

The genus *Igernella* (Demospongiae : Dendroceratida) with description of a new species from the central Atlantic

by María-Jesús URIZ & Manuel MALDONADO

Abstract

The genus *Igernella* TOPSENT, 1905 includes those dendroceratid sponges characterised by an irregularly reticulate skeleton arising from a spongin plate and the presence of diactinal, triactinal, or tetractinal spiculoids. To date, two species of this genus had been described: *I. mirabilis* LÉVI from the Indo-Pacific and *I. notabilis* (DUCHASSAING & MICHELOTTI) from the central Atlantic.

A re-examination of material previously assigned to the genera *Igernella* and *Darwinella* allowed us to detect the existence of a second species of *Igernella* in the central Atlantic. *Igernella vansoesti* sp. nov. is erected to include the specimens from the Cape Verde Islands assigned to *I. notabilis* by VAN SOEST (1993), and one specimen from the Gulf of Mexico formerly recorded under the name *D. muelleri* SCHULZE by DE LAUBENFELS. The specimen described as *D. joyeuxi* TOPSENT by LITTLE (1963) probably belongs to this species as well. The new species is distinguishable from *I. notabilis* by its massive growth habit -without conspicuous tubes-, a minutely conulose surface, small oscules, and a skeletal network, made of narrow primary and secondary fibres, denser than that of *I. notabilis*. There is an important amount of foreign material embedded in the mesohyl whereas it is scarce within the fibres or even absent.

The absence of debris in the fibres of some species of *Igernella* suggests a close relationship between this genus and other genera of the family Darwinellidae. This is in agreement with a recent proposal of moving the genus *Igernella* from the family Dictyodendrillidae to the family Darwinellidae on the basis of their chemical affinities.

Keywords : Demosponges, Dendroceratida, Darwinellidae, *Igernella*, systematics, new species, central Atlantic.

Resumen

El género *Igernella* TOPSENT, 1905 alberga aquellas esponjas dendroceratidas caracterizadas por un esqueleto irregularmente reticulado, que parte de una lámina basal de espongina, y por la presencia de espiculoides diactinados, triactinados o tetractinados. Hasta ahora, sólo dos especies de este género habían sido descritas: *I. mirabilis* LÉVI, del Indo-Pacífico, e *I. notabilis* (DUCHASSAING & MICHELOTTI), del Atlántico Central. El examen de cierto material, previamente asignado a los géneros *Igernella* y *Darwinella*, nos ha permitido detectar la existencia de una segunda especie de *Igernella* en el Atlántico Central. *Igernella vansoesti* sp. nov. se erige para incluir los ejemplares de las Islas de Cabo Verde asignados a *I. notabilis*

por VAN SOEST (1993) y un espécimen del Golfo de Méjico, descrito previamente bajo el nombre de *D. muelleri* SCHULZE por LAUBENFELS. El ejemplar descrito como *D. joyeuxi* TOPSENT por LITTLE (1963) probablemente pertenece también a esta nueva especie. *I. vansoesti* se diferencia de *I. notabilis* por su forma masiva, sin tubos evidentes, una superficie finamente conulosa, ósculos pequeños y una red esquelética consistente en fibras primarias y secundarias delgadas, más densamente dispuestas que en *I. notabilis*. En su mesohilo, se encuentra una importante cantidad de material foráneo, mientras que éste es escaso o incluso ausente en las fibras. La ausencia de material foráneo de las fibras de algunas especies de *Igernella* sugiere una relación estrecha entre éste y otros géneros de la familia Darwinellidae y apoya la reciente propuesta de trasladar el género *Igernella* de la familia Dictyodendrillidae a la familia Darwinellidae, en base a afinidades químicas.

Palabras clave : Demosponjas, Dendroceratida, Darwinellidae, *Igernella*, sistemática, especie nueva, Atlántico Central.

Introduction

The genus *Igernella* was erected by TOPSENT (1905) to include one specimen from the Gulf of Mexico, previously described under the name *Darwinella joyeuxi* TOPSENT, 1889. Later, LÉVI (1961) described a second species of this genus, *I. mirabilis*, from the West Indian Ocean. VAN SOEST (1978) synonymised *Igernella joyeuxi* with *Igernella* (= *Euryades*) *notabilis* (DUCHASSAING & MICHELOTTI, 1864) and added to the species description the presence of a continuous basal spongin plate as a diagnostic character. Thus, the genus *Igernella* contained up to now only two described species: *I. mirabilis* LÉVI from the Indo-Pacific and *I. notabilis* from the central Atlantic. The type species, *I. notabilis* is a rather frequent easily recognisable species. In contrast, *I. mirabilis* is known from very few records. This last species was re-described by VACELET & VASSEUR (1971) who compared their specimen to a *Darwinella* species devoid of the ascending fibres.

The genus *Igernella* was originally placed in the Family Pleraplysillidae by TOPSENT (1905) on the basis of the presence of cored fibres. Subsequently,

it was moved to the Darwinellidae MEREJKOWSKI by VAN SOEST (1978) because of the presence of horny spicules. It was later transferred to a new family (Dictyodendrillidae) erected by BERGQUIST (1980) to harbour Keratose sponges whose skeleton is intermediate between those of Dictyoceratida (reticulate) and Dendroceratida (fibres strongly coloured, pithed and laminated and horny spiculoids). Later, BERGQUIST and co-workers (1990) proposed to move this genus to the Aplysillidae (junior synonymy of Darwinellidae, according to HOOPER & WIEDENMAYER, 1994) on the account of the chemical affinities between *Igernella notabilis* and *Dendrilla rosea* (both species contained metabolites of the type aplyroseol-1 and 2, SCHMITZ *et al.*, 1985). Noticeable morphological differences detected between the Caribbean specimens of *I. notabilis* and some specimens from the Cape Verde Islands assigned to this species (VAN SOEST, 1993) induced us to conduct a taxonomic appraisal of the genus *Igernella* by re-examination of material from different geographical localities, belonging to the genera *Igernella* and *Darwinella*.

