.; **A**-**E**, choanosomal spirasters with long pointed rays; **F**-**K**, massive ectosomal rhabd-like spirasters; **L**, **M**, ectosomal dichotriaene; **N**, cladome of ectosomal dichotriaene. Scale bars: A-E, 20 µm; F-K, 5 µm; L-N, 100 µm.

FIG. 30. — *Anaderma rancureli* Lévi & Lévi, 1983; **A**, **B**, section perpendicular to the outer surface showing subectosomal spaces and bunches of anatriaenes and oxeas in fan-like organisation; **C**, microxeas; **D**, styles; **E**, ectosomal anatriaene; **F**, streptaster/amphiaster. Scale bars: A, B, 1 µm; C, 20 µm; D, 10 µm; E, 50 µm; F, 5 µm.

Ectosomal skeleton

Smooth dichotriaenes and some long oxeas occur on both surfaces. Microscleres in the ectosome are amphiasters/streptasters with short and massive rays covered by numerous low spines and rounded, blunt tips.

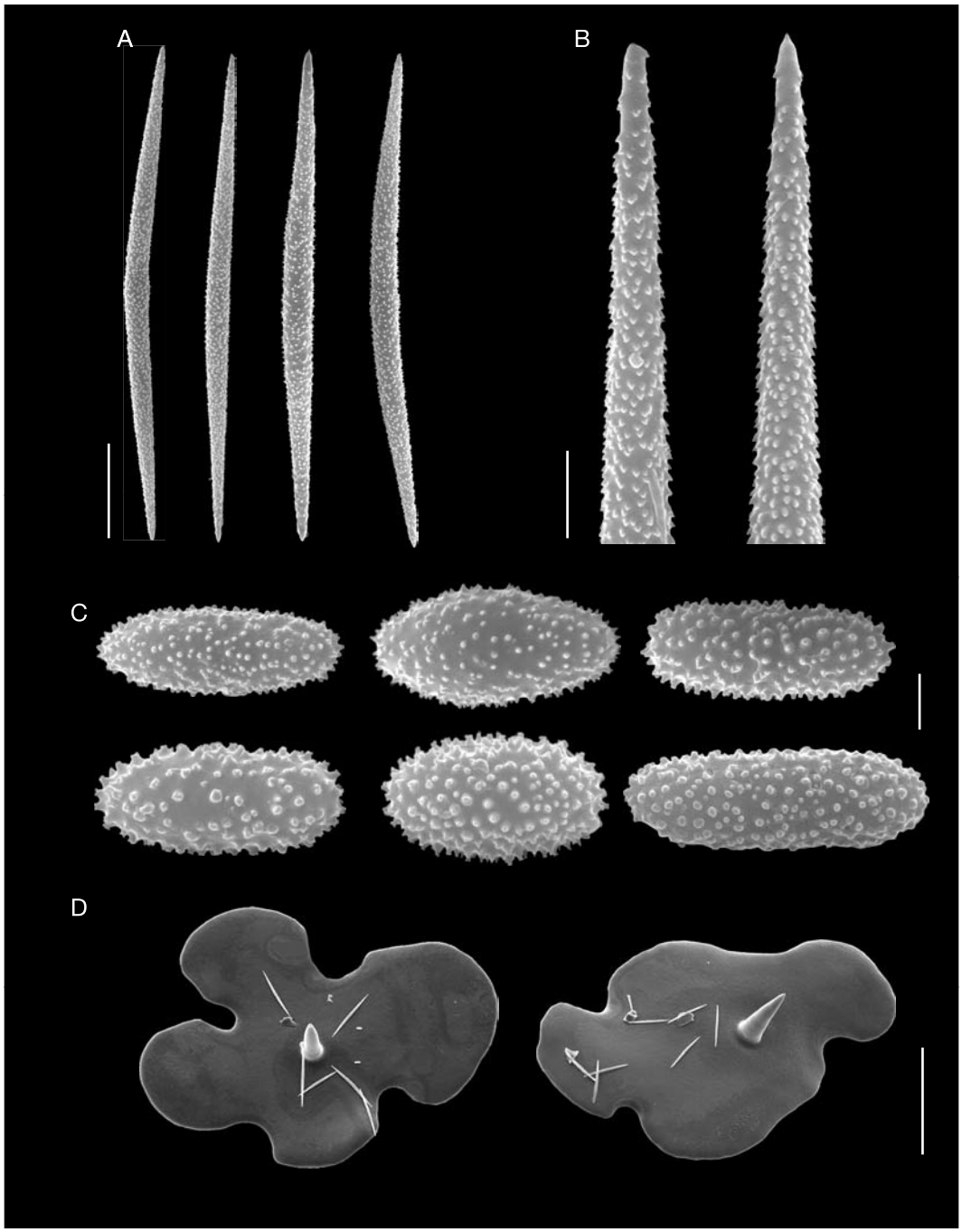

FIG. 31. — *Discodermia proliferans* Lévi & Lévi, 1983; **A**, microacanthoxeas; **B**, detail of microacanthoxeas; **C**, fusiform acanthorhabds; **D**, discotriaene. Scale bars: A, 20 µm; B, 5 µm; C, 2 µm; D, 200 µm.

Choanosomal skeleton
The relatively dense choanosomal skeleton consists of smooth branched tetraclone desmas; there is very poor or no terminal articulation resulting in a fragile sponge structure. Microscleres in the choanosome are amphiasters/streptasters which are covered with hook-like spines and have long and slender rays with pointed ends.

Megascleres
Tetraclone desmas: smooth, branched, with poor terminal articulation: 380-420 µm/20-30 µm.
Dichotriaenes: 100-190 µm long × 150-300 µm (diameter of cladome).
Oxeas: 500-1000 × 7-8 µm.

Microscleres
Massive amphiasters/streptasters: 9.61-12.8 × 7.46-10.3 µm.
