GOOD CONGRUENCE BETWEEN MORPHOLOGY AND MOLECULAR PHYLOGENY OF HADROMERIDA, OR HOW TO BOTHER SPONGE TAXONOMISTS. *Memoirs of the Queensland Museum 44: 100. 1999*:- Within Demospongiae, the order Hadromerida is well defined and there is a strong consensus among systematicians about its composition and validity. This order is characterised by the presence of tylostyles radially arranged at least in the periphery, and by microscleres, when present, of the aster type. All Hadromerida are oviparous and the choanocytes have a periflagellar sleeve. Ten families are without any doubt attributed to Hadromerida, six of which with microscleres of the aster type and four of which without microscleres.

The first work on molecular phylogeny of Porifera was made on the Hadromerida (Kelly-Borges, Bergquist & Bergquist, 1991). The molecule used was the 18S rRNA, which appeared to be not sufficiently informative to resolve the phylogeny at that taxonomic level.

In this work we have used the 5' end of the 28S rRNA (about 1000bp) to explore the internal phylogeny of this order. 15 species belonging to 12 genera and 8 families were sequenced. Five outgroup species were sequenced belonging to Axinellida, Tetractinellida, and Halichondrida. Parsimony and Neighbor-Joining analyses have been done. Trees were rooted by using Tetractinellida (*Cinachyrella* and *Discodermia*) as a monophyletic outgroup. Both analyses (Parsimony and Neighbor-Joining) show that the Hadromerida are composed of four monophyletic taxa. Taxon 1 is composed of 6 species belonging to the Spirastrellidae, Acanthochaetetidae, Clionidae, and Placospongiidae. All these families have microscleres of the spiraster-type. Taxon 2 is composed by 5 species of Timeidae and Tethyidae. These two families have microscleres of the euaster-type. Taxon 3 is composed of only one species *Polymastia mamillaris* belonging to the family Polymastiidae, which has no microsclere of aster type. The validity of this taxon has to be checked with other genera belonging to the Polymastiidae family. Taxon 4 is composed of three Suberitidae and an external species *Halichondria panicea*, which belongs to the family Halichondriidae (order Halichondrida). Neither the Suberitidae nor the Halichondriidae have microscleres of the aster type. The monophyly of each of these four taxa is well supported with high bootstrap proportions. The monophyly of the four taxa together is also well supported but the relationships between them cannot be ascertained.

The monophylies of taxa 1 and 2 are congruent with morphology, both taxa corresponding to the hadromerid families with spirasters and with euasters, respectively. An important and unexpected problem of classification appeared with taxon 4. The result obtained with our sequence of *Halichondria panicea* was confirmed with a shorter sequence of *Hymeniacidon heliophila* available in GenBank. When the sequence of *Hymeniacidon* is included, taxon 4 remains monophyletic and strongly supported by BP. From the morphological and cytological point of view there is no synapomorphy between the two groups. The Halichondrida are defined mostly by negative characters. However, we observed a fine morpho-molecular synapomorphy for taxon 4. This is the loss of a small loop of 15 bp in the secondary structure of the D2 domain, which is probably the result of only one deletion event. From the chemical point of view, there is another synapomorphy: a large amount of stanols have been described both in the Suberitidae and the Halichondrida.

The best hypothesis seems to reallocate Halichondriidae to the Hadromerida. The order Hadromerida remains monophyletic. With the exception of this reallocation the classification obtained with 28S rRNA is perfectly congruent with the existing classification. All the families are monophyletic. We propose a subordinal classification : Spirastrellina, Timeina, Polymastiina and Suberitina. ❐ *Porifera, Demospongiae, molecular phylogeny, 28S rRNA, Hadromerida, Halichondrida, monophyly.*

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REMARKS ON THE STATUS OF *MYXILLA* (PORIFERA: POECILOSCLERIDA) ON THE GALICIAN COAST (NW IBERIAN PENINSULA)

F.J.CRISTOBO, P. RÍOS AND V. URGORRI

Cristobo, F.J., Ríos, P. & Urgorri, V. 1999 06 30: Remarks on the status of *Myxilla* (Porifera: Poecilosclerida) on the Galician coast (NW Iberian Peninsula). *Memoirs of the Queensland Museum* **44**: 101-123. Brisbane. ISSN 0079-8835.

Myxilla Schmidt is represented on the Iberian Peninsula by six species, five of which, studied in this paper, were collected from the coast of Galicia (NW of Spain): *M. incrustans, M. iotrochotina, M. macrosigma, M. rosacea* and *M. fimbriata,* and the sixth (*M. tarifensis*), recently described from the Strait of Gibraltar. 188 specimens were collected from 72 stations along the coast of Galicia between 1979-1991. Illustrated descriptions of these species, their habitus, skeletal arrangement and spicules are provided, together with information on their autecology, distribution, and biometric studies of spicules. Morphological comparisons are made between these species and other *Myxilla* from the Atlantic region, and a taxonomic key to species of *Myxilla* in the NE Atlantic is provided. ❐ *Porifera, Poecilosclerida, Myxilla, Iberian Peninsula, NE Atlantic, taxonomy, ecology, key.*

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Only few studies have been made on Galician sponges (Solórzano & Rodriguez, 1979; Solórzano & Durán, 1982; Solórzano, 1991; Solórzano & Urgorri, 1991, 1993; Solórzano et al., 1991). Other records of sponges from the sublittoral benthos are also available in more general publications (Benito, 1976; Gili et al., 1979; Polo et al., 1979; Durán & Solórzano, 1982; Acuña et al., 1984), as well as from nudibranch - sponge dietary studies (Urgorri & Besteiro, 1984). Studies on *Myxilla* in the Ría de Ferrol (Cristobo, 1997) and Galician coast (this study) recorded five species: *M. incrustans, M. iotrochotina, M. macrosigma, M. rosacea*, and *M. fimbriata*. These are comprehensively described and discussed in this present study.

MATERIALS AND METHODS

Collections were made between 1979-1991 using direct sampling in the intertidal, and SCUBA and naturalist benthic dredge (Holme & McIntyre, 1984) in the sublittoral zones.

A total of 188 specimens of *Myxilla* were collected from 72 stations on the Galician coast (Fig. 1). Preparation and histological methods follow Rubió (1973), Rützler (1978), Uriz (1978, 1986) and Cristobo et al. (1993). Spicules were examined under a Hitachi S570 scanning electron microscope (SEM). Underwater photographs were taken with a Nikonos V camera and SB-102 flash. A biometric study of sponge spicules was made for specimens from the Ría de Ferrol and microscopic preparations of two paratypes of *M. macrosigma* (Museum National d'Histoire Naturelle, París (MNHN), Laboratoire de Biologie des Invertébrés Marins et Malacologie: DNBE282 from the Grotte des Calanques, and DNBE287 from Île Grosse). All specimens were deposited in the Departamento de Bioloxía Animal in the Facultade de Bioloxía at the Universidade de Santiago de Compostela, Spain.

SYSTEMATICS

Order **Poecilosclerida** Topsent
Family **Myxillidae** Topsent
Myxilla Schmidt, 1862

Myxilla incrustans (Johnston, 1842)
(Figs 2-4, 17C)

MATERIAL. Stations 19, 20, 23, 43 (see Fig. 1).

AUTECOLOGY. In Galicia, this sublittoral species lives in a small bathymetric zone from 8-14m depth in the outer Ría area, settling on granite rock on exposed bottoms; also found on gravel bottoms (Topsent, 1913) and as epibiont on *Inachus* and *Cellaria* (Crawshay, 1912); elsewhere it may also be found intertidally (Stephens, 1921; Könnecker, 1973; Hoshino, 1981), in the sublittoral zone (Descatoire, 1969)

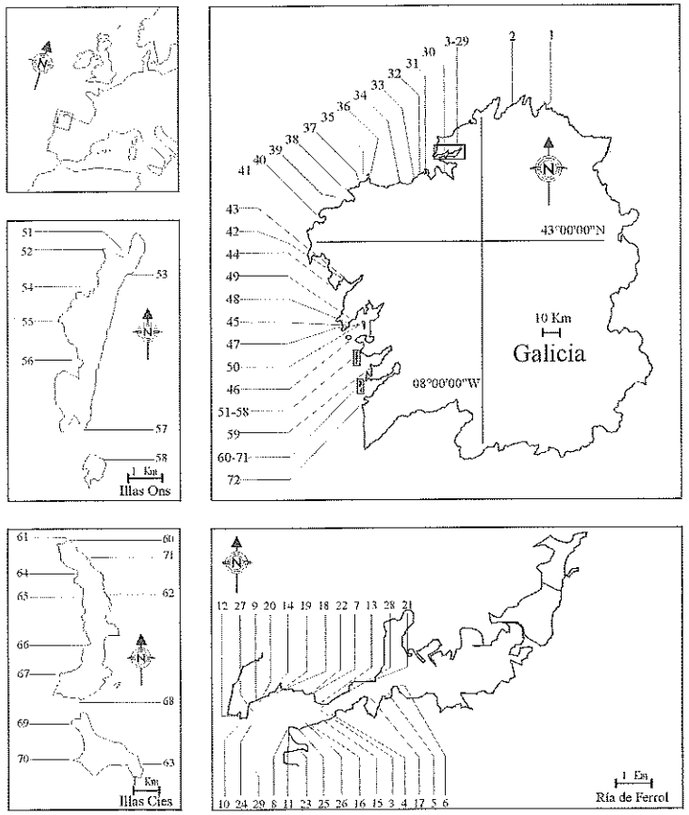

FIG. 1. Map of the study area showing location of collecting stations.

and on rocky circalittoral bottoms (Vidal, 1967; Borojevic et al., 1968; Topsent, 1913) up to 170m deep (Boury-Esnault et al., 1994).

DISTRIBUTION. Arctic, European Atlantic coasts, Gibraltar and Mediterranean Sea (Ackers et al., 1992); also allegedly reported from Senegal (Lévi, 1952), Japan (Hoshino, 1981), Korea (Sim, 1994) and Antarctica (Arndt, 1935), although the conspecificity of these records must be checked. In Galicia this species is known from the Ría de Ferrol, only the second record for the Iberian Peninsula, previously known from Punta Uhía, Ría de Muros (Solorzano, 1991).