Taxonomic descriptions

Genus *Igernella* TOPSENT 1905

DIAGNOSIS

Diagnosis slightly amended from BERGQUIST, 1980. Sponges in which the fibrous skeleton is irregular, reticulate, and frequently reduced in relation to the bulk of the soft tissue. In some specimens, fibres appear to be concentrated superficially or even are totally absent. In structure, the fibres are laminated and have a pith, although this can be obscured by variable amounts of foreign material. The fibre skeleton is augmented by diactinal, triactinal, and tetractinal horny spicules comparable in structure to those of *Darwinella* MÜLLER. The reticulate skeleton arises from a basal spongin plate. Abundant foreign material may be present in the mesohyl and on the sponge surface.

Igernella mirabilis LÉVI, 1961

MATERIAL EXAMINED

NE coast of Sumba, Indonesia, E of Melolo, gradually sloping reef, 12 m, Dutch/Indonesian Snellius II Exped. : specimen ZMA POR. 9316.

DESCRIPTION

According to the specimen examined and the descriptions from the literature (LÉVI, 1961; VACELET & VASSEUR, 1971), *Igernella mirabilis* is a massive (non-tubular) sponge black, dark brown or white outside, white in colour inside. Its surface has pronounced widely separated conules, is smooth to the touch and lacks foreign material. The oscula are non-prominent, 2-6 mm in size. Consistency is somewhat resilient in alcohol, reminding that of some species of the genus *Sarcotragus* SCHMIDT.

SKELETON

The skeleton mainly consists of abundant horny spiculoids, with the fibre network either reduced to the sponge periphery (LÉVI, 1961; specimen ZMA POR. 9316) or totally absent (VACELET & VASSEUR, 1971). Fibres are laminated, pithed, and totally devoid of foreign material. No differentiation into primary and secondary fibres can be established. Their thickness varies in the different specimens, ranging from 7 µm to 67 µm in diameter. The spiculoids are diactines, triactines or/and tetractines with rays of about 400-1000 µm in length.

DISTRIBUTION

The geographical distribution is restricted to the Indo-Pacific. This species has been recorded from the Indian Ocean (LÉVI, 1961, VACELET & VASSEUR, 1971) and from Indonesia.

Igernella notabilis

(DUCHASSAING & MICHELOTTI, 1864)

MATERIAL EXAMINED

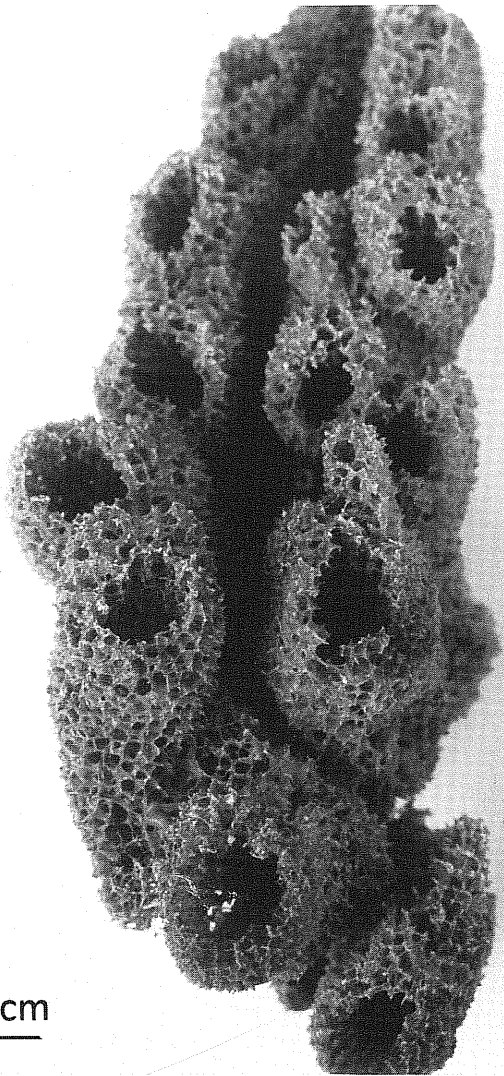
Curaçao, Blamobaai, 15-20 m : specimen ZMA POR. 3611; Anguilla : Bowing Point, specimen 2/5/86M ST32; Sandy Island, specimen 27/4/86MM ST24.

DESCRIPTION (Fig. 1)

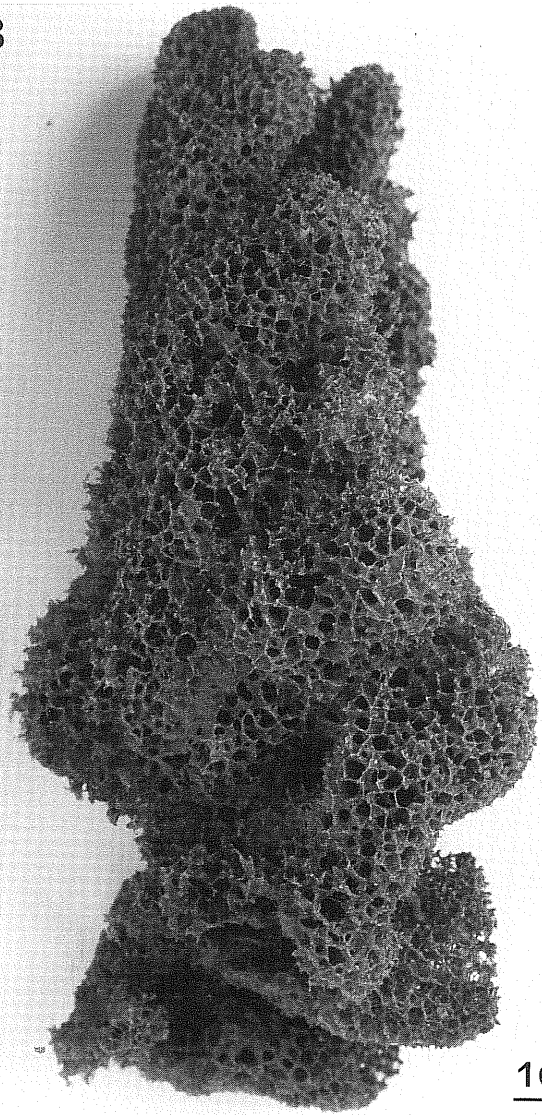
This is a well-known brick-pink sponge with a massive habit developing relatively wide anastomosing tubes which can be either open in a wide oscule (up to 1.5 cm in diameter) or closed by a thin ectosome perforated by small orifices (0.2-0.5 mm in diameter). The surface is provided with pronounced conules, 1-2 mm high, 1-4 mm apart.