Amphiasters/spirasters with long rays: 19-21.2 × 15.4-16.1 µm.

REMARKS
This new material agrees closely with the holotype in shape and desma geometry. The morphology and size of microscleres is also identical with the type material.

Reidispongia tuberculata n. sp.
(Figs 4C; 19; 33)

HOLOTYPE. — New Caledonian Slope, 22°52'22"S, 167°12'27"E, 340-381 m, RV *Alis*, 28.VI.2001, Warén dredge, coll. T. Schlacher (MNHN DCL 3907, a fragment of the holotype in QM [G318677]).

ETYMOLOGY. — Named for the tuberculation of desmas.

DESCRIPTION
Growth form
Massive shallow cup/bowl-shaped with thick walls, round margins and a simple base. The examined specimen is about 3 cm high, 5.5 cm wide and has a 2 cm broad base.

Colour
Light blue to dirty white in etoh.

Oscules
Not visible.

Texture
Hard, stony.

Surface ornamentation
Rough.

Ectosomal skeleton
Smooth dichotriaenes and some long oxeas occur on both surfaces. Microscleres in the ectosome are amphiasters/streptasters with short and massive rays covered by numerous low spines and rounded, blunt tips.

Choanosomal skeleton
The relatively dense choanosomal skeleton consists of strongly tuberculated tetraclone desmas. Microscleres in the choanosome are amphiasters/streptasters which are covered with hook-like spines and have long and slender rays with pointed ends.

Megascleres
Tetraclone desmas are thick, and more or less evenly covered by numerous mushroom-shaped, round, invariably smooth tubercles: 700-750 µm/35-65 µm.
Dichotriaenes: 350-400 µm long × 150-440 µm (diameter of the cladome).
Oxeas: 1200-1800 µm × 10-15 µm.

Microscleres
Massive amphiasters/streptasters: 12.6-13.8 × 10.1-11.7 µm.
Streptasters with long pointed rays: (very variable) 14.4-37.2 × 12.9-30.4 µm.