DESCRIPTION. An encrusting sponge, sometimes massive, with a rough surface consisting of fine reticulation of spicules. Orange or yellow in colour. Skeletal arrangement: Choanosomal skeleton myxilloid with triangular and quadrangular meshes of acanthostyles forming ascending tracts of up to 20 spicules interconnected by transverse fascicles. The ectosome is made up of tornotes in paratangential brushes which extend out in a bouquet-like fashion. Microscleres are scattered throughout the sponge but anchorate chelae are more abundant in the ectosome, where they form a sub-superficial layer. Sigmas are dispersed within the choanosome. Megascleres: straight or slightly curved robust acanthostyles with conical spines. Dimensions: 150.3-209.0× 2.9-12.8μm. Smooth, straight or slightly curved tornotes, with asymmetrical terminations: one having a marked ellipsoidal tyle and the other with diverse irregular terminations, the most common of which is spear-shaped, in some cases bearing fine spines. Dimensions: 128.5-207.6×2.6-7.3μm. Microscleres: Sigmas with the typical c- and s- shapes. Dimensions: 22.2-39.4×0.7-3.2μm. Arched spatuliferous anchorate isochelae, of two different size categories: 11.3-19.2×3.5-6.3μm and 24.1--35.5 ×10.9-16.2μm.

Myxilla iotrochotina (Topsent, 1892)
(Figs 5-7, 17D)

MATERIAL. Stations 1, 2, 7, 9, 31, 34, 36, 37, 40, 43, 45, 52, 56, 58, 66 (see Fig. 1).

AUTECOLOGY. Cryptic species, occupying highly localised and well-concealed enclaves, perhaps explaining why it has been overlooked since it was first described by Topsent; in Galicia it is found in secluded places such as on the roofs of small caves and intertidal crevices in the mid-outer zone of the rías; the few references to this species describe it living in similar environments to a depth of up to 30m, such as detritic bottoms (Sará & Siribelli, 1960), and artificial breakwaters (Sará, 1961); also epibiont on other sponges such as *Geodia* (Ferrer-

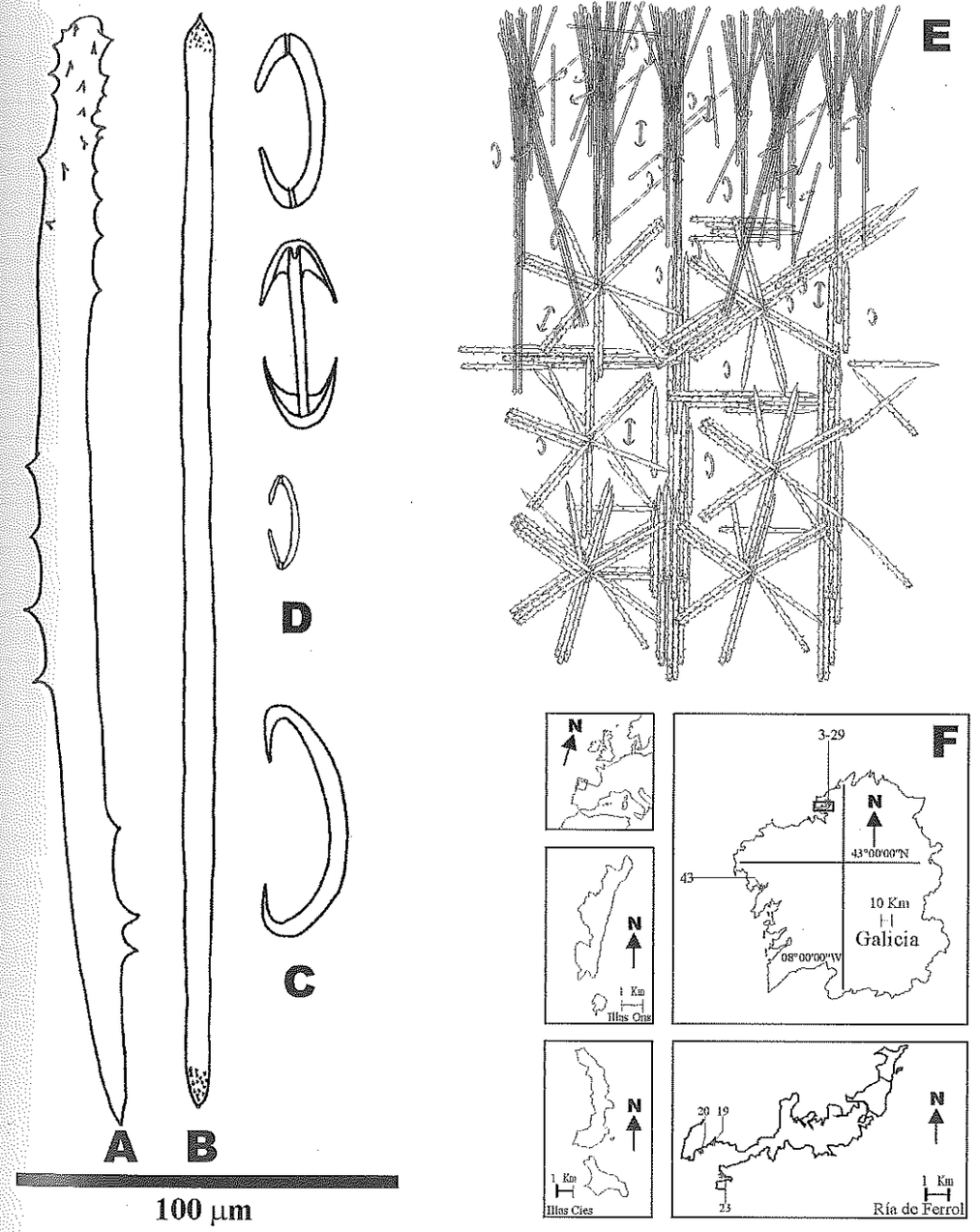

FIG. 2. *Myxilla incrustans*. Spicules: A, Acanthostyle; B, Tornote; C, Sigmas; D, Isochelae; E, Skeletal arrangement; F, Distribution in Galicia.

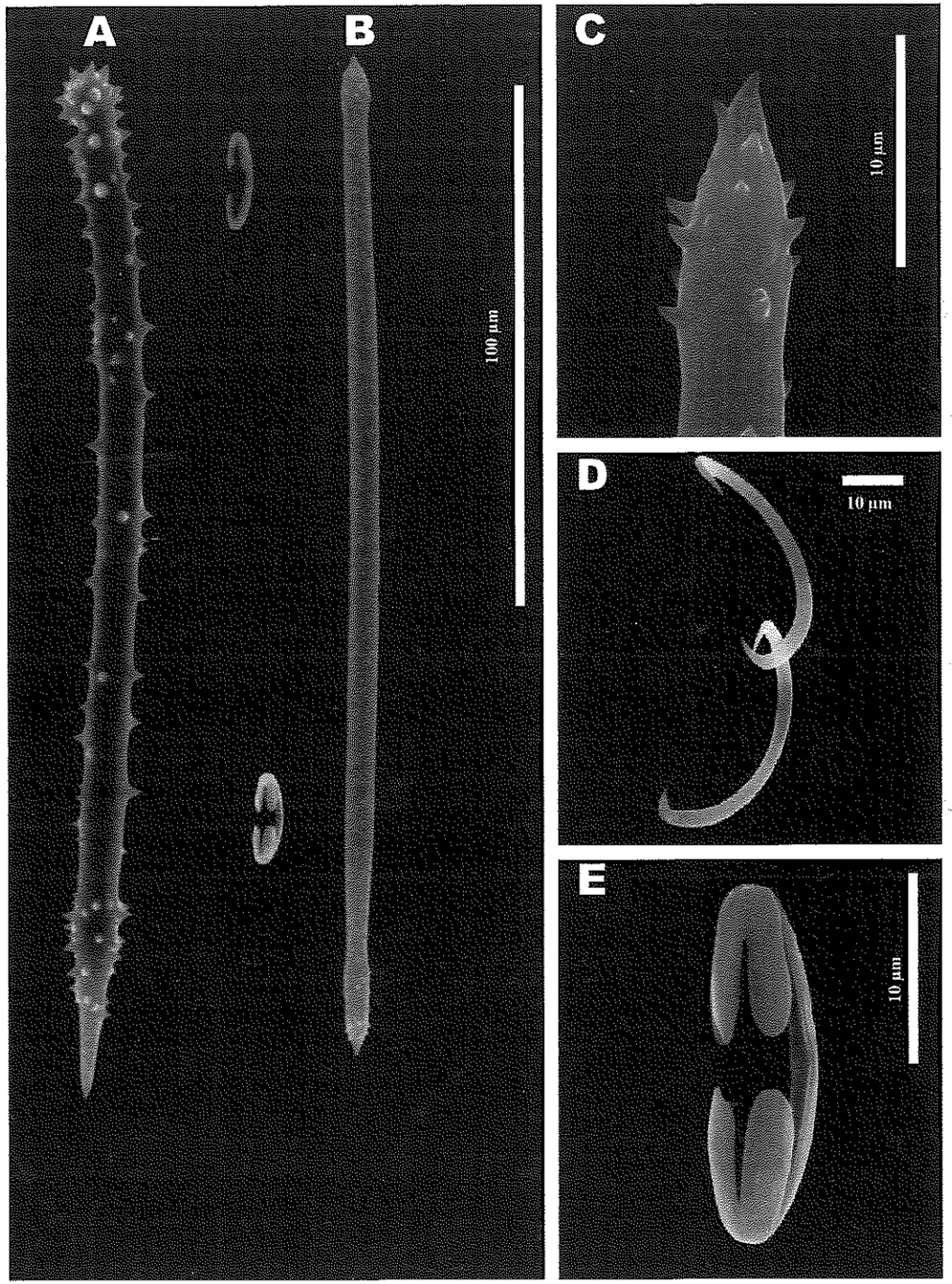

FIG. 3. *Myxilla incrustans*. Spicules: A, Acanthostyle; B, Tornote; C, Detail of the end of a tornote; D, Sigmas; E, Isochela.