Fig. 1.- *Igernella notabilis* (DUCHASSAING & MICHELOTTI). - A, B. Upper and lower sides of specimen POR. 3611 from Curaçao. - C. Fragment of specimen POR. 3611. - D. Specimen from Sandy Island (Caribbean).

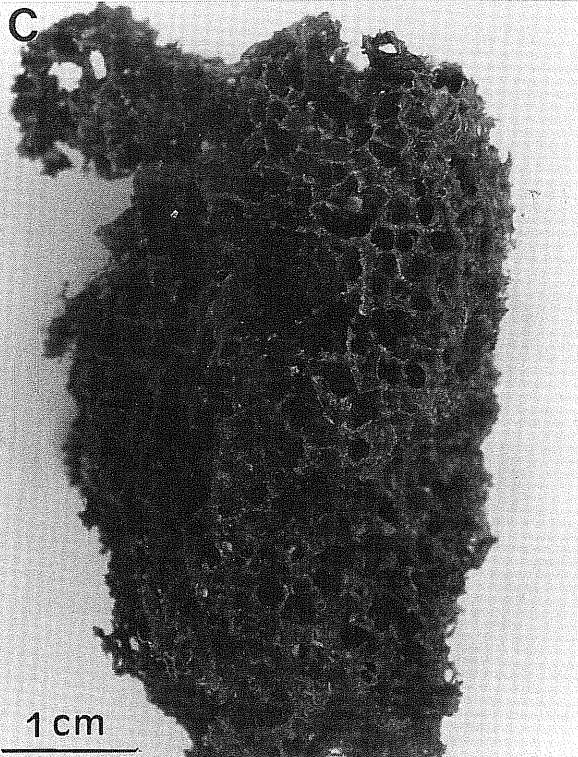
A



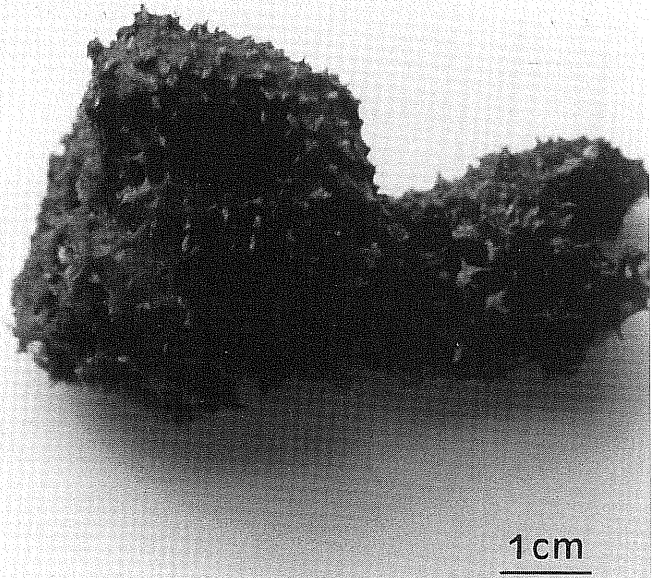
B



C



D



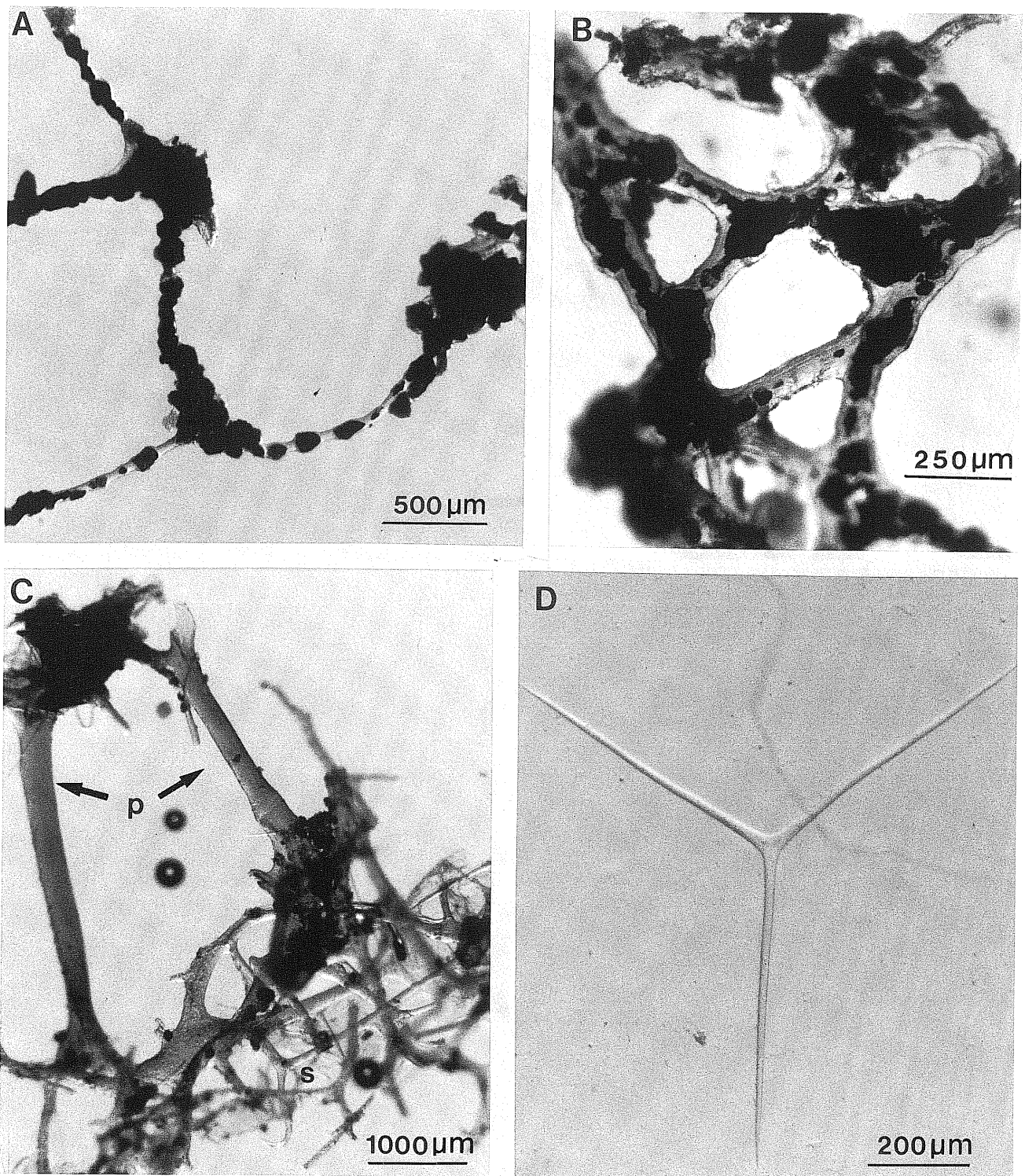
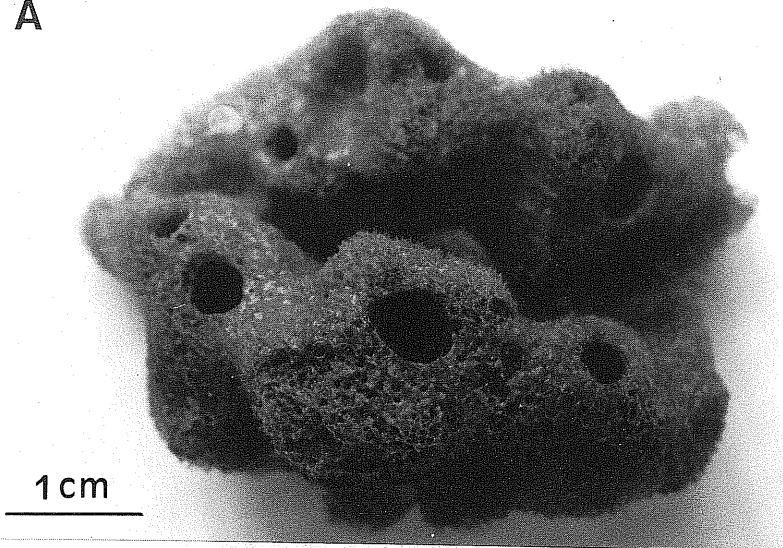


