SCI. MAR., 57(4): 353-366 SCIENTIA MARINA 1993

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

Redescriptions of some rare sponge species in the western Mediterranean.*

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SUMMARY: Five poorly known sponge species from the southwestern Mediterranean are described and their taxonomic status discussed. The species *Raspailia agnata* and *Axinella egregia* are recorded for the first time outside the Atlantic. The skeletal arrangement of *R. agnata*, currently considered an *Axinella*, justifies placing it in the genus *Raspailia* alongside other species without acanthostyles (subgenus *Syringella*). The spicule complement of the Mediterranean specimens of *R. agnata* perfectly matches that of the type and thus differs from the remaining Atlantic specimens lacking oxeas. Two species of dubious validity (*A. salicina* and *I. pipeta*), only known at present by the type, have also been recognized in specimens from Alboran Island. *I. pipetta*, considered by some authors to be a form of *I. variabilis*, is presented here as a valid species, not because of its habit but because of its skeletal features. The species *Antho oxeifera*, also known by a unique specimen, is redescribed on the basis of a second specimen found in the Columbretes Archipelago. The reliability of the spicule categories described in the holotype and, consequently, the validity of this last species, is confirmed after examination of this second specimen. In view of its skeletal arrangement, *Antho* is considered to be a more appropriate genus than *Clathria* in which to place the species originally named *C. oxeifera*.

Key words: Demospongiae, *Raspailia*, *Axinella*, *Antho*, *Ircinia*, systematics, southwestern Mediterranean.

INTRODUCTION

The sponge fauna of the western Mediterranean is widely considered among the best known in the world because of the vast amount of literature on the sponges of this region. A great deal of information is certainly available on particular bathymetric zones, such as the shallow littoral (e.g., SARÀ, 1958; BOURY-ESNAULT, 1971; BIBILONI, 1981; URIZ *et al.*, 1992), or the shallow bathyal of some areas (e.g., VACELET, 1969; PULITZER-FINALI, 1983; URIZ, 1983). Nevertheless, the surveys carried out in the Mediterranean have not been as extensive as those carried out in the Atlantic (e.g., Challenger Rep., Albert-I of Monaco Exp., Galathea Rep. Danish Ingolf Exp., etc). This, together with the higher species diversity of the Mediterranean sponges suggests that many geographical areas and ecological habitats remain poorly known or even unexplored, as indicated by the recent finding of new species (PANSINI, 1987; URIZ and ROSELL, 1990; MALDONADO and BENITO, 1991; BOURY-ESNAULT, *et al.*, 1992; VOULTSIADOU and VAN SOEST., 1991A; VOULTSIADOU *et al.* 1991 MALDONADO, 1992), or by the presence of previously considered Atlantic or rare species such as those here redescribed.

MATERIAL AND METHODS

Sponges were collected by dredging and scuba diving during several surveys (CORAL-ROJO-I, ECOFARM-I, and FAUNA IBERICA-I) along the

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* Received October 25, 1992. Accepted May 18, 1993.

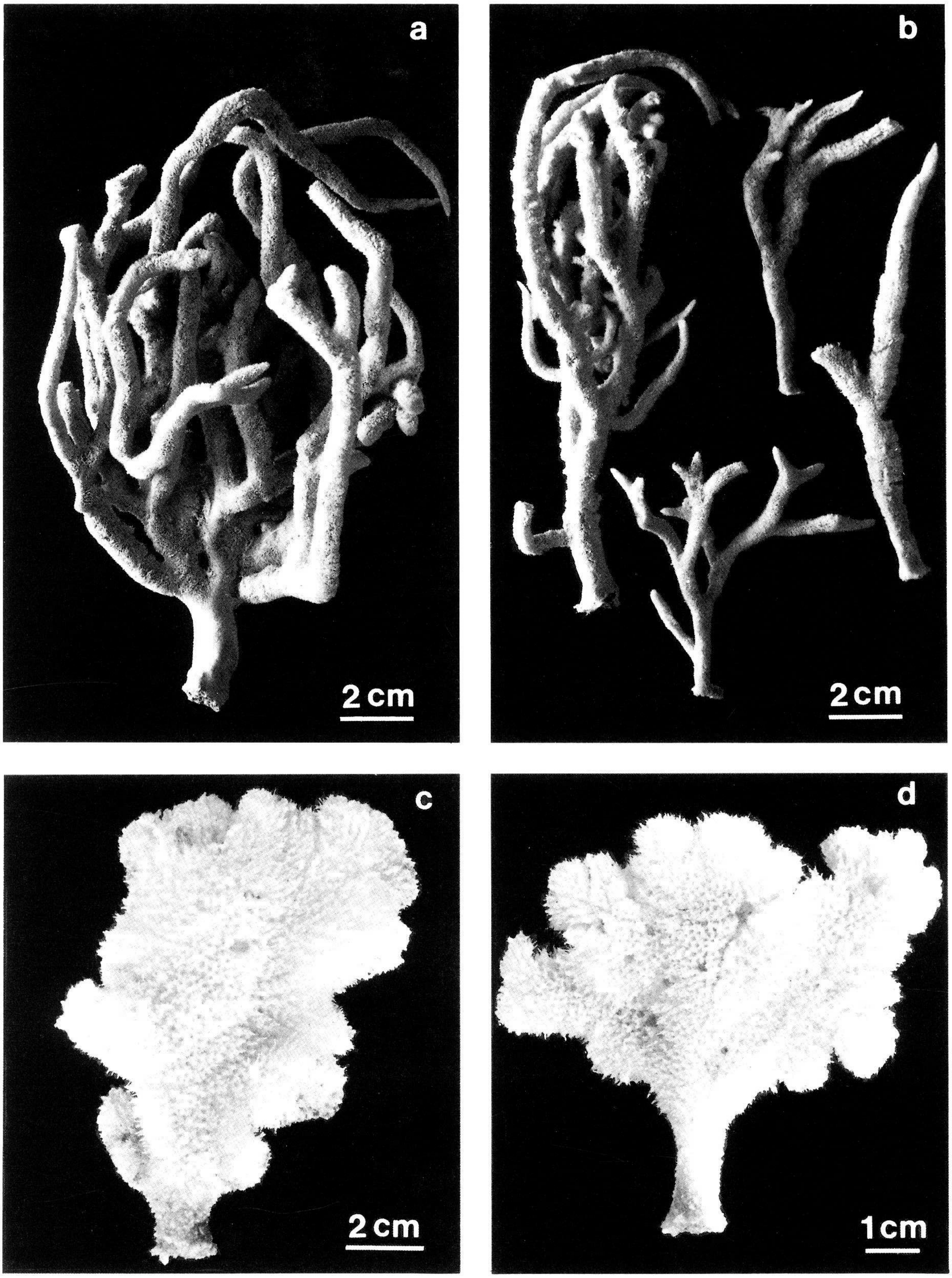

FIG. 1. — a and b, Various specimens of *Raspailia agnata*; c and d, Two specimens of *Axinella egregia*.

Iberian littoral. The methods employed in classifying and dealing with the specimens are described by RÜTZLER (1978). Micrographs of clean spicules coated with gold palladium in a sputtering E-5000 were taken through an Hitachi scanning electron microscope.