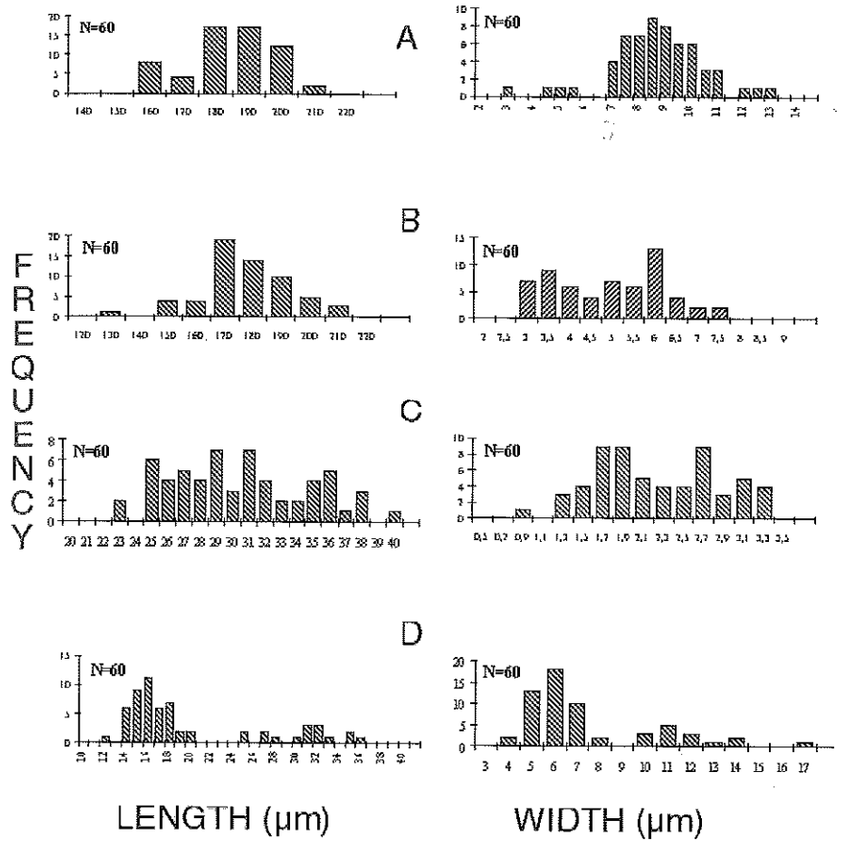

FIG. 4. Frequency histograms for spicules of *Myxilla incrustans*. All measurements are given in µm. (numbers in parentheses indicate means). A, Acanthostyles: 150.3-(179.5)-209.0×2.9-(8.4)-12.8µm. B, Tornotes: 128.5-(172.8)-207.6×2.6-(4.7)-7.3µm. C, Sigmas: 22.2-(30.0)- 39.4×0.7-(2.1)-3.2µm. D, Isochelae: 11.3-(19.6)- 35.5×3.5-(6.9)-16.2µm.

Hernández, 1918; Solórzano, 1991), *Erylus discophorus* (Solórzano, 1991), on *Pinna* (Topsent, 1892), and on Laminarian rhizoids (Descatoire, 1969). It has recently been reported by Carballo (1994) in the stomach contents of *Platydoris argo* (Mollusca: Opistobranchia) in the Bay of Algeciras.

DISTRIBUTION. Atlantic and Mediterranean, 0-30m depth (Carballo & García-Gómez, 1996). In Galicia it is known from the Ría de Ferrol (Cristobo, 1997), Punta Uhía, Centoleira, (Durán & Solórzano, 1982), Islas Cíes (Acuña et al., 1984), Morás, Espasante, Orzán, Caión, Malpica, Santa Mariña, Camariñas, Esteiro, Punta Pasante, Enseada Canibeliñas, Punta Cociñadoiro and Enseada do Lago (Solórzano, 1991).

DESCRIPTION. Forming small coverings on rocks. Rough surface; light cream in colour. Skeletal structure is typical for the genus with a choanosome made up of quadrangular or triangular polyspicular meshes and ectosomal tornotes in palisade; microscleres are widespread throughout the sponge. Megascleres: straight, robust acanthostyles with conical spines in a tangential arrangement over the entire spicule. Dimensions: 106.5-144.5×5.5-11.4µm. Smooth, straight fusiform tornotes with symmetrycal ends formed by several spines (from 3-6) which may be slightly divergent. Dimensions: 113.1-139.2× 3.9-8.7µm. Microscleres: sigmas typically c- and s- shape, differentiated into two sizes categories: 11.7-19.9×0.5-1.2µm and 20.7-43.1×1.3-3.6µm. Tridentate chela with a straight spicular stem;

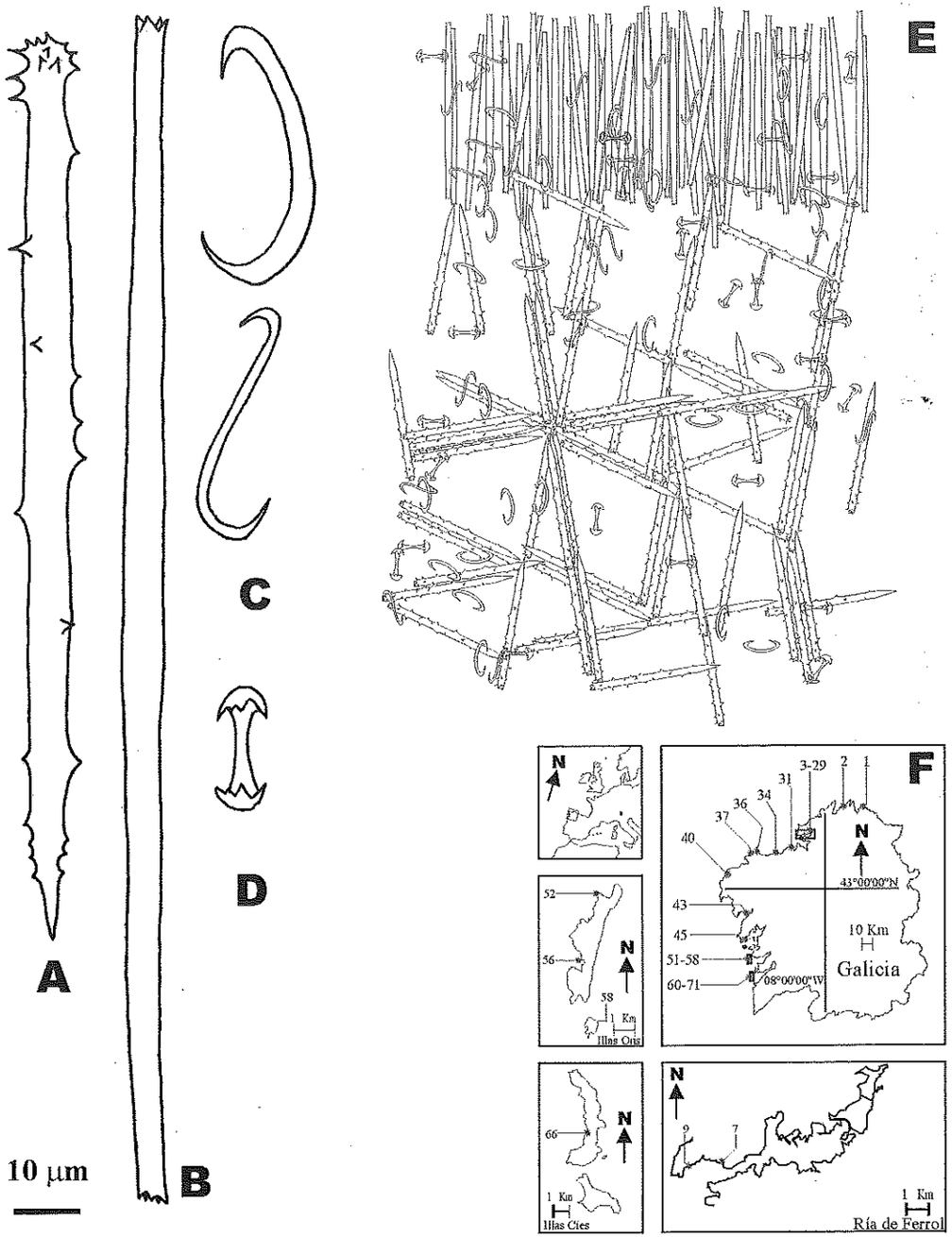

FIG. 5. *Myxilla iotrochotina*. Spicules: A, Acanthostyle; B, Tornote; C, Sigmas; D, Tridentate chela; E, Skeletal arrangement; F, Distribution in Galicia.