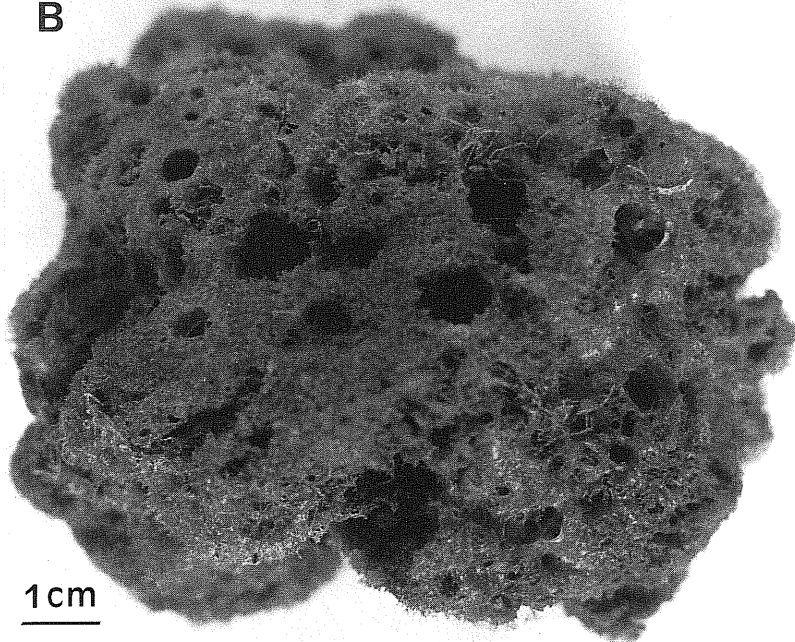
Fig. 2. - *Igernella notabilis*. - A, B. Ectosomal skeleton showing the fibres filled with foreign material. - C. Choanosomal skeleton; p : primary fibres; s : secondary fibres. - D. Triactinal spongin spicule.

Fig. 3. - *Igernella vansoesti* sp. nov., specimens from Cape Verde. - A. Holotype (ZMA POR . 11036). - B. Specimen ZMA POR . 6938a - C. Specimen ZMA POR . 6938b.