RESULTS

Descriptions

Order Axinellida
Family Raspailiidae Hentschel, 1923
Raspailia (Syringella) agnata (TOPSENT, 1896) comb. nov.
Syn.:*Axinella agnata* Topsent, 1896

Material examined: Specimens No: FAUN-I (33)4-25a, (33)4-25b, (33)4-25c, (33)4-25d, (33)4-25e, (33)4-25f, (33)4-25g and (33)4-25h. Loc.: St. FAUN-I 33, 33-44 m depth, horizontal rocky substrata densely covered by the seaweed *Laminaria ochroleuca*, Alboran Island, SE Spain, western Mediterranean.

Description (Fig. 1a-b)

Erect stalked specimens, 6.5-28 cm high, branching preferably in a sole plane. The stalk, 0.6-2.5 cm wide, splits up at 1-6 cm of the base into two to several branches that successively bifurcate to many branches (10-39) in the biggest specimens. The branches, 0.5-2 cm in diameter, are compressed and frequently concrescent in their basal part but grow freely in a cylindrical-acuminate shape in the apical zone. They show lateral serial small expansions, 2-3 mm wide, similar to those found in some species of *Axinella* such as *A. cannabina* or *A. dissimilis*. These expansions can produce additional narrower branches by growth. Surface quite hispid, especially in the inner parts of branches, velvety to the touch. Functional orifices, 100-200 µm in diameter, widespread through the whole sponge without any clear differentiation between oscules and ostia. Superficial depressions perpendicular to the main axis of branches separating the lateral expansions in fixed specimens seem to correspond to subectosomal exhalant conductes. Consistency firm and hard in the basal parts, flexible in the apical zones. Color orange— yellow in life, ochre in alcohol.

Skeleton (Figures 2-3)

1. Styles of two categories, difficult to separate on the basis of their dimensions or form since intermediate spicules are frequently found. The two categories are distinguished mainly by their axial or extra-axial location within the skeleton. Both are curved in the basal zone or even flexuous. Those forming part of the central axis (styles I: 300-700 µm × 10-30 µm) are in general more curved and stronger than those responsible for the sponge hispidation (styles II: 500-1,200 µm × 10-30 µm). Some of the longer styles can occasionally have both ends rounded in the shape of a strongyle. The supplementary category of oxeas described by DESCATOIRE (1969) is not present in any of the eight Mediterranean specimens, which perfectly match the spicule types described in the holotype.

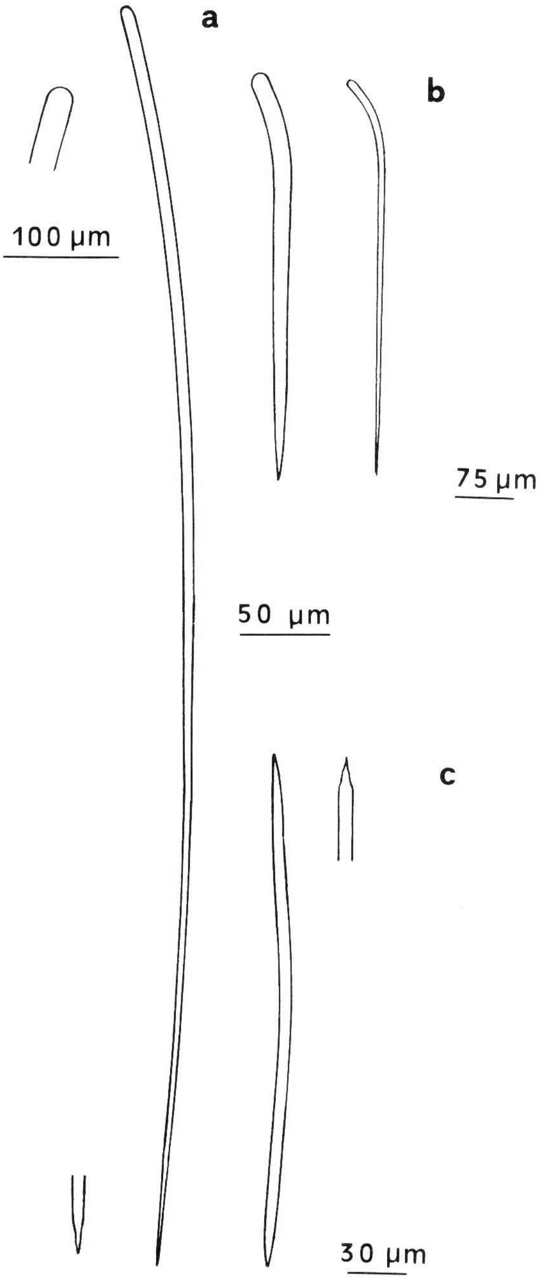

FIG. 2. — Spicules of *Raspailia agnata*: a, style of the extra-axial zone; b, styles of the axial zone; c, ectosomal oxeote spicules.

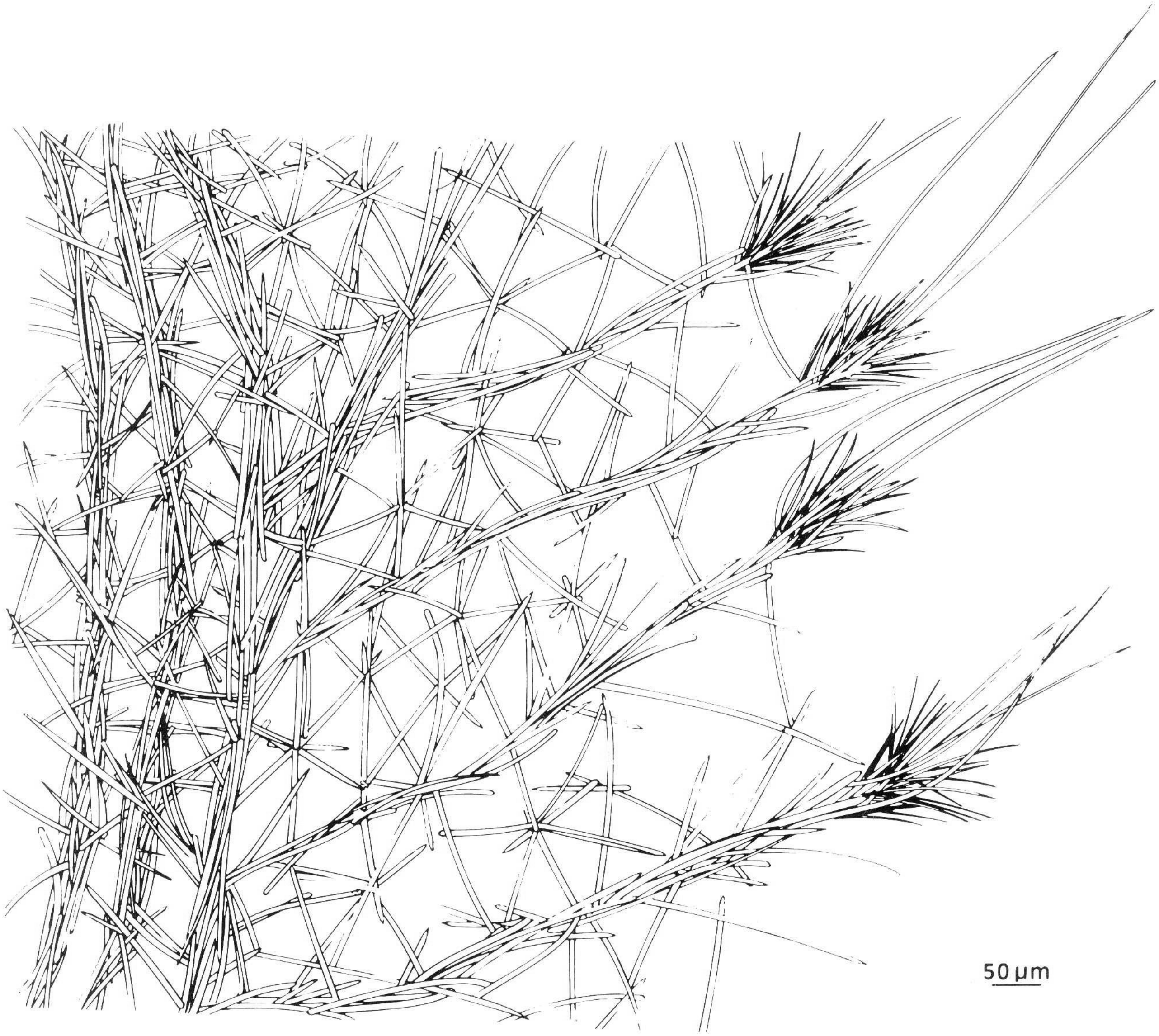

FIG. 3. — *Raspailia agnata*: skeletal arrangement.