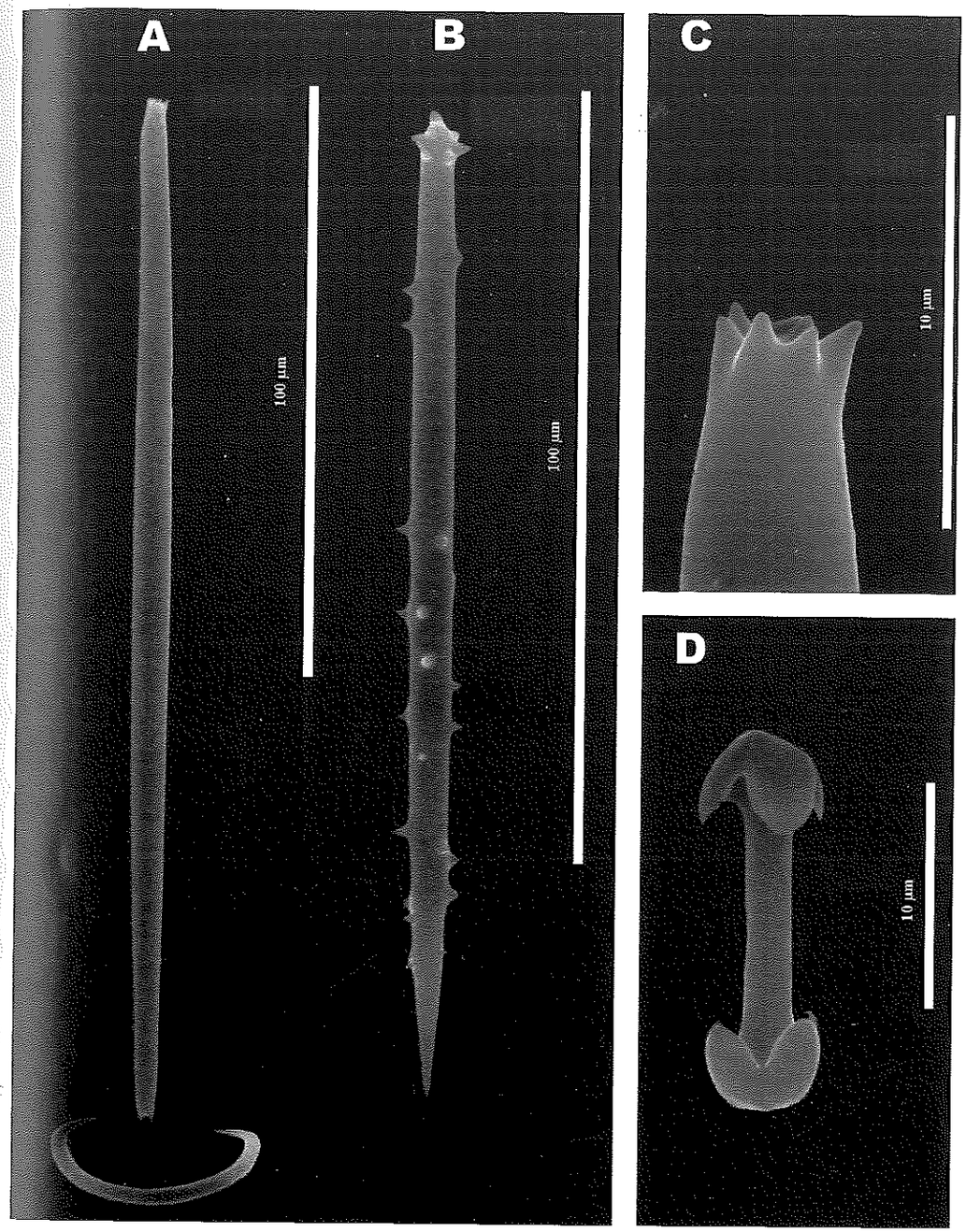

FIG. 6. *Myxilla iotrochotina*. Spicules: A, Tornote and sigma; B, Acanthostyle; C, Detail of the end of a tornote; D, Tridentate chela.

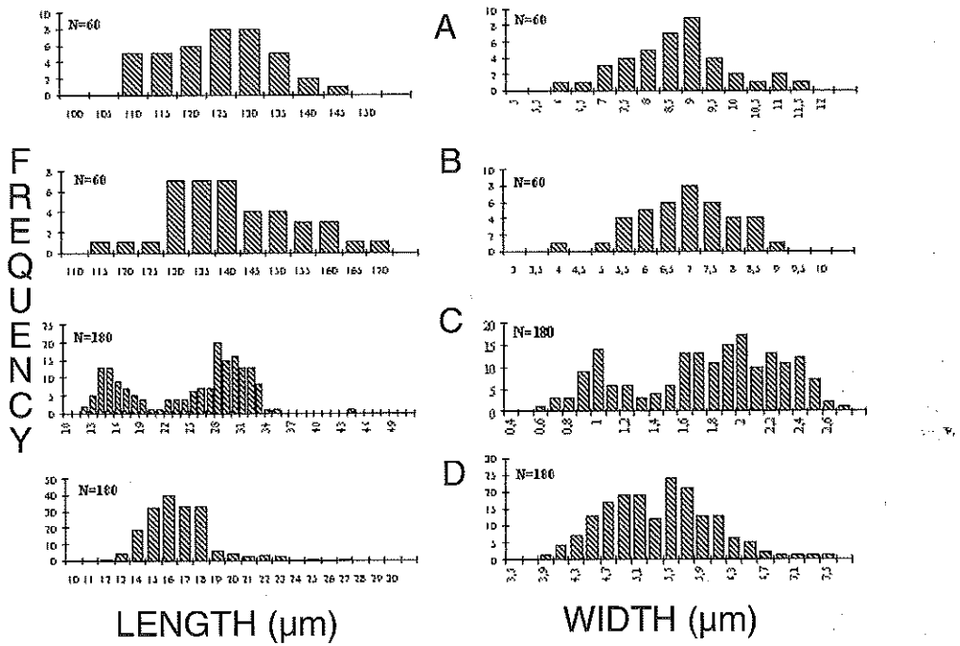

FIG. 7. Frequency histograms for spicules of *Myxilla iotrochotina*. All measurements are given in µm (numbers in parentheses indicate the mean). A, Acanthostyles: 106.5-(122.4)-144.5×5.5-(8.3)-11.4µm. B, Tornotes: 113.0-(167.6)-139.2×3.9-(6.6)-8.7µm. C, Sigmas: 11.7-(23.9)-43.1×0.5-(1.6)-3.6µm. D, Tridentate chelae: 11.2-(16.1)-26.0x3.8-(5.2)-7.3µm.

extremities bearing three short, wide teeth; abundant. Dimensions: 11.2-26.0× 3.8-7.3µm.

Myxilla macrosigma Boury-Esnault, 1971
(Figs 8-10, 17A)

MATERIAL. Stations 13, 25, 26, 66 (see Fig. 1).

AUTECOLOGY. In the Ría de Ferrol this species is found between intertidal to 11m depth, preferring to settle on vertical walls and in crevices in the outer Ría stations, with either a southern or northern orientation. Boury-Esnault (1971) first collected it on the upper and middle levels (2-13m) of dark biotopes in the area of Banyuls-sur-Mer (Mediterranean). Pouliquen (1972) collected it from the caves of Endoume (Marseille), and later Boury-Esnault & Lopes (1985) found it in the Azores on vertical walls between 8-20m depth. This species prefers to settle in areas with very little light, such as crevices and the roofs of caves. It was not found on soft substrates such as mud, sand, pebbles or gravel in the 78 stations sampled in the a Ría de Ferrol, unlike the closely related *Myxilla rosacea* which is found on maerl in the Ría de Arousa (Solórzano et al.,1991), and on gravel in the Ría de Ferrol (Cristobo et al., 1992), indicating that the two species have different ecological preferences.

DISTRIBUTION. Mediterranean and Atlantic. In Galicia it has only been found in the Ría de Ferrol and on the Cíes Islands, the first record for the Iberian Peninsula.

DESCRIPTION. Massive or encrusting sponge. The largest specimen (Station 25) measures 4cm long, 1cm thick. Surface is irregular, lobate, velvet to touch and highly perforated. The exhalant canals form a network of surface veins converging toward the circular osculum measuring up to 5mm diameter. Consistency is flexible and mucusy. Live specimens are yellowish-orange in colour, becoming light beige or brown in alcohol, staining the alcohol slightly yellowish. Specimens collected in August were reproductive. Choanosomal skeleton composed of a reticulation of acanthostyles. The networks are isodictyal with triangular or quadrangular

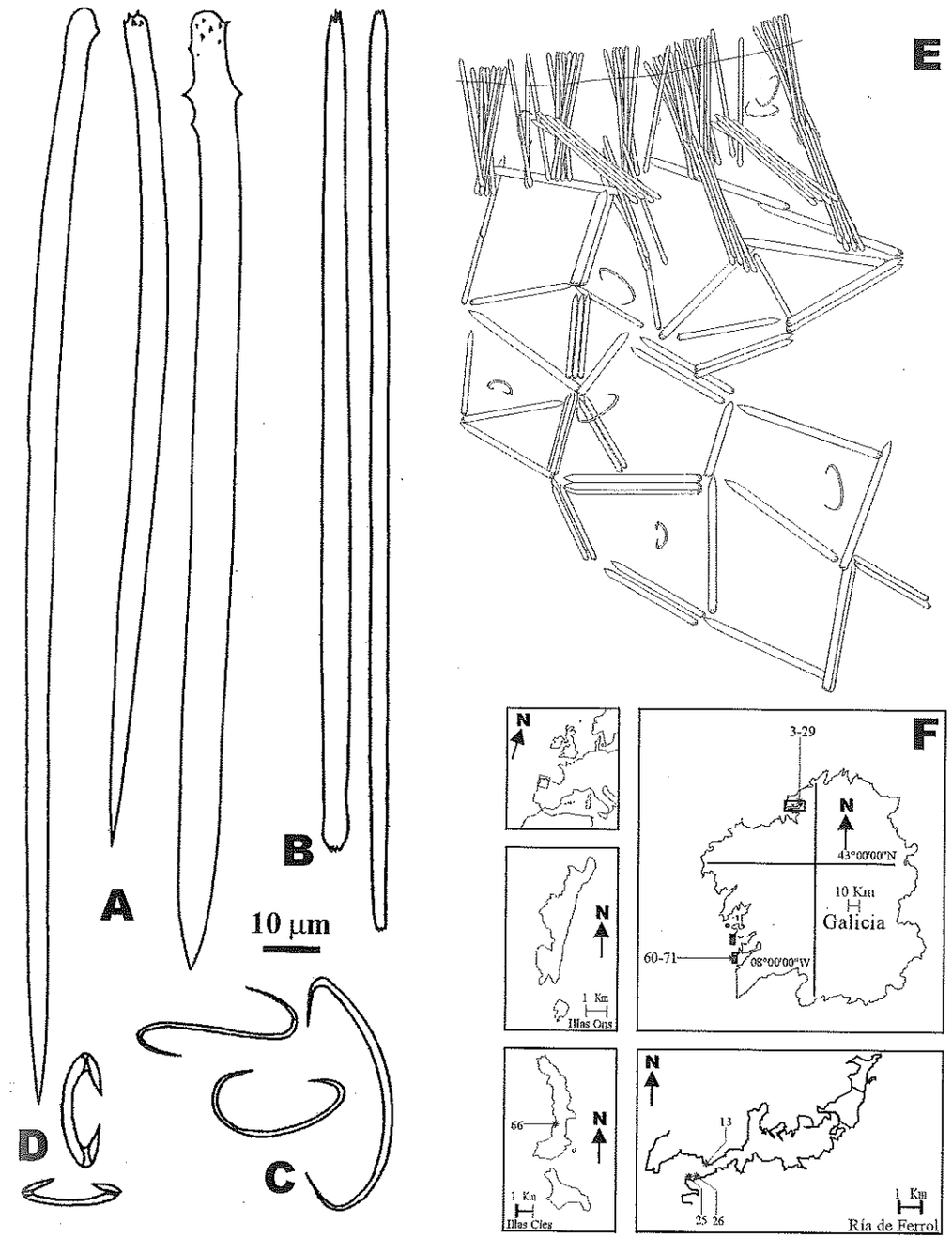

FIG. 8. *Myxilla macrosigma*. Spicules: A, Acanthostyles; B, Tornotes; C, Sigmas; D, Isochelae; E, Skeletal arrangement; F, Distribution in Galicia.