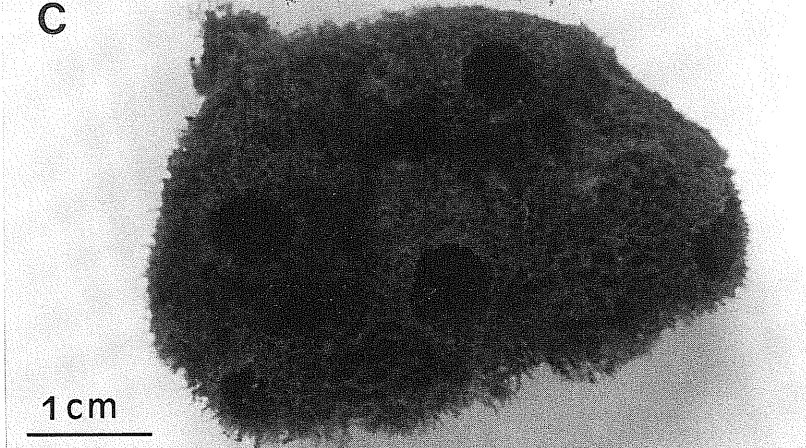
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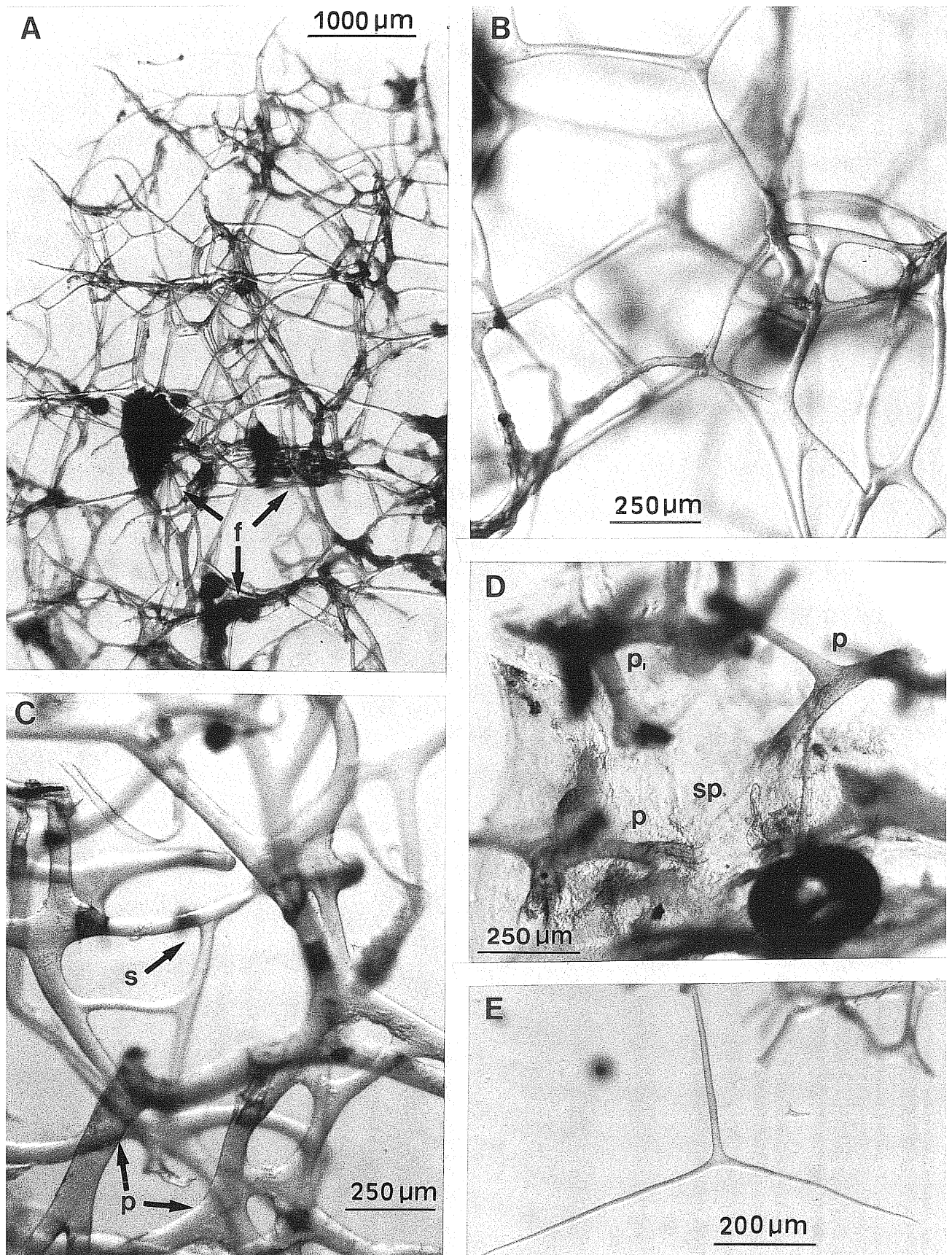


Fig. 4. - Skeleton of *Igernella vansoesti* sp. nov. (holotype). - A. General view of the network; f: foreign material within the mesohyl. - B. Ectosomal skeleton. - C. Choanosomal skeleton; p : primary fibres; s : secondary fibres. - D. Primary fibres (p) arising from the basal spongin plate (sp). - E. Triactinal spongin spicule.

SKELETON (Fig. 2)

Its reticulate skeleton is made up of primary and secondary fibres (110-305 μm and 15-109 μm in thickness, respectively) irregularly interconnected, forming meshes 100-1,800 μm in diameter (Table 1). The basal spongin plate is conspicuous in all the specimens examined. This species always incorporates great amounts of foreign materials on its surface, within the mesohyl, and in the fibres. Specially, those fibres corresponding to the ectosomal skeleton are heavily filled with sand grains. Spiculoids are mostly triactine and tetractine with rays of 445-900 μm x 16-22 μm .

DISTRIBUTION

This species seems to be characteristic to the Caribbean region (WIEDENMAYER, 1977, VAN SOEST, 1978, and VACELET, pers. comm.) and Brazil ? (BOURY-ESNAULT, 1973).

Remarks. - The specimens from Cape Verde (VAN SOEST, 1993) attributed to this species actually belong to the new species described below. The specimen exhibited thin fibres (40-110 μm) similar to those of the new species. Whether the specimen described by BOURY-ESNAULT (1973) as *Igernella joyeuxi* from the coasts of Brazil belongs to this new species or to *I. notabilis* needs to be verified.

Igernella vansoesti sp. nov.

SYNONYMY

Darwinella muelleri (USNM 23395) from the Gulf of Mexico, DE LAUBENFELS, 1953. (Non *Darwinella muelleri*, DE LAUBENFELS, 1950 from Bermuda; *D. muelleri* TOPSENT 1905 from Brazil). *Igernella notabilis sensu* VAN SOEST, 1993 : 212, Table 3.