2. Ectosomal thin oxeote spicules (250-410 µm × 2-3 µm), slightly curved, occasionally flexuous, with short points (called tornotes by previous authors: TOPSENT, 1986; DESCATOIRE, 1969).

Skeletal arrangement: an axial condensed zone, notably wider in the stalk and basal part of the branches, and a looser peripheral area are clearly discernible. The axis is comprised of ascending reticulate tracks of 4-7 styles I. In the peripheral (extra-axial) area, plumose bundles of styles II divergently rise from the central axis, ending in a brush of two to four long spicules. These spicule brushes protrude from the sponge surface and thus cause the external hispidation. Bundles of oxeote ectosomal spicules surround the hispidating styles near the sponge surface. The spongin is abundant around the main spicule tracks, and it cements the base of the styles in the extra-axial bundles. Its abundance decreases from the sponge base to the apex of branches.

Distribution

Up to now the species was only known from the northeastern Atlantic the coasts of France-(TOPSENT, 1896; BOROJEVIC *et al.*, 1968; DESCATOIRE, 1969). It is abundant in the Alborán area, where it seems to characterize certain bottoms. This is the first record of the species outside the type region.

Discussion

This species was assigned to the genus *Axinella* by Topsent (1896), who nevertheless suggested that its character was intermediate between *Axinella* and *Raspailia*. Descatoire (1969) argued that a new genus was needed for this species despite the fact that two genera (*Raspaliopsis* Burton, 1959 and *Syringella* Schmidt ss. Ridley, 1884) had been previously used for sponges matching the genus *Raspailia* but lacking acanthostyles, as in the case of Topsent's species. According to Hooper (1991), *Syringella* was in use when Burton (1959) erected the genus *Raspailopsis* for similar sponges and consequently it has priority. Because the absence of acanthostyles does not seem reason enough to separate genera in this family, we agree with Pick (1905) and Hooper (1991) that *Syringella* should be considered a subgenus. The present species is related to other *Raspailia* lacking acanthostyles such as *R. australiensis* Ridley, *R. clathrata* Ridley, *R. elegans* Lendenfeld, *R. nuda* Hentschel, and *R. stelliderma* (Carter).

Despite the fact that it has seldom been recorded, *R. agnata* seems to be frequent along the French Atlantic coasts at depths of 30-100 m (Borojevic *et al.*, 1968). Curiously, it has never been recorded outside this region. The specimens found by Descatoire (1969) displayed additional oxeas, absent from the type. The specimens described from Ouessant by Lévi and Vacelet (1958) do not seem to correspond to this species, since oxeas are present, the ectosomal oxeote spicules and the long styles are lacking.

Family Axinellidae
Axinella egregia (Ridley, 1881)
Syn.: *Phakellia egregia* Ridley, 1881 p.114

Material examined: Specimens FAUN-1-3(11A)a, FAUN-1-3 (11A)b and FAUN-1-3(11A)c. Loc.: Cabo Sagra-Motril (Almería), 60-160 m depth, muddy rocky bottom, SE Spain, western Mediterranean.

Description (Fig. 1b)

Erect stipitate specimens, 5.5-7 cm high, with short stalks ending in laminae 0.5-0.9 cm thick with irregular contours. Some short, rounded, newly formed branches are in evidence in one specimen. Consistency firm in the stalk, somewhat more flexible in the remaining sponge. Surface hirsutely conulose owing to skeletal projections. Oscula and ostia indistinguishable. Ectosome of a pseudoepitelial type almost totally damaged in preserved specimens. Color greyish yellow in life; cream in alcohol.

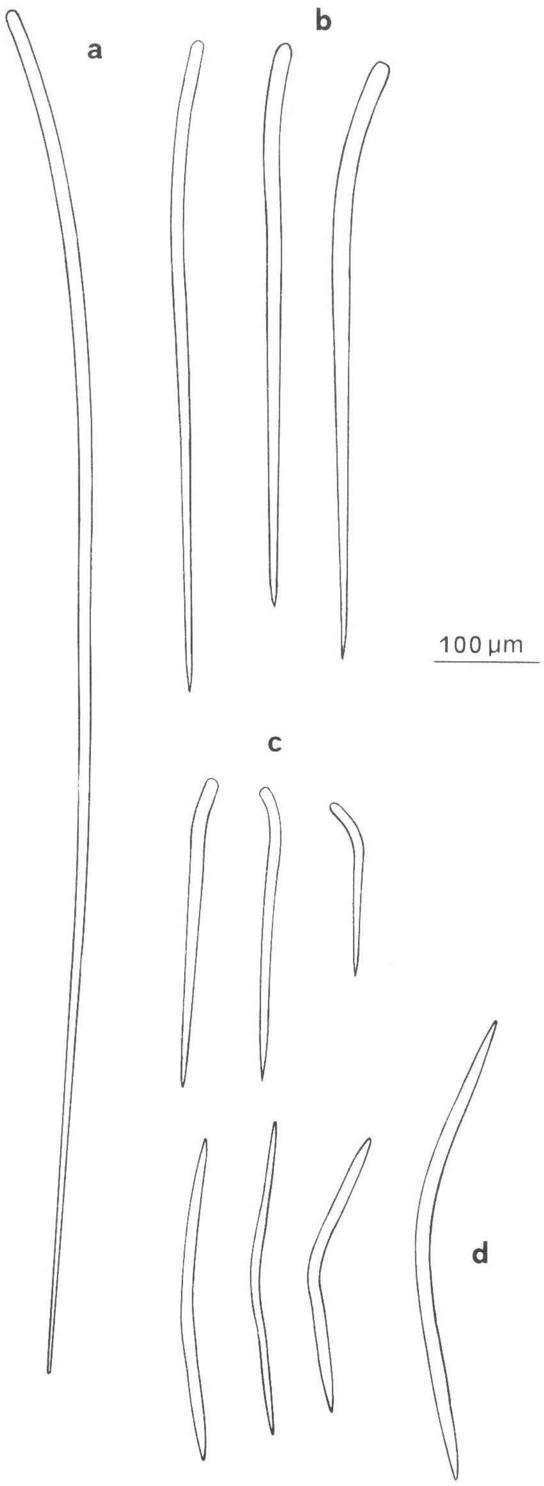

Fig. 4. — Spicules of *Axinella egregia*: a, style I, echinating the peripheral tracks; b, styles II; c, styles III; d, oxeas.