REMARKS
This species slightly resembles *Reidispongia coerulea* in its blue live colouration and microsclere spiculation. Upon closer investigation, however, it is distinguished from that species in differences in morphology (cup-shaped and very thick walled, while *R. coerulea* has very thin folded walls), and desmas (which are strongly tuberculated, with rounded mushroom-like tubercles [Fig. 19D] as compared to smooth zygomes in *R. coerulea* [Fig. 20F]).

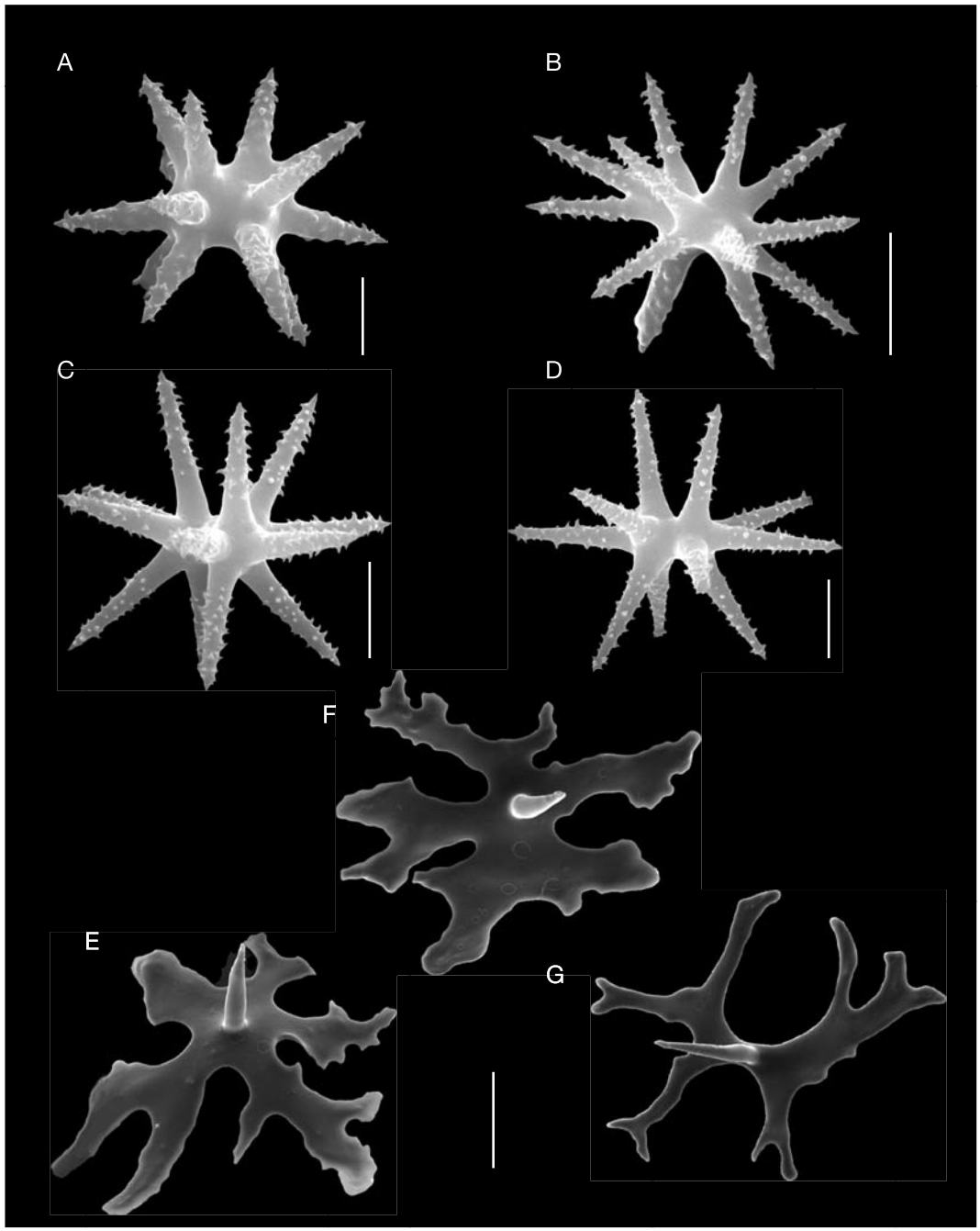

FIG. 32. — *Homophymia pollubrum* n. sp.; **A**-**D**, amphiasters, **E**-**G**, ectosomal pseudophyllotriaenes. Scale bars: A-D, 5 µm; E-G, 100 µm.