MATERIAL EXAMINED

Ciudad Velha, South coast of Sao Tiago, Cape Verde Islands, depth 5-15 m, volcanic rocks : specimens number ZMA POR. 11036 (holotype), ZMA POR. 6938a, ZMA POR. 6938b and ZMA POR. 6938c (paratypes). Gulf of Mexico : specimen labelled as *D. muelleri* by DE LAUBENFELS (USNM 23395).

DESCRIPTION (Fig. 3)

Specimens from the Cape Verde Islands are massive-amorphous sponges some cm in diameter (from 4,5 x 2 cm to 8 x 5 cm). Some reminiscence of early coalescent tubes can be observed in one specimen (holotype). The holotype harbours some barnacles but these do not affect the external aspect of the sponge. Specimen POR. 6938b is completely deformed by the presence of the Cirripedia. Living specimens are pink in colour. Preserved specimens still keep pink tinges in some areas. Surface covered with densely-arranged short conules (0.2-

0.5 mm high, 0.5-1 mm apart). The inhalant orifices are clustered around the conules. Oscula, 0.3-0.8 mm in diameter, are either linearly arranged on the sponge top (holotype) or widespread on the sponge surface (POR. 6938a and POR. 6938b) (Table 1).

SKELETON (Fig. 4)

Fibres, laminated and pithed, arise from a basal spongin plate. Primary fibres are 50-100 μm in thickness. Secondary fibres are 15-45 μm in thickness. Meshes are 140-480 μm in diameter. Spiculoids are mainly triactines, very abundant, with rays of 720-950 μm in length. Fibres contain little foreign material. Some debris are included in the mesohyl while the sponge surface appears free of sand.

The specimen of *D. muelleri* from the Gulf of Mexico displayed an irregularly massive form. Due to its poor preservation, conules were difficult to measure. Nevertheless, its reticulate skeleton closely resembles that of the specimens from the Cape Verde Islands. The dimensions of the spiculoids, fibres and reticule meshes are also similar (Fig. 5) : primary fibres 44-79 μm ; secondary fibres 17-27 μm , meshes 145-580 μm , spiculoid rays 330-890 μm x 11-22 μm in length (Table 1).

DISTRIBUTION

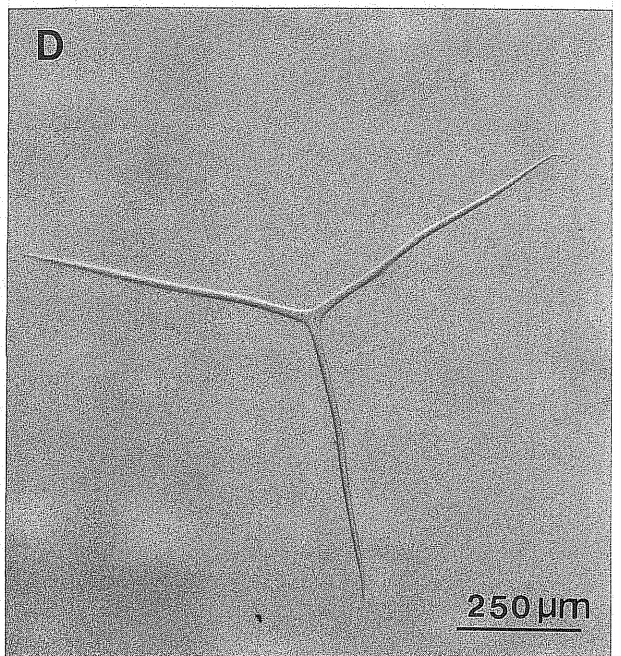
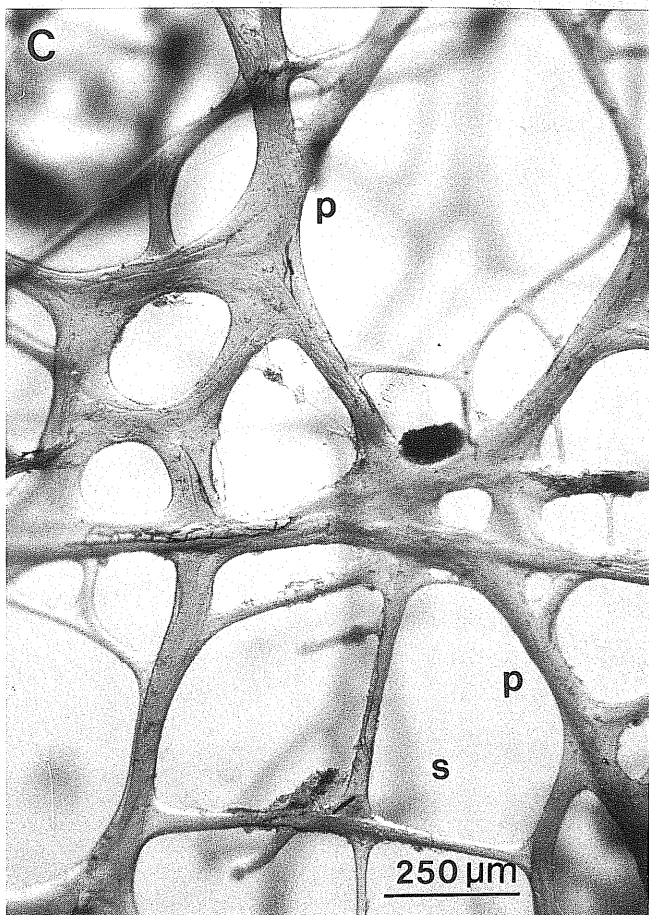
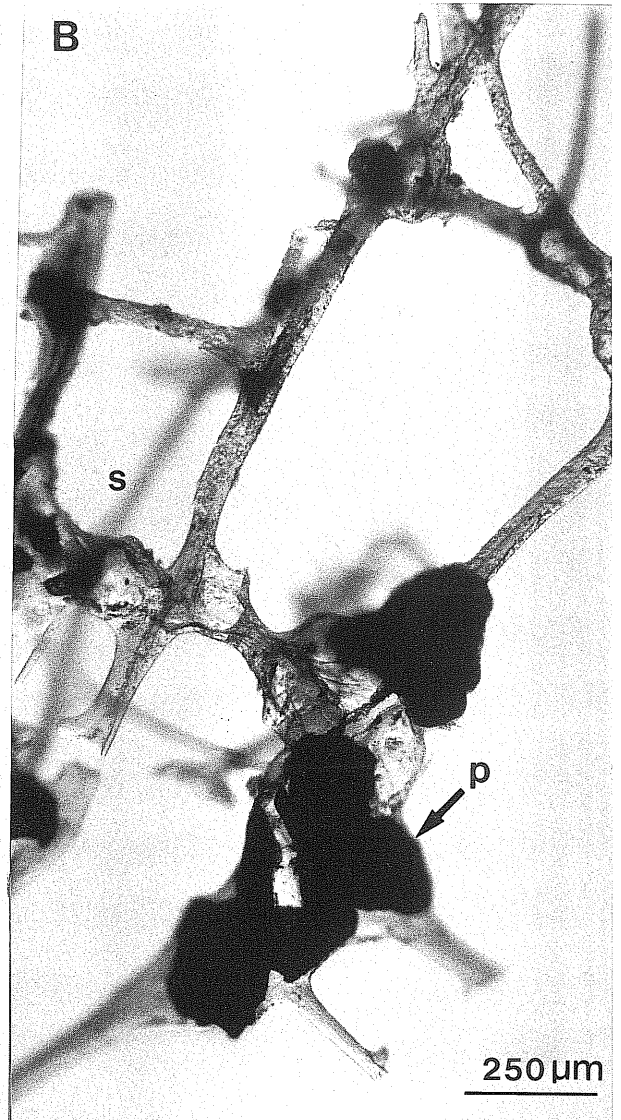
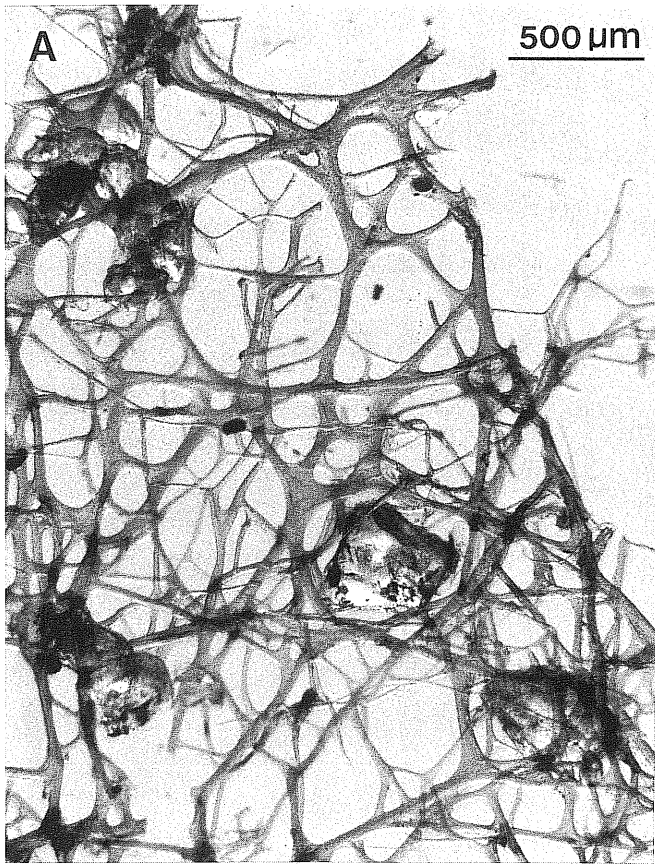
East central Atlantic : Gulf of Mexico (DE LAUBENFELS, 1953) and Cape Verde Islands (VAN SOEST, 1993).