Skeleton (Fig. 4)

Styles I, long and relatively thin, slightly curved, tapering to a sharp point, some of them with a swollen subterminal (1,250-1,400 µm × 10-11 µm). They echinate the peripheral tracks protruding from the sponge surface.

Styles II, stout, slightly and widely curved (370-580 µm × 11-18 µm).

Styles III, stout, sharply bent at approximately one-fourth of its length (in the form of a rhabdostyle), with sharp points or gradually ending in a stepwise fashion (200-320 µm × 11-15 µm).

Oxeas, sharply bent at the middle, with sharp points or gradually ending in a stepwise fashion (170-340 µm × 10-13 µm).

Skeletal arrangement: strong axial condensation of stout styles linked by spongin, perpendicularly echinated by plumose fibers of stout and long styles interconnected by single oxeas in such a way that the extra-axial skeleton has a plumoreticulate feature.

Distribution

North Atlantic: Iberian Península, coasts of Asturias (Topsent, 1892), Santander (Ferrer Hernández, 1914), coasts of France (Topsent, 1928), coasts of Galice (Rodriguez-Solórzano, 1990). South Atlantic: Strait of Magellan (Ridley, 1881), coasts of Chile (Desqueyroux-Faundez, 1976). Depths of 13 to 135 m. This is the first record of the species in the Mediterranean.

Discussion

This Axinella shows unusual features with regard to the most common species of the genus, such as the thickness of the foliaceous branches and the hirsute-conulouse surface. As indicated by Ridley (1981), it seems to be close to *A. cinnamomea* Schmidt from the Adriatic and Algerian coast, although there are clear differences such as the presence of two different categories of slightly curved styles and the rhabdostyloid form of the sharply bent styles, both typical characteristics of *A. egregia*.

Axinella salicina Schmidt, 1868

Material examined: specimen COR-6-Alb-6 Loc.: St. Cor-6, coralligenous biocoenosis, 70-120 m of depth, Alborán Island, SE Spain, western Mediterranean.

Description

Erect graceful branching specimen 8 cm high, with stalk 3 cm long, 0.3 cm wide at the base, and 0.5 cm wide where it splits into three branches. The branches are typically narrower in their base than in their distal parts (before they split up).

Surface velvety to the touch, somewhat more hispid than that of *A. verrucosa* and *A. polypoides*. Consistency flexible, some more rigid in the basal part of the stalk. Small oscula, similar in form to those of *A. polypoides* but smaller in diameter along the branches. Color whitish yellow in alcohol.

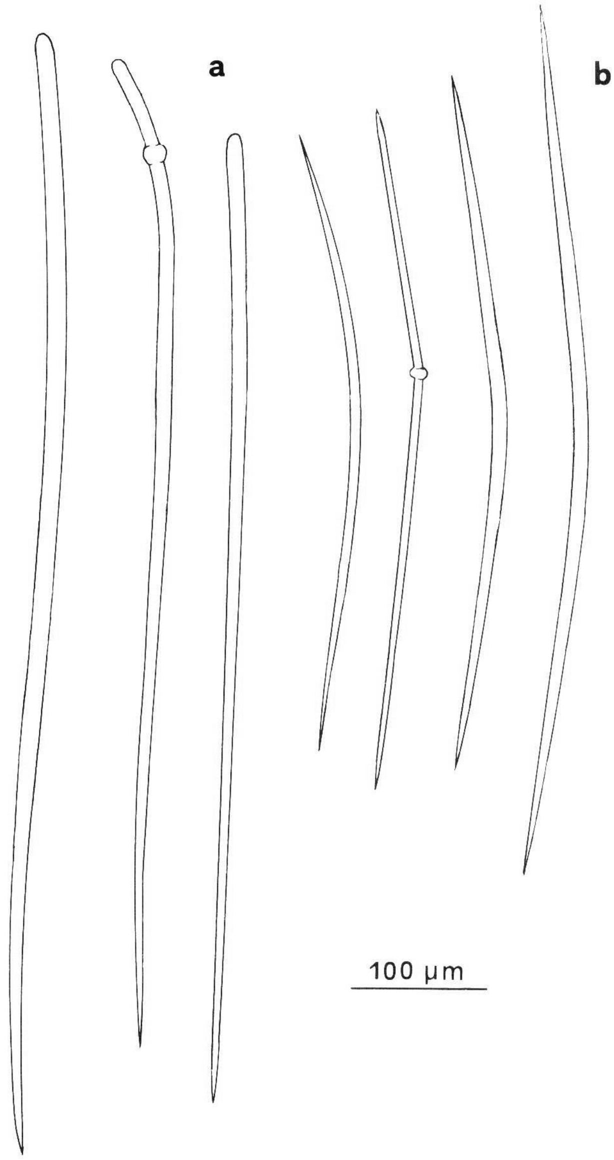

Fig. 5. — Spicules of *Axinella salicina*: a, styles; b, oxeas.

Skeleton (Fig. 5)

Styles, slightly curved at one-third of their length or somewhat flexuous, tapering to a sharp point, frequently with a swollen subproximal (700-1,118 µm × 12-20µm).

Oxeas, more or less curved in the middle, with mucronate or ending in points in a stepwise fashion (450-915 µm × 12-20 µm).

Skeletal arrangement: axial condensation of reticulate tracks linked by spongin. Extra-axial skeleton of radial plumoreticulate tracks ending in a bundle of 4-6 long styles protruding from the sponge surface.

Distribution

Mediterranean species only recorded from the southern zone of the western Mediterranean-Algerian coast (SCHMIDT, 1868). This is the second record of this species.

Discussion

This species has probably been misidentified as *A. verrucosa*, since the spicule complement is close in both species. Nevertheless, when revising the type, TOPSENT (1938) found some characteristics that seemed to him of taxonomic value. External characteristics such as the remarkable gracefulness of its habit (long and thin branches) and the morphology of branches (narrower in their proximal zones) seem to be constant and so species specific. The division of the branches in a trichotomous way instead of the more common dichotomous division of *Axinella* seems to be another characteristic typical of *A. salicina*.

The styles of the above specimen (mean length, 850 µm) are longer than those of the type (mean length, 650 µm).

Order Poecilosclerida Topsent
Family Clathriidae Hentschel, 1923
Antho oxeifera (FERRER HERNÁNDEZ, 1921)
Syn.: *Clathria oxeifera* Ferrer Hernández, 1921

Material examined: Specimen N° 5.10.88.3.1 growing on the sponge *Stryphnus mucronatus* (Schmidt). Loc.: Placer de la Barra Alta (39° 49,84′ N, 0° 32, 25′ E), horizontal bottom with rocky blocks covered by the alga *Halimeda tuna*, 36 m in depth, Columbretes Islands, SE Spain, western Mediterranean.