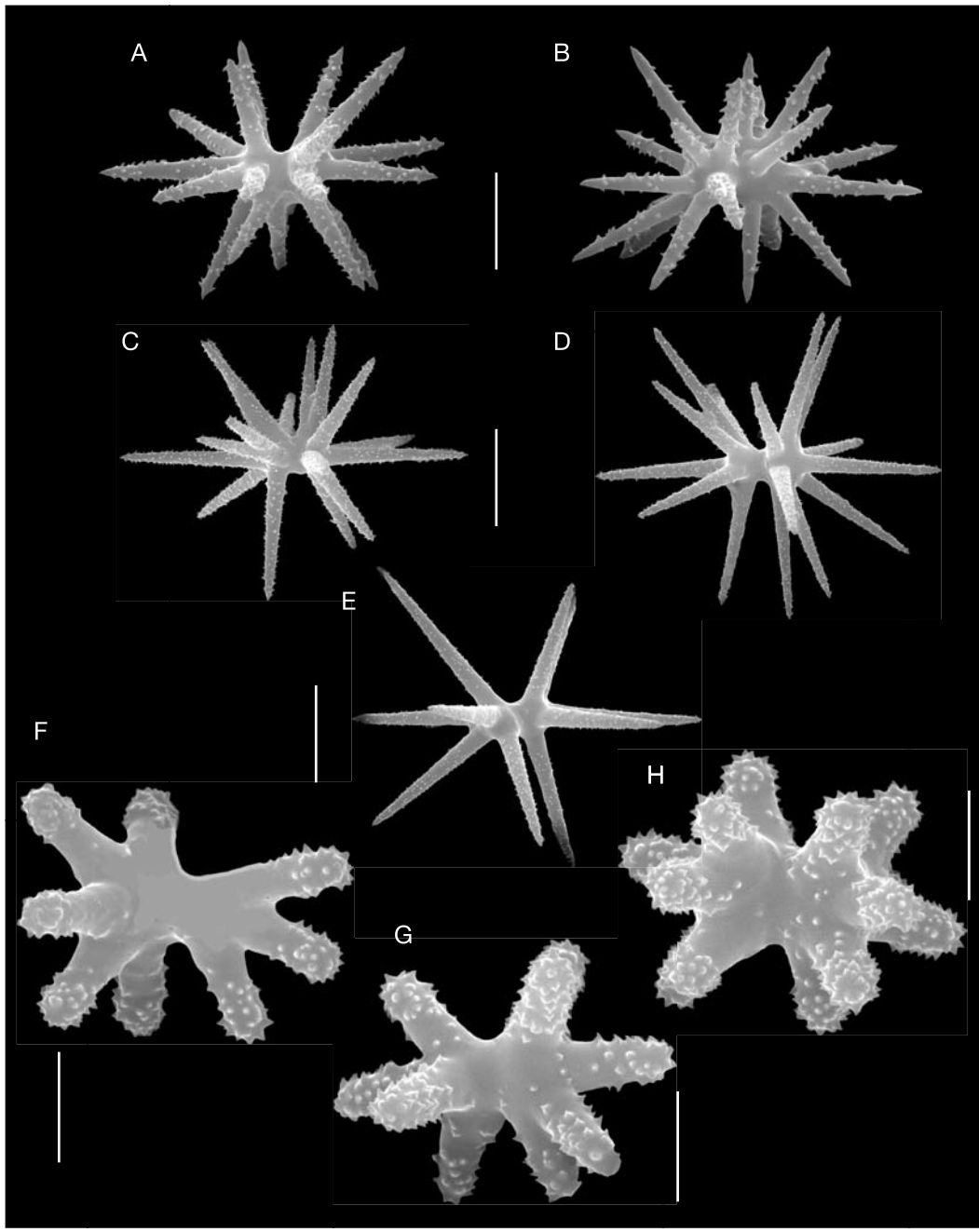

FIG. 33. — *Reidispongia tuberculata* n. sp.; **A**, **B**, choanosomal streptasters/amphiasters with long pointed rays; **C**-**E**, variable choanosomal streptasters/amphiasters with long pointed rays; **F**-**H**, massive ectosomal streptasters/amphiasters. Scale bars: A, B, 5 µm; C-E, 10 µm; F-H, 5 µm.