ETYMOLOGY

This species is named in honour to ROB VAN SOEST who collected the specimens from the Cape Verde Islands and mentioned the existence of a species of *Igernella* different from *I. notabilis* after revising one specimen of *Darwinella muelleri* from the Gulf of Mexico (VAN SOEST, 1978).

Key to the species of *Igernella*

- 1 *Brick-red, dull-red, pink or orange coloured sponge 2
 - *White, grey or black in colour.....*I. mirabilis*
- 2 *Single or anastomosing tubes.
 - Conules 1- 4 mm apart.
 - Primary fibres up to 300 μm wide.
 - Secondary fibres up to 100 μm wide
 - *I. notabilis*
 - *Massive or tubulo-ramose habit.
 - Conules 0.5-1 mm apart.
 - Primary fibres up to 100 μm wide.
 - Secondary fibres up to 45 μm wide..... 3
- 3 *Massive to amorphous. Dull-red to pink in colour
 -*I. vansoesti*
 - * Tubulo-ramose. Orange in colour
 -*Igernella* sp.



Discussion

A re-examination of material previously assigned to the genera *Igernella* and *Darwinella* allowed us to detect the existence of a new species of *Igernella* in the central Atlantic. *Igernella vansoesti* sp. nov. is erected to include several specimens of *I. notabilis* collected by VAN SOEST (1993) from the Cape Verde Islands, and one specimen from the Gulf of Mexico formerly described as *D. muelleri* by DE LAUBENFELS (1953). This species is clearly distinguishable from *I. mirabilis* by its form, conules, colour and skeleton. It also differs from *I. notabilis* by its massive -without conspicuous tubes- growth habit, a minutely conulose surface, small oscules, and a skeletal network with primary and secondary fibres narrower than those of *I. notabilis*.

Although we have not re-examined the specimen described as *D. joyeuxi* by LITTLE (1963), it seems that it also belongs to the new species *I. vansoesti*. According to the description by LITTLE (1963), it is a massive to amorphous sponge, dull red in colour, with a reticulate skeleton made of relatively thin fibres: primary fibres 32-61 μm (mean 50) in diameter and secondary fibres 10-30 μm (mean 19.7), both rarely cored by debris. Triactines have with rays of 437-650 x 7-16 μm in size.