Description

Thick encrusting specimen harboring a sponge of the genus *Gellius*. It covers a surface of 2 × 3 cm and produces erect pseudocylindrical projections 1 cm high and 0.3-0.5 cm in diameter. Surface rough to the touch, uniformly hispid under the binocular microscope. Ectosome nonseparable from the choanosome, perforated by numerous orifices 150-500 µm in diameter without any clear differentiation between oscules and ostia. Consistency compressible but delicate. Color bright red in life, cream in alcohol. The outside aspect of this sponge is hardly distinguishable from that of *Antho involvens*, although the consisten-

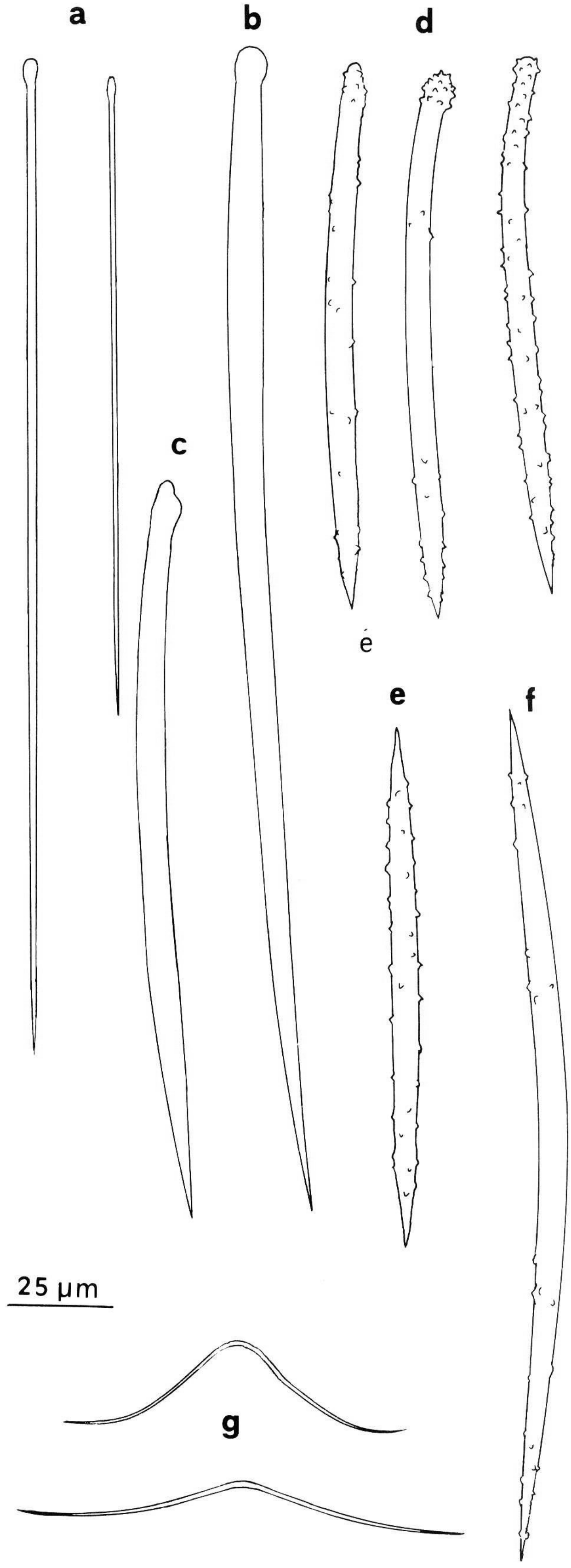

FIG. 6. — Spicules of *Antho oxeifera*: a, ectosomal (auxiliary) subtylostyles; b and c, main subtylostyles; d, secondary acanthostyles; e, secondary acanthoxea; f, main acanthoxea; g, toxas.

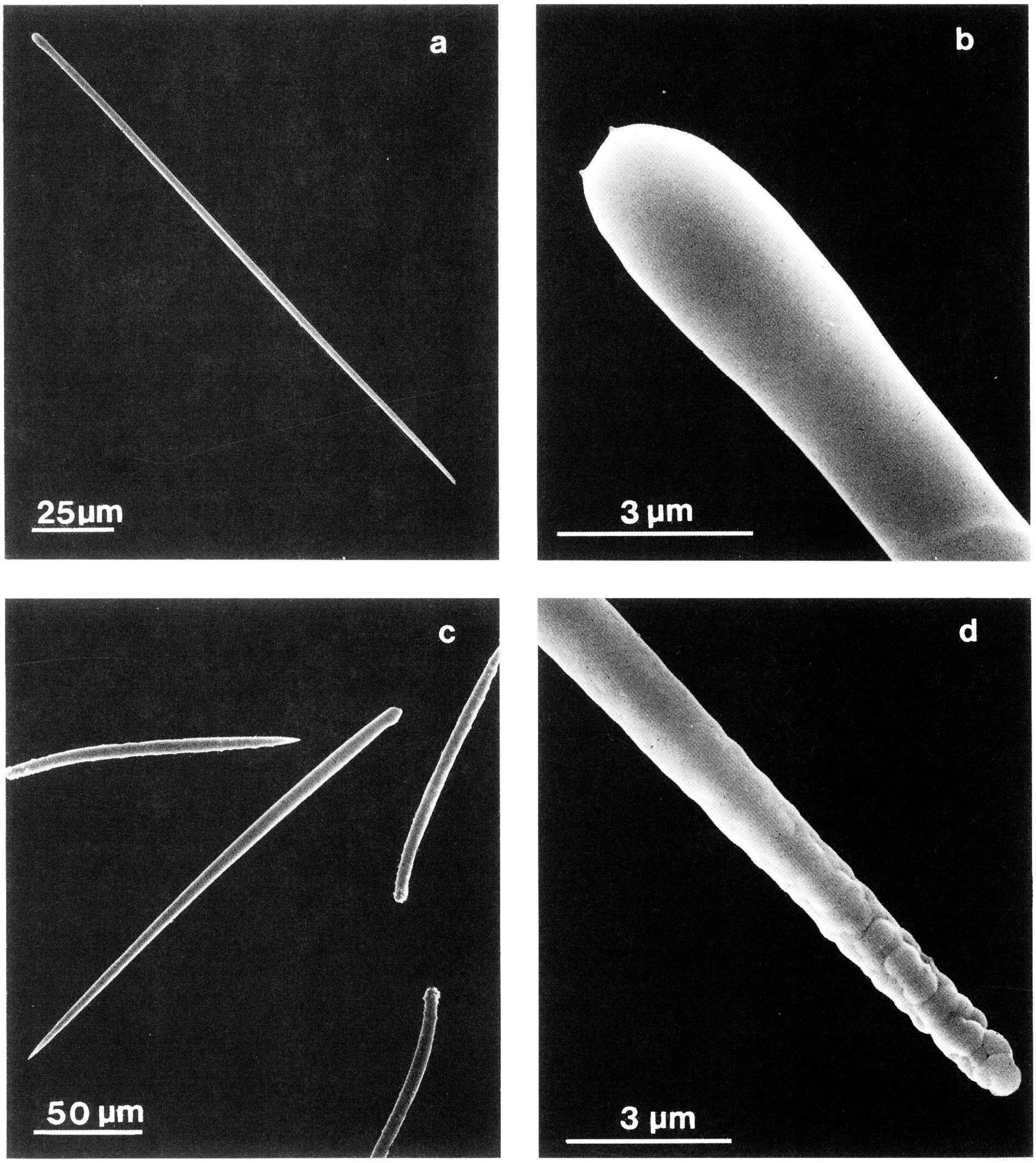

FIG. 7. — *Antho oxeifera:* scanning electron micrographs. a, b and d, ectosomal subtylostyles: a, whole spicule; b, detail of the tyle; d, detail of a point; c, main and secondary acanthostyles.

cy is somewhat more delicate in the Ferrer Hernández specimens reflecting a lesser spongin content.

Skeleton (Figs. 6-9)

1. Main subtylostyles, somewhat fusiform, with a rounded more or less inflated base (asymmetrically inflated in the smaller spicules) and a shaft tapering gradually toward the point (180-230 µm × 6-10 µm). The two size categories differentiated by FERRER HERNÁNDEZ (1921) are hardly distinguishable when a great number of spicules are measured.