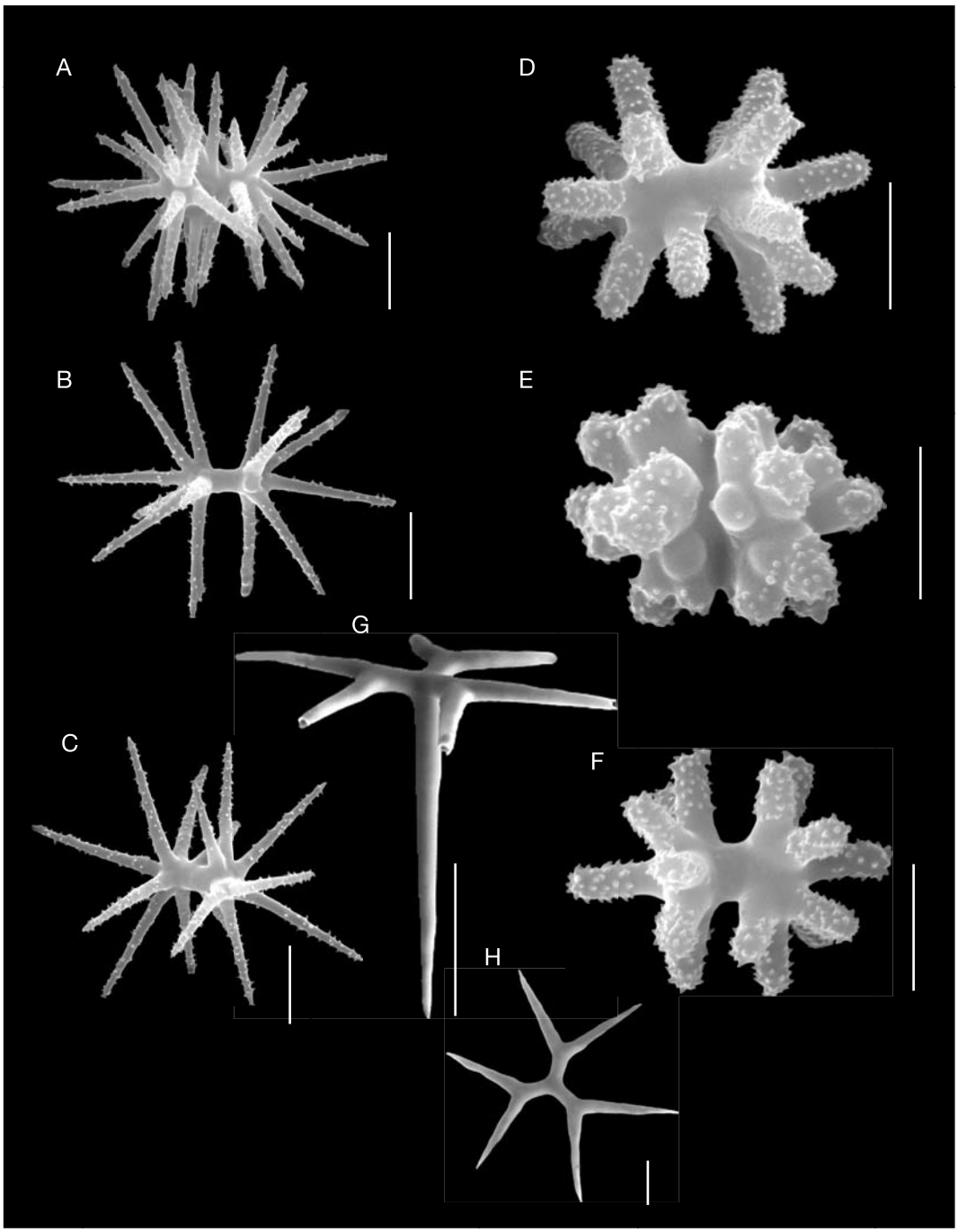

FIG. 34. — *Reidispongia coerulea* Lévi & Lévi, 1988; **A**-**C**, variable choanosomal streptasters/amphiasters with long pointed rays; **D**-**F**, massive ectosomal streptasters/amphiasters; **G**, ectosomal dichotriaene; **H**, cladome of ectosomal dichotriaene. Scale bars: A-F, 5 µm; G, H, 100 µm.

TABLE 3. — Distribution of sponges on seamounts and slope localities, including prevalence of species per locality and number of localities per species.

Species	Locality										
	Seamount								Slope		
	Banc 1	Stylaster	Jumeau-West	Kaimon-Maru	Éponge	Introuvable	Jumeau-East	Antigonia	Banc 2	Sud-NC	**Species distribution**
Aciculites orientalis Dendy, 1905						×					1
Scleritoderma sp.				×							1
Scleritoderma flabelliforme Sollas, 1888	×				×			×			3
Scleritoderma camusi Lévi & Lévi, 1983							×				1
Coralistes australis n. sp.			×						×		2
Herengeria auriculata Lévi & Lévi, 1988					×	×					2
Herengeria vasiformis n. sp.					×					×	2
Isabella mirabilis n. sp.			×					×			2
Neoschrameniella moreti Lévi & Lévi, 1988						×					1
Neoschrameniella norfolkii n. sp.			×			×					2
Neoschrameniella castrum n. sp.					×						1
Anaderma rancureli Lévi & Lévi, 1983	×		×								2
Discodermia proliferans Lévi & Lévi, 1983		×			×						2
Homophymia pollubrum n. sp.				×							1
Reidispongia coerulea Lévi & Lévi, 1988					×						1
Reidispongia tuberculata n. sp.										×	1
Seamount diversity	**2**	**1**	**4**	**2**	**6**	**4**	**1**	**2**	**1**	**2**	

DISCUSSION