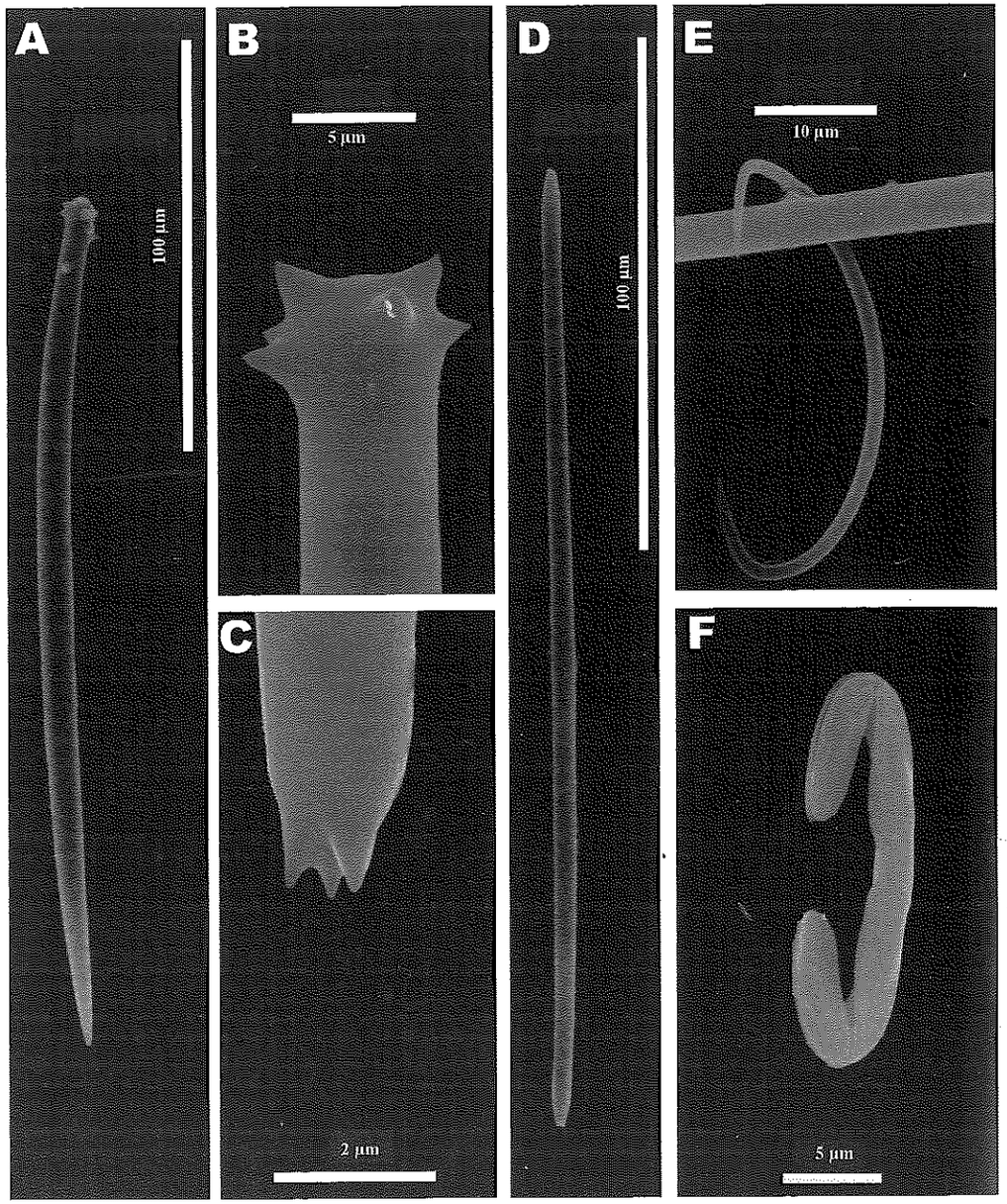

FIG. 9. *Myxilla macrosigma.* Spicules: A, Acanthostyle; B, Detail of the head of acanthostyle; C, Detail of the end of a tornote; D, Tornote; E, Sigma; F, Isochela.

meshes composed of 1-5 acanthostyles. The ectosomal skeleton is made up of tornotes which are tangentially arranged to the sponge surface, sometimes forming bouquets. Microscleres, sigmas and isochelae, are found throughout the sponge. Spicules. Megascleres: slightly curved acanthostyles, with curvature occasionally more pronounced near the head of the spicule. Spines

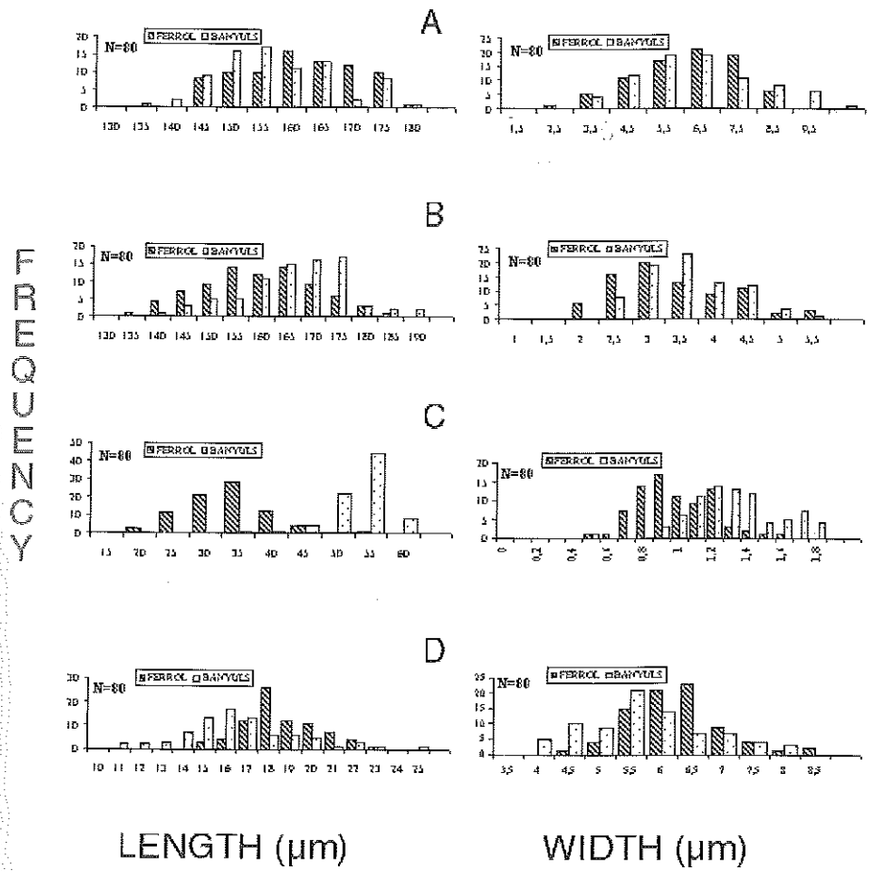

FIG. 10. Frequency histograms for spicules of *Myxilla macrosigma* from two different localities: Ferrol, Spain (Atlantic) and Banyuls-Sur-Mer, France (Mediterranean). All measurements are given in µm (numbers in parentheses indicate the mean). A, Acanthostyles: 141.1-(158.4)-177.3×1.9-(5.6)-8.3µm. B, Tornotes: 132.5-(157.0)-182.8×1.5-(3.1)-5.2µm. C, Sigmas: 18.4-(30.7)- 51.9×0.4-(0.9)-1.5µm. D, Isochelae: 14.5-(18.0)-22.2× 4.4-(5.9)-8.1µm.

are located on or near the head and few in number (1-20). Smooth stem. Dimensions: 141.1-177.3× 1.9-8.3µm. Smooth, straight tornotes fusiform, with spiny endings and occasionally swollen at the ends with short terminations. Dimensions: 132.5-182.8×1.5-5.2µm. Microscleres: sigmas typically c- and s- shape with a wide opening. Dimensions: 18.4-51.9×0.4-1.5µm. Isochelae with alae closed along less than a third of the total length of the spicule. Dimensions: 14.5-22.2 ×4.4-8.1µm.

Myxilla rosacea (Lieberkühn, 1859)
(Figs 11-13, 17B)

MATERIAL. Stations 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 67, 68, 69, 70, 72 (see Fig. 1).