2. Main acanthoxeas, with few (if any) spines, ap-

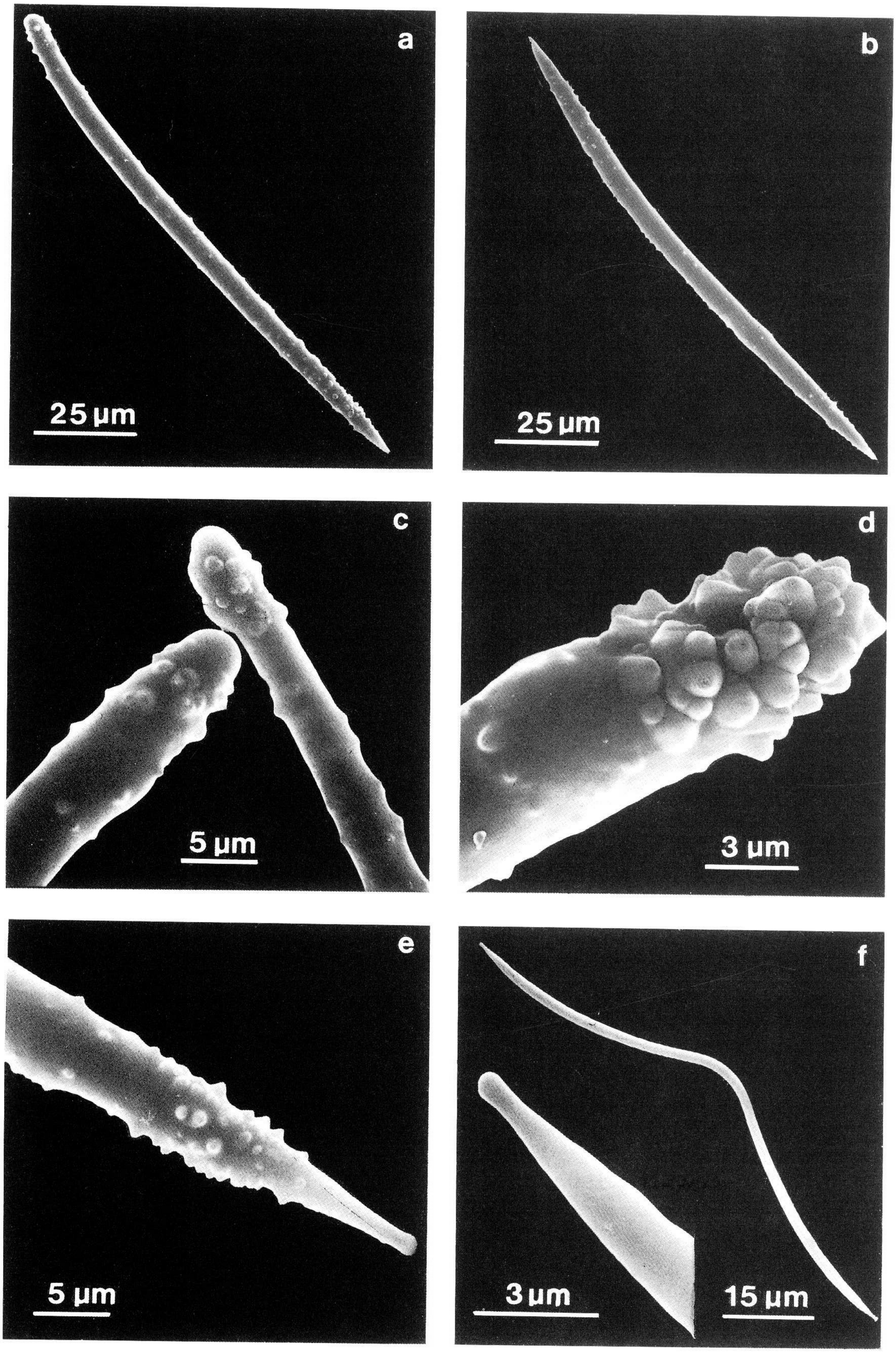

FIG. 8. — *Antho oxeifera*: scanning electron micrographs. a, secondary acanthostyle; b, secondary acanthoxea; c and d, different tyles of secondary acanthostyles; e, point of a secondary acanthostyle; f, toxa with, in detail, the ending of its point.

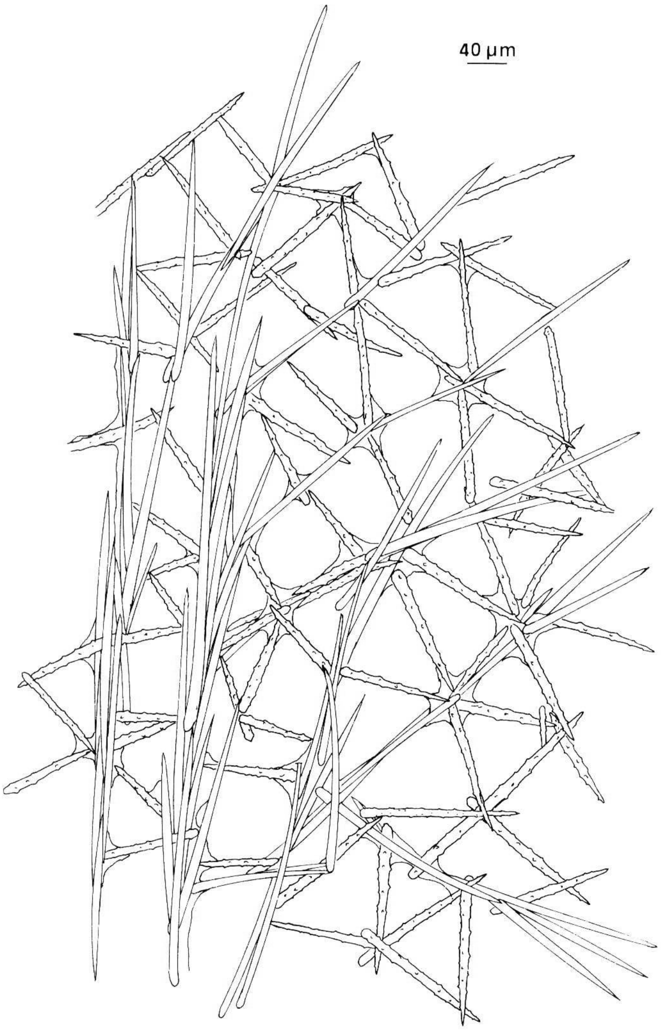

FIG. 9. — *Antho oxeifera*: skeletal arrangement.

parently derived from the main subtylostyles. Shaft slightly and uniformly curved, frequently swollen once or twice (210-230 µm × 8-10 µm).

3. Secondary acanthostyles, with the base either narrower than the shaft, slightly globulous or asymmetrically inflated (trilobulate in the description by Ferrer Fernández). Shaft slightly curved (frequently near the base) covered with spines, more densely placed both in the basal and proximal parts of the spicule. They measured 120-175 µm × 7-9 µm (100-130 µm × 7µm in the holotype). FERRER HERNÁNDEZ (1921) differentiated two kind of acanthostyles on the basis of the tyle form (rounded or asymmetrical). These two forms are also distinguishable in the specimen from Columbretes, but no size categories can be correlated with the two shapes.