Previous work on "lithistids" in Western and Southern Pacific has primarily concerned faunas on slopes and ridges surrounding islands, at bathyal depths (e.g., Sollas 1888; Lévi & Lévi 1983, 1988, 1989; Lévi 1991; Kelly 2000), with only a few records from the upper portions of the many seamounts in this region. In this study we recorded the "lithistid" faunas of nine seamounts (and one island slope locality) to the south of New Caledonia, reporting 16 species (seven new, one indeterminate) including a new genus. Given the geographic differences between previous and present sampling regimes, however, it is not surprising that only seven species (21%) were common to all studies (Table 2), with nine (27%) recorded from this region for the first time. Similarly, only three localities contained more than four of the 16 species recorded here (Table 3: Jumeau-West, Introuvable and Éponge), and only one species (*S. flabelliformis*) was recorded from more than two localities, with the remainder found from only two (seven species) or single localities (eight species). Undoubtedly all localities were under-sampled, with only two to six replicate trawls undertaken at each site, but this apparent spatial heterogeneity is widely reported in the benthic marine biodiversity literature, including seamount faunas (e.g., Richer de Forges *et al.* 2000), and other sponge habitats (e.g., Hooper *et al.* 2002). Analysis of this seamount "lithistid" sponge distribution will be presented elsewhere (Schlacher & Schlacher- Hoenlinger in prep.).

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