AUTECOLOGY. This species has been found on gravel in the mid-zone, on soft bottoms of the Ría de Ferrol, where tidal currents are predominant (Cristobo et al., 1992). In other locations in Galicia it is also abundant in both the intertidal zone in semi-exposed areas, and in protected areas such as on rocky bottoms of the sublittoral

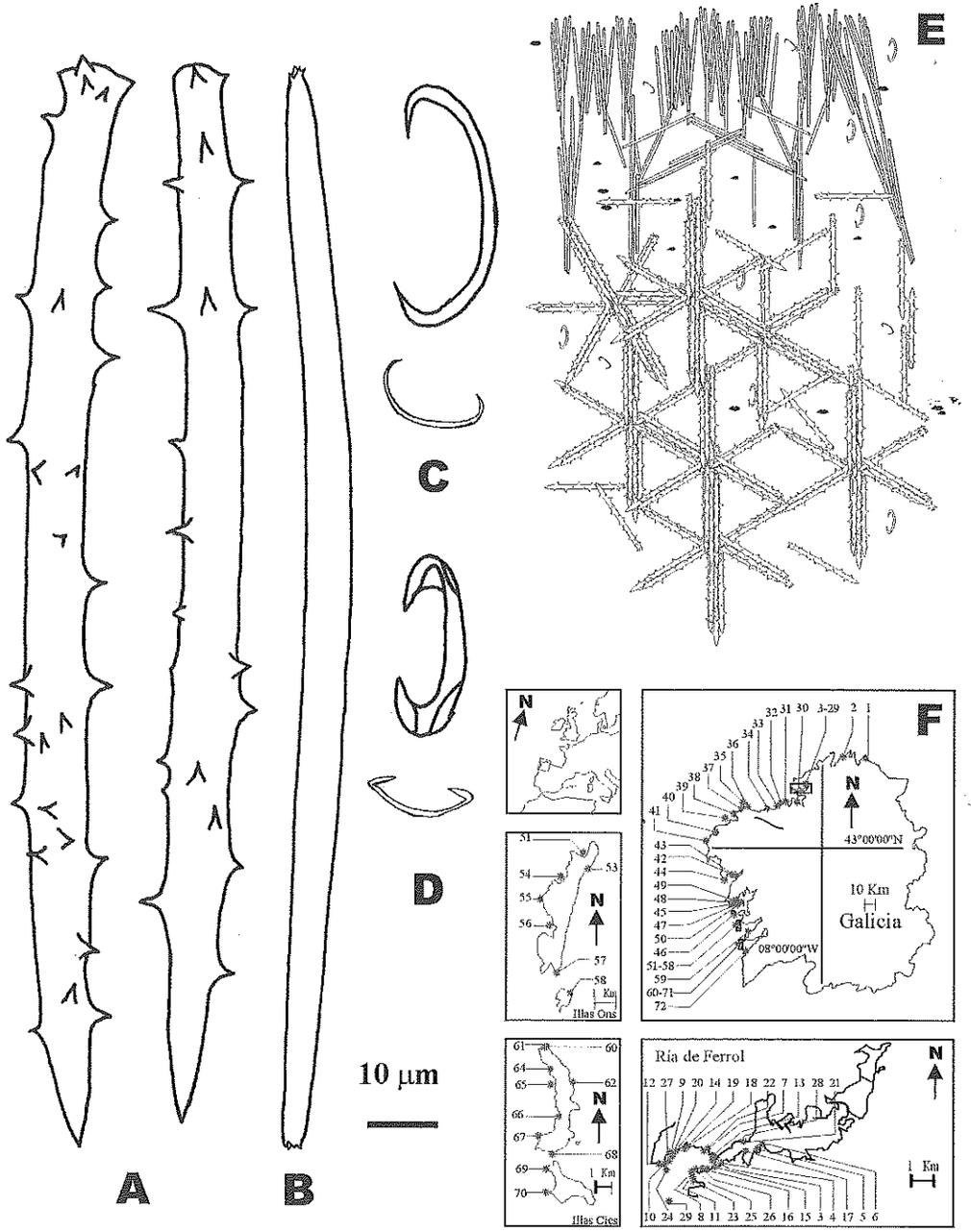

FIG. 11. *Myxilla rosacea.* Spicules: A, Acanthostyles; B, Tornote; C, Sigmas; D, Isochelae; E, Skeletal arrangement; F, Distribution in Galicia.

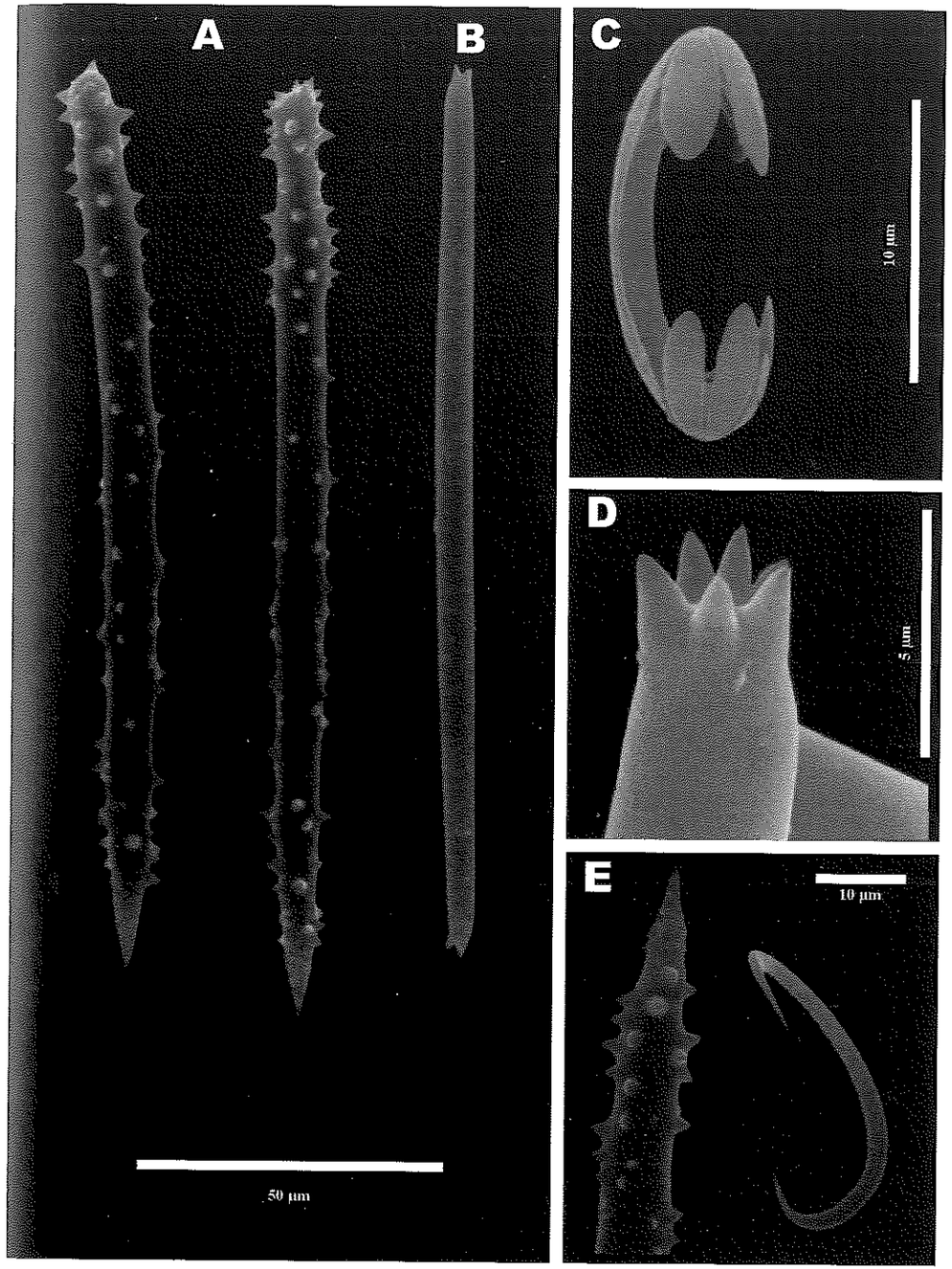

FIG. 12. *Myxilla rosacea.* Spicules: A, Acanthostyles; B, Tornote; C, Isochela; D, Detail of the end of a tornote; E, Detail of the end of an acanthostyle and sigma.

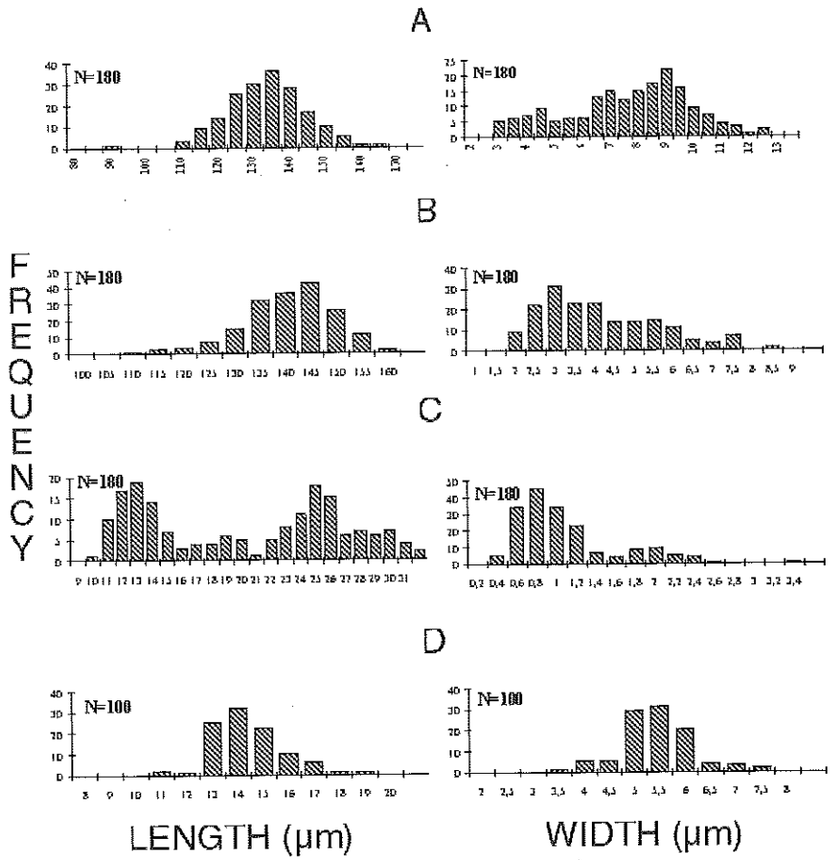

FIG. 13. Frequency histograms for spicules of *Myxilla rosacea.* All measurements are given in µm (numbers in parentheses indicate the mean). A, Acanthostyles: 89.6-(130.9)-162.0×2.5-(7.3)-12.2µm. B, Tornotes: 106.2-(137.9)-158.6×1.5-(3.9)-8.3µm. C, Sigmas: 9.8-(19.6)- 31.7×0.3- (0.9)-3.2µm. D, Isochelae: 10.5-(13.8)-18.7×3.0-(5.1)-7.3µm.