VAN SOEST (1978) re-examined the specimen USNM 23345 of *D. muelleri* also collected by DE LAUBENFELS (1953) from the Gulf of Mexico and found it to belong to the genus *Igernella*. This specimen had a skeleton similar to *I. vansoesti* sp. nov. (fibres 15-90 μm in diameter), but it was orange in colour and exhibited a ramose growth habit. Both characteristics suggest to keep both species separated although the skeletal differences between the two are trivial. Neither the colour nor the growth habit differentiate the specimen of *I. vansoesti* from the Gulf of Mexico from those from the Cape Verde Islands. However, although no skeletal or morphological differences can be at present used to describe two separate species, the resulting geographical distribution of *I. vansoesti* is difficult to be accepted without some reservation. It is unlikely that sponge gene flow can be maintained across the Atlantic. Further investigations on more Caribbean specimens and/or based on characteristics other than those morphological might confirm the presence of two different species.

The specimen described by BOURY-ESNAULT (1973) as *Igernella joyeuxi* from the coasts of Brazil, which is characterised by thin fibres (40-110 μm) similar to those of the new species, has not been examined and its assignment to *I. notabilis* or to *I. vansoesti* is not determined yet. The presence of foreign

material within the fibres is not a constant feature in *Igernella* and, consequently, it seems not to have a diagnostic value at the genus level. The absence of foreign material within the fibres of *I. mirabilis* and its scarcity from those of *I. vansoesti* increases the similarity of *Igernella* to other genera of the family Darwinellidae that are also characterised by the presence of horny spicules (i.e. *Darwinella*).

Whether the presence/absence of spongin spicules is more relevant than the reticulate vs. dendritic skeleton or vice-versa in the taxonomy of this group of sponges has been repeatedly discussed (VAN SOEST, 1978, BERGQUIST, 1980). As a consequence of the different views, the genus *Igernella* has alternatively been located in the families Pleraplysillidae, Dictyodendrillidae or Darwinellidae. Recent chemical studies (BERGQUIST *et al.*, 1990) seem to support a close relationship between *Igernella* and genera in the Darwinellidae. In addition, cytological studies showing similarities between Dysideidae and some Dendroceratida, support the view that the secondary reticulation has evolved more than once in the Dendroceratida (BOURY-ESNAULT *et al.*, 1990). Thus, most recent evidence, this study included, suggests the location of the genus *Igernella* in the Darwinellidae.

However, BERGQUIST (1995) includes the presence of horny spicules in the diagnosis of the family Dictyodendrillidae. This would imply that she considers the emplacement of *Igernella* more appropriate among the Dictyodendrillidae than among the Darwinellidae, although no further arguments are provided to support this new decision. The scarcity or even the absence of foreign material coring the fibres of the new species of *Igernella* also approaches this species to the genus *Dictyodendrilla* BERGQUIST. However, the regularly reticulate skeleton with rectangular meshes in this later genus and its particular secondary metabolites (BERGQUIST *et al.*, 1990) indicate that *Dictyodendrilla* should be separated from the Darwinellidae.

A reticulate but more regular (radial primary fibres, according to ROW, 1911) skeleton is also present in the related genus *Euryspongia* ROW, placed by BERGQUIST in the family Dysideidae. The absence of horny spicules, and the lack of a basal spongin plate are discriminant features of this last genus. *Igernella mirabilis* and *Euryspongia lactea* ROW (the type species of their respective genera) might represent the extremes of an evolving line leading from the presence of horny spicules as the only skeletal element to the total absence of these skeletal elements or vice-versa.

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Fig. 5. - Skeleton of *Igernella vansoesti* sp. nov. (specimen USMN 23395) from the Gulf of Mexico). - A. General view; f: foreign material included within the mesohyl. - B. Portion of the skeleton in which foreign material is incorporated to the primary (p) and secondary (s) fibres. - C. Skeleton zone free of foreign material; p: primary fibres; s: secondary fibres. - D. Triactinal spongin spicule.

Table 1:
Comparative characteristics of the species of *Igernella* in the Atlantic.

*	Colour	Growth form	Conules high (mm)	Conules apart (mm)	Oscules diameter (mm)	Fibres 1 diameter (μ m)	Fibres 2 diameter (μ m)	Meshes diameter (μ m)	Foreign material within the fibres
<i>I. notabilis</i> (lectotype) Caribbean	?	Anastomosing tubes	1	1-3	7-12	150-300	25-100	150-1500	abundant
<i>I. notabilis</i> ZMA POR.3611 Caribbean	Brick-red	Anastomosing tubes	1	1-3	9-15	110-300	15-100	100-1800	abundant
<i>I. notabilis</i> SME ST32SAC2 Caribbean	Brick-red	Single tube	1-2	2-4	closed 0.2-0.25	120-305	20-109	130-1700	abundant
<i>I. vansoesti</i> ZMA POR.11036 Cape Verde Islands	Pink	Massive	0.1-0.3	0.4-1	4-8	53-98	18-45	145-475	not abundant
<i>I. vansoesti</i> USMN 23395 Gulf of Mexico	Pink	Massive to amorphous	0.1-0.2	0.3-1.1	?	44-79	17-27	127-510	not abundant
<i>D. joyeuxi</i> (LITTLE, 1963) Gulf of Mexico	Dull - red	Massive to amorphous	?	?	?	32-61	10-30	?	not abundant
<i>D. muelleri</i> (VAN SOEST, 1978) Gulf of Mexico	Orange	tubulo-ramose	?	?	?	15 - 90	?	?	?
<i>I. joyeuxi</i> (BOURY-ESNAULT, 1973) Coasts of Brazil	?	Massive	?	?	?	43 - 110			abundant

* All specimens have abundant horny spicules (mainly triactines).

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María-Jesús URIZ

&

Manuel MALDONADO

Department of Aquatic Ecology
 Centre d'Estudis Avançats de Blanes
 Camí de Santa Bàrbara s/n
 17300-Blanes, Girona
 Spain