4. Acanthoxeas, straight or slightly curved, with the spines preferably placed near the tips. They are probably derived from the secondary acanthostyles (85-150 µm × 7-8 µm).

5. Auxiliary subtylostyles, straight, with a base that is a little inflated and often asymmetrical. Two size categories are discernible: 150-180 µm × 1.5-3 µm, and 210-290 µm × 2.5-4 µm.

6. Toxes, lisses with arms either straight or slightly curved forming an obtuse angle, frequently ending in the shape of a drumstick (65-110 µm × 1-1.5 µm). They reach lengths of up to 154 µm in the holotype (FERRER HERNÁNDEZ, 1921).

Skeletal arrangement: thin tracks of main subtylostyles and acanthoxeas, more clearly pronounced in the axis of the digitiform projections, diverge toward the sponge surface. They bifurcate into other thinner tracts (1-4 spicules across), ending in a bundle of 1-3 spicules protruding from the ectosome and causing superficial hispidation. Secondary acanthostyles and acanthoxeas emerge from these tracks at a right angle, forming a renieroid unispiculate network between the main spicule tracks. The spicules are linked by spongin at the mesh knots. Auxiliary subtylostyles are particularly abundant in the peripheral region of the sponge, arranged in bundles more or less tangentially to the sponge surface, and also widespread in the choanosome. Toxes are abundant throughout the sponge. The spongin is not very abundant. It just surrounds the spicule tracts and links the spicules of the secondary network.

Discussion

The finding of a second well-developed specimen of this enigmatic species in a different archipelago 100 km away from the type locality (Balearic Islands) confirmed the constancy of their spicule types and, consequently, validated the species.

This species was fully described by FERRER HERNÁNDEZ (1921) and its spicule categories appropriately modified by LÉVI (1960). The holotype showed the secondary acanthostyles just echinating the main spicule tracts, but without forming a true network (FERRER HERNÁNDEZ, 1921). This more likely plumose arrangement is characteristic of the genus *Clathria* (LÉVI, 1960) and that is why Ferrer Hernández placed the species into this genus. Nevertheless, the specimen from the Columbretes Islands clearly shows a unispiculate network of secondary acanthostyles and acanthoxeas between the primary tracts. This skeletal arrangement, between those of *Clathria* and *Antho*, would be characteristic of the genus *Labacea* Laubenfels, but the gradation frequently found in the skeletal arrangement of some species of Clathriidae renders this genus superfluous.

LÉVI (1960) suggested moving the species of Ferrer Hernández into the genus *Antho* (= *Dictyoclathria* Topsent, 1920). This move seems reasonable because of the weak radial spicule tracts and the clearly renieroid network between tracts at the peripheral region of the new specimen.

That the genus *Antho* should be kept within the Clathriidae instead of being moved into the family Myxillidae on the basis of the renieroid network of acanthostyles (BERGQUIST and FROMONT, 1988) is supported by species with a skeleton intermediate between those of *Antho* and *Clathria* such as *A. oxeifera*.

The skeletal arrangement is not actually discriminant for families in the order Poecilosclerida since different families have the same skeletal arrangement: a plumose or plumoreticulate skeleton in Tedaniidae, Biemnidae, Phorbasidae, and Crellidae; a hymedesmoid skeleton in Hymedesmiidae and Clathriidae; an isodictyal skeleton in Myxillidae, Desmacidae (genus *Guitarra*) and, in our opinion, also in some genera of Clathriidae (*Antho*, *Allocia*).

Although we agree with BERGQUIST and FROMONT (1988) that the type of ectosomal spicule does not have enough weight in itself to separate families, it is a complementary characteristic to be added to those mentioned above and justifies the classification of *Antho* in the family Clathriidae according to LÉVI (1973). In any case, the genus *Antho* (in the light of species like that of Ferrer Hernández) could represent a bridge between Clathridae and Myxillidae if the sequence -hymedesmoid, plumose, plumoreticulate, reticulate -or vice versa, is assumed in the evolution of the skeletal arrangement of that group of species.

Consequently, the genus *Antho*, characterized by habitual modifications at the tips of the acanthospicules and the presence of a renieroid network, seems a clear member of the family Clathriidae. In this genus, the secondary spicules form the main skeleton (reticulated) and the main smooth spicules emerge from the knots of the network. This location of the main spicules may seem to indicate an echinating function but should really be considered the result of an extreme reduction of the main tracts, along with the considerable development of the originally echinating (secondary) spicules. Moreover, as stated above, some representatives of this genus, in which tracts of smooth (main) spicules are already more or less conspicuous, have been mentioned in the literature (*Antho brattergardi* Van Soest and Stone, 1986; and *Antho brondstedi* Bergquist and Fromont, 1988).

In conclusion, this species, which so far appears to be endemic to the central Mediterranean region, is characterized by the presence of two categories of acanthostyles and oxeas (the main one deprived of spines); its plumoreticulate skeletal arrangement, with a tendency toward a reneroid network in the peripheral zone; the presence of smooth toxas; and the absence of isochelae. It seems to be a well-defined representative of the genus *Antho*. Thus, at present the genus *Antho* appears to harbor six Atlanto-Mediterranean (European) species: *Antho involvens* (Schmidt, 1864), *Antho erecta* (Ferrer Hernández, 1922), *Antho dichotoma* (Esper, 1974), *Antho oxeifera* (Ferrer Hernández, 1921), *Antho circonflexa* Lévi, 1960, and *Antho brattergardi* van Soest and Stone, 1986.

O. Dictyoceratida
Family Thorectidae Bergquist
Ircinia pipetta (SCHMIDT, 1868)
Syn.: *Hircinia pipetta* Schmidt, 1896
Ircinia (Sarcotragus) pipetta (Schmidt) Topsent, 1945

Material examined: St. 7-44, specimens 7-44-1-8a, 7-44-1-8b, 5-44-1-8c, 7-44-1-8d and 7-44-1-8e. Loc.: coralligenous biocoenosis, 70-120 m depth, Alboran Island, SE Spain, western Mediterranean.

Description (Fig. 10a)

Massive specimens 1-3 cm wide and up to 8 cm long of subglobulous or repent form, projecting from one to three osculiferous papillae. Osculiferous projections (1-3 cm in length, 0.4-0.7 cm in diameter) typically curved. An ectosomal layer covers the whole apical part, perforated by a sole oscule 1 mm in diameter. Surface irregularly conulose. Conules 1-1.5 mm high, 1-3 mm apart. Ectosome conspicuous, thick but somewhat translucent, the dark skeletal fibers and some subectosomal cannals being observed by transparency. Ostia grouped in areas between conules. Surface covered by sand in a reticulate pattern only visible under magnification. Consistency tough and flexible. Color cream with greyish or greenish tinges in alcohol.

Skeleton (Figs. 10b-e)

Primary fibers fasciculate, divided into various slender fibers often irregularly branched and anastomosed. A pith and a stratified bark are conspicuous in the zones where fibers are not totally filled by foreign material, mainly in the lateral fascicles. Diameter variable (30-310 µm).

Secondary fibers scarce, in general without foreign inclusions, forming perforated plates in contact with the primary fibers. Its diameter varies between 25 and 50 µm, although some perforated plates can reach up to 400 µm in width.