zone, where it is frequently associated with rhizoids of *Laminaria* and other seaweeds, and on soft bottoms such as the biocenosis of maerl (Solórzano et al., 1991). At greater depths on the circalittoral bottoms this species has been found associated with the biocenosis of *Dendrophyllia cornigera.* Abundant in both intertidal and sublittoral zones, with wide bathymetric range to 414m depth (Uriz, 1988). In the intertidal zone it is found in the middle and outer rías, particularly in semi-exposed enclaves and protected areas, with preference to settle on rocky granitic substrates, vertical and horizontal walls, and on seaweeds, especially laminarian rhizoids. The wide ecological range of this species is conducive to its colonisation of a wide variety of habitats: the intertidal zone (Stephens, 1921; Sará, 1961, 1964a, 1964b), seaweed rhizoids (Stephens, 1921; Benito, 1976; Rodriguez & Lorenzo, 1978). In the sublittoral zone it is found in caves and on extremely plumb surfaces (Labate, 1964; Descatoire, 1969; Boury-Esnault, 1971; Pouliquen, 1972; Bibiloni, 1981a), it incrusts on *Microcosmus sulcatus* (Sará & Melone, 1963), on ascidians, balanids, and *Sabellaria* tubes (Borojevic et al., 1968), on *Spondylus* (Benito, 1981); it also encrusts *Arca barbata* and *Cerithium vulgatum* (Pulitzer-Finali, 1978), on meadows of *Posidonia oceanica* (Benito, 1981; Pansini & Pronzato, 1985), on gravel, sand, calcareous seaweeds *Inachus* sp., and the sponge *Ircinia variabilis* (Babic, 1922), on the

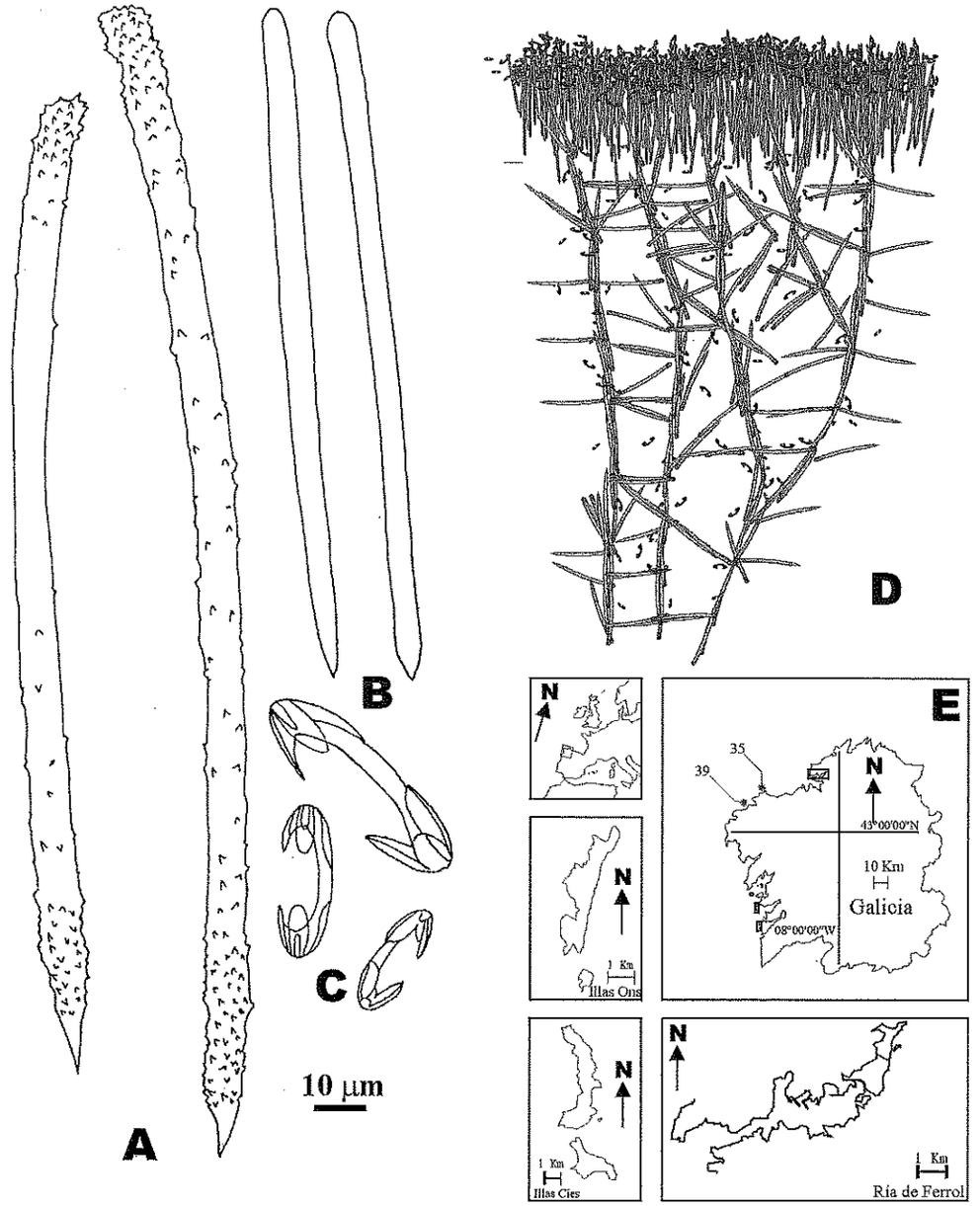

FIG. 14. *Myxilla fimbriata.* Spicules: A, Acanthostyles; B, Tornotes; C, Isochelae; D, Skeletal arrangement; E, Distribution in Galicia.

Mediterranean coralligen biocenosis (Sará, 1972; Bibiloni, 1981b), detritic and detritic-mud bottoms, (Poggiano, 1965) and forming part of the port fouling epifauna (Pronzato, 1972; Sará, 1974). This species is also found on circalittoral bottoms (Vidal, 1967), consisting of sand, pebbles, and gravel, between 130-160m depth (Topsent, 1928), on *Antipatharia* at 60-100m depth

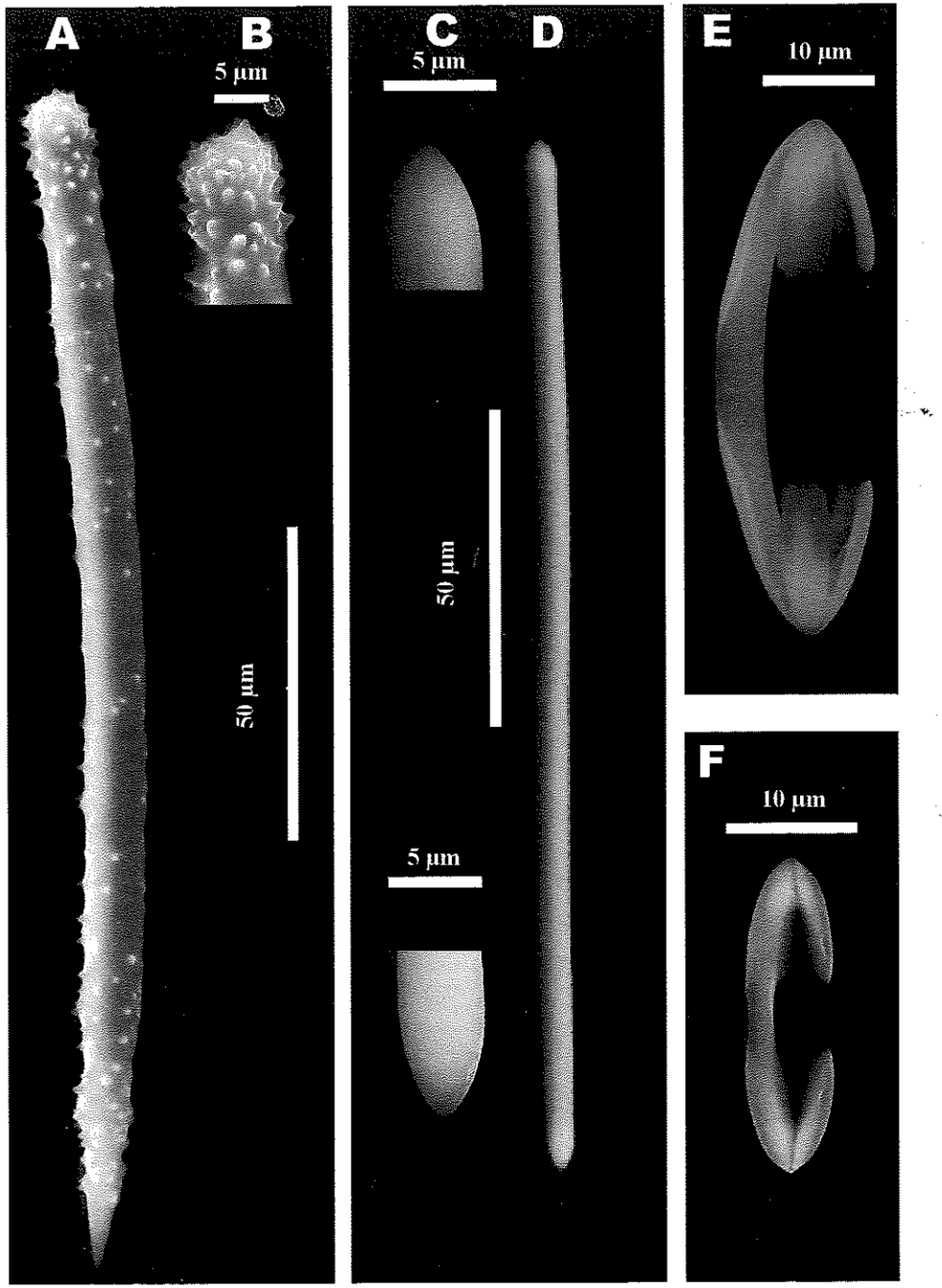

FIG. 15. *Myxilla fimbriata.* Spicules: A, Acanthostyle; B, Detail of the head of a acanthostyle; C, Detail of the ends of a tornote; D, Tornote; E-F, Isochelae.