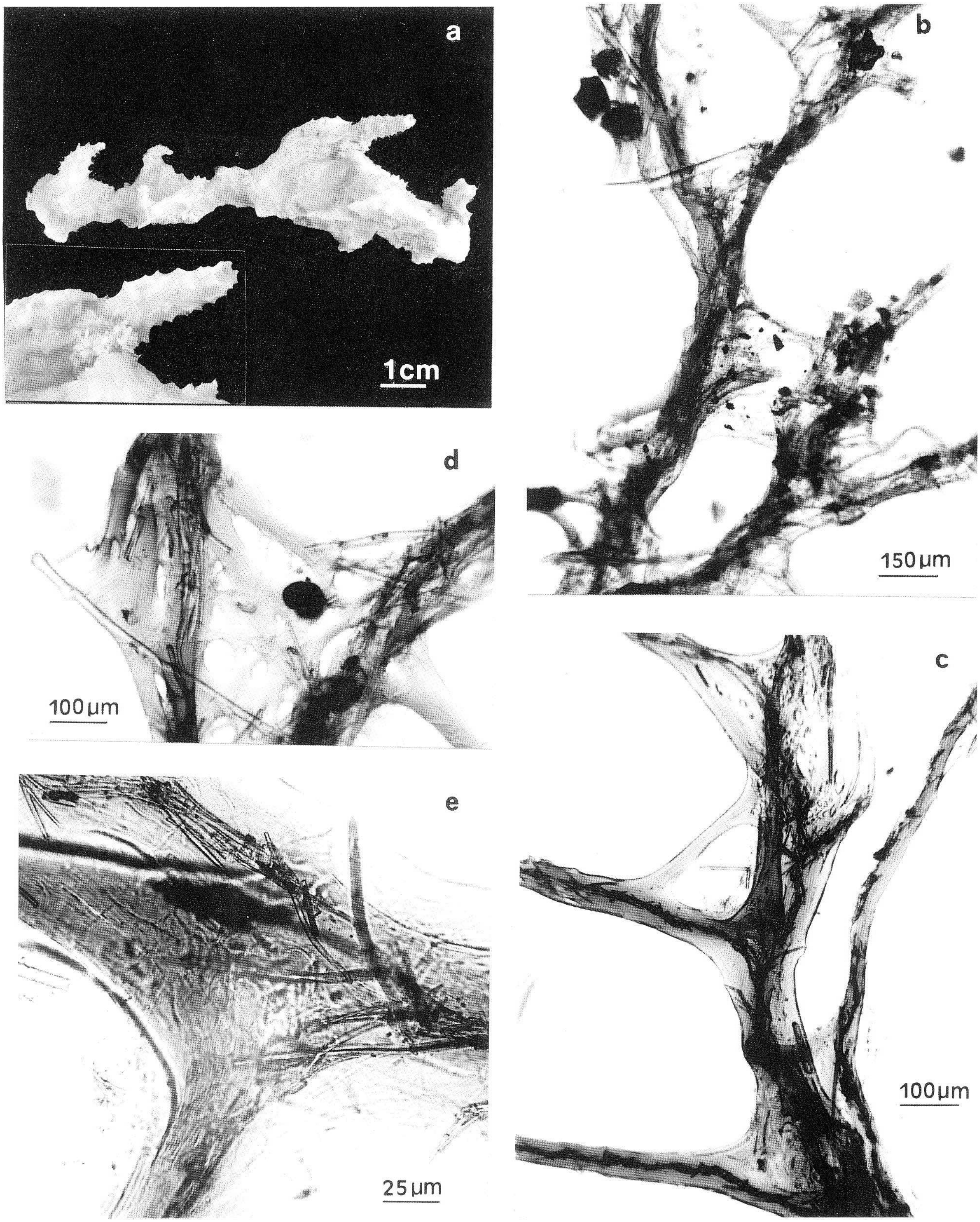

FIG. 10. — *Ircinia pipetta*: a, specimen from Alborán; b and c, primary fibers; d, perforated plate; e, detail of a primary fiber.

As described by TOPSENT (1938), the fibers show a characteristic brown-reddish color unusual in the remaining species of the genus.

Spongin filaments, 4.6-7 µm wide, occasionally up to 2 µm thick.

Skeletal arrangement: Ascending primary fibers divided into up to six interconnected branches, each of them finishing in a surface conule. Secondary fibers mainly interconnecting branches of the same primary fiber in such a way that frequently each primary complex remains free. This gives the whole skeleton a pseudodendritic feature and leaves some sponge zones deprived of skeleton.

Distribution

Species up to date only known from the southern part of the western Mediterranean: the Algerian coast (SCHMIDT, 1868) and the Thyrrenian Sea (PULITZER and PRONZATO, 1980). Bathymetric range: 11-120 m in depth.

Discussion

VACELET (1969) considered this species a variety of *I. variabilis* because only its external form appeared to distinguish it from *I. variabilis tipica*. Nevertheless, a reexamination of the type by TOPSENT (1938) and BERGQUIST (1980), and then PULITZER-FINALI and PRONZATO (1980),discovered skeletal peculiarities in this species distinguishing it from *I. variabilis*. The present specimens confirm these features, which are the strongly fasciculate primary fibers almost without any secondary connection among them, but with wide perforated plates of secondary fibers connecting the different fascicle clusters of each primary fiber, the absence of skeleton in some zones of the sponge, and the dark color of its fibers, constantly present in *I. pipetta* and absent from *I. variabilis*. The presence of osculiferous projections in itself would not be reason enough to separate either species since hydrodynamism has a strong influence on these formations in sponges. Moreover, the specimens usually ascribed to *I. pipetta* are habitually covered by ebibionts, and that could also influence some of its morphological features, such as the thick translucent (without sand) ectosome and the chimney-like osculiferous formations. Nevertheless, the above-mentioned skeletal characteristics are not easily ascribable to environmental variability. Despite its thick filaments, TOPSENT (1945) placed this species in the subgenus *Sarcotragus* because of the fasciculate form of its primary fibers. It would be advisable to obtain further information on this species besides its skeletal features (e.g. on the nature of its secondary metabolites) before determining whether it would be better placed in the genus *Sarcotragus* instead of *Ircinia*.

GENERAL DISCUSSION

The five sponge species redescribed here are characteristic of the most southern region of the western Mediterranean, the zone in which the Atlantic influence is strongest. Two of them clearly show North Atlantic affinities (*R. agnata* and *A. egregia*), and it is supposed that they colonized the Mediterranean via the Straits of Gibraltar. Neither would probably go far into the Mediterranean because the Atlantic influence is quickly attenuated there (PÉRÈS, 1985).

The species *A. oxeifera* is also present in the central Mediterranean region. The remaining two species (*A. salicina* and *I. pipetta*) seem to be endemic to the southwestern Mediterranean area, since they have only been found in the north littoral of Africa, as well as in the Tyrrhenian and the Alboran seas.

According to this and previous studies (MALDONADO, 1992), the littoral sponge fauna of the Alborán and nearby seas differs in some respects from that of the remaining western Mediterranean regions. In contrast, the bathyal sponge fauna from the same zone would represent an impoverished aspect of that from the nearby bathyal Atlantic (BOURY-ESNAULT *et al.*, in press).

ACKNOWLEDGMENTS

We thank J. M. Fortuño for help in taking the scanning micrographs and G. Carreras for the spicule drawings. This study was supported in part by projects CICYT MAR91-0528 (Marine Resources and Aquaculture National Program), MAS2-CT91-0004 (Marine Sciences and Technologies MAST-II) and CICYT PB89-0081 (Fauna Ibérica), and by a "Generalitat de Catalunya" fellowship to M. Maldonado.

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