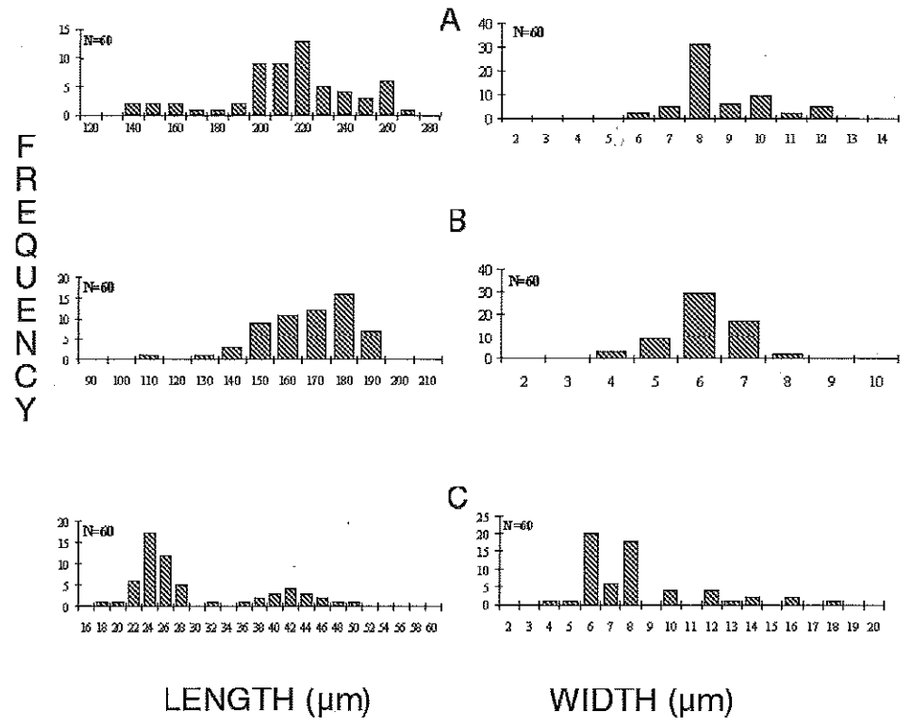

FIG. 16. Frequency histograms for spicules of *Myxilla fimbriata.* All measurements are given in µm (numbers in parentheses indicate the mean). A, Acanthostyles: 133.2-(210.2)-264.0×6.1-(8.6)-12.1µm. B, Tornotes: 106.5-(162.9)- 190.8×4.1-(5.9)-7.5µm. C, Isochelae 18.0-(29.3)- 58.3×4.0- (8.2)-18.1µm.

(Topsent, 1928), on the biocenosis of *Corallium rubrum* between 100-200m depth (Templado et al., 1986), on bottoms of dead Madreporaria with brachiopods, tubicolous polychaetes and anthozoans at between 260-269m depth (Uriz, 1985), on *Antipathes fragilis* between 130-180m depth, as well as on epibathyal mud (Vacelet, 1960).

DISTRIBUTION. Eastern Atlantic from the Arctic to South Africa; Pacific (Lambe, 1892); Mediterranean, (Carballo & García Gómez, 1996). In Galicia it is found in a number of locations: 43°44'50"N, 08°12'W - 43°40'N, 08°55'W (Topsent, 1892), Os Feitales (Benito, 1976), Aguiño, O Grove (Rodriguez & Lorenzo, 1978), San Ciprián de Burela (Gili et al., 1979; Polo et al., 1979), Suevos, Caión, Patos (Solórzano & Rodriguez, 1979), Punta Uhía, Queixal, Insuela, Corvasa, Corasa, Centolleira, Isla de Rúa, Airós, Sálvora, Isla de Ons (Durán & Solórzano, 1982), Laxe (Solórzano & Durán, 1982), Islas Cíes (Acuña et al., 1984) and Ría de Arousa (Solórzano et al., 1991).

DESCRIPTION. Morphologically variable, appearing as a massive, prominent covering on rocky substrates with osculiferous digitiform chimneys, and heart-shaped covering small-sized seaweeds. Dimensions: 2-20cm maximum diameter, 0.4-10cm thick. Rough surface, having several characteristic crests, in some places very occasionally smooth. Soft and slightly flexible consistency; delicate ectosome and choanosome with a spongy appearance, highly perforated. The oscula may not be apparent in smaller specimens, but they are generally abundant, located in conical elevations protruding from the sponge mass from 1-8cm, producing chimneys, commonly having ascending, superficial aquiferous ducts; the osculum is circular in shape, sometimes clover-shaped. Abundant ostia appear between the numerous ridges on the surface. colouration varies from various shades of orange, beige or light pink. The species frequently secretes

TABLE 1. Comparison between spicule dimensions of *Myxilla fimbriata* (Bowerbank, 1866). All measurements in µm.

Reference	Acanthostyles	Tornotes	Isochelae I	Isochelae II
Cristobo et al.	190-260	129-200	18-25	35-60
Lundbeck, 1910	260-430	230-320	22-35	64-90
Descatoire, 1966	210-310	160-250	25-30	60-75

mucus in formaldehyde during fixation. Skeletal arrangement: Choanosomal skeleton consists of quadrangular or triangular polyspicular meshes composed of 2-15 acanthostyles. Ectosomal tornotes form bouquets protruding externally less than one third of the length of the spicule. Microscleres, sigmas and isochelae, are distributed throughout the sponge. Megascleres are straight or slightly curved acanthostyles, with strong conical spines highly variable in number arranged perpendicularly to the axis of the spicules, ranging from smooth (i.e. styles) to completely bristled with spines covering the entire surface, and all intermediate gradations between. Dimensions: 89.6-162.0×2.5-12.3µm. Smooth, straight tornotes, slightly fusiform, symmetrical similar extremities ending in small straight spines. Dimensions: 106.2-158.6×1.5-8.3µm. Microscleres: sigmas in typical c- and s- shapes in two size categories: 9.8-20.7× 0.3-1.5µm and 21.3-31.7×1.6- 3.2µm. Arched isochelae. Dimensions: 10.5-18.7×3.0-7.3µm.

Myxilla fimbriata (Bowerbank, 1866)
(Figs 14-16, 17E)

MATERIAL. Stations 35, 39 (see Fig. 1).

AUTECOLOGY. In Galicia the species has been recorded from the biocenosis of *Dendrophyllia cornigera* between 50-58m depth, where it covers both the anthozoan and the brachiopod *Terebratulina caputserpentis*. This species is typical of the circalittoral and bathyal bottoms with bathymetric range between 50-3500m (Descatoire, 1966). It is abundant on bottoms characterised by the presence of *Dendrophyllia cornigera* at 60m depth, and less common in shallower waters less than 40m depth. In the sublittoral and circalittoral zones, the species is found in crevices (Descatoire, 1969). Also reported on *Caryophylia clavus, Lophoelia prolifera* and on rocky bottoms between 80-700m depth (Stephens, 1921).

DISTRIBUTION. North Atlantic and Arctic (Arndt, 1934). In Galicia: Laxe (Solórzano & Duran, 1982).

DESCRIPTION. Encrusting sponge with a smooth or slightly crateriform surface without aquiferous orifices visibles macroscopically. Consistency is elastic; live colouration is pale yellow, brownish-ochre in alcohol. Dimensions: 23×5×2mm. Skeletal arrangement: Choanosomal skeleton is arranged in ascending tracts of acanthostyles interconnected by other transverse fascicles, with isochelae arranged around the tracts. The ectosomal skeleton consists of tornotes forming a relatively regular palisade, together with abundant isochelae. Megascleres: slightly curved acanthostyles with the distal end terminating in a sharp tip and irregular ornamentation with profuse spines on the head and a third of the distal region, except for the tip which is smooth. Dimensions: 133.2-264.0×6.1-12.1µm. Straight tornotes with slightly swollen and tapered distal extremities. Dimensions: 106.5-190.8×4.1-7.5µm. Microscleres: spatuliferous isochelae, with two clearly differentiated size classes. Dimensions: 18.0-28.0 and 35.0-58.3µm.

KEY TO *MYXILLA* FROM THE NE ATLANTIC

1. With styles as choanosomal megascleres 2
   With acanthostyles as choanosomal megascleres . . . 4
2. With pluridentated subtylotes . . . . . *M. pluridentata* Lundbeck, 1905 . . . . . .
   With sharp tornotes 3
3. Only one class of spatuliferous anchorate chela . . . . . *M. pedunculata* Lundbeck, 1905
   Two classes of spatuliferous anchorate chela . . . . . *M. diversiancorata* Lundbeck, 1905
4. Without isochelae . . . . . *M. prouhoi* (Topsent, 1892)
   With isochelae 5
5. Without sigmas. . . . *M. fimbriata* (Bowerbank, 1864)
   With sigmas 6
6. With strongyles . . . . *M. tarifensis* Carballo & García Gómez, 1996
   Without strongyles. 7
7. Tornotes without ends having small divergent points. 8
   Tornotes with ends having small divergent points . . 9
8. Microspined tornote ends . . . . . *M. incrustans* (Johnston, 1842)
   Smooth tornote ends . . . . *M. fibrosa* Levinsen, 1893
9. With tridentate chela . *M. iotrochotina* (Topsent, 1892)
   Without tridentate chela 10
10. Sigmas of two size classes . . . . . *M. rosacea* (Lieberkühn, 1859)
    Sigmas of one size class . . . . . *M. macrosigma* Boury-Esnault, 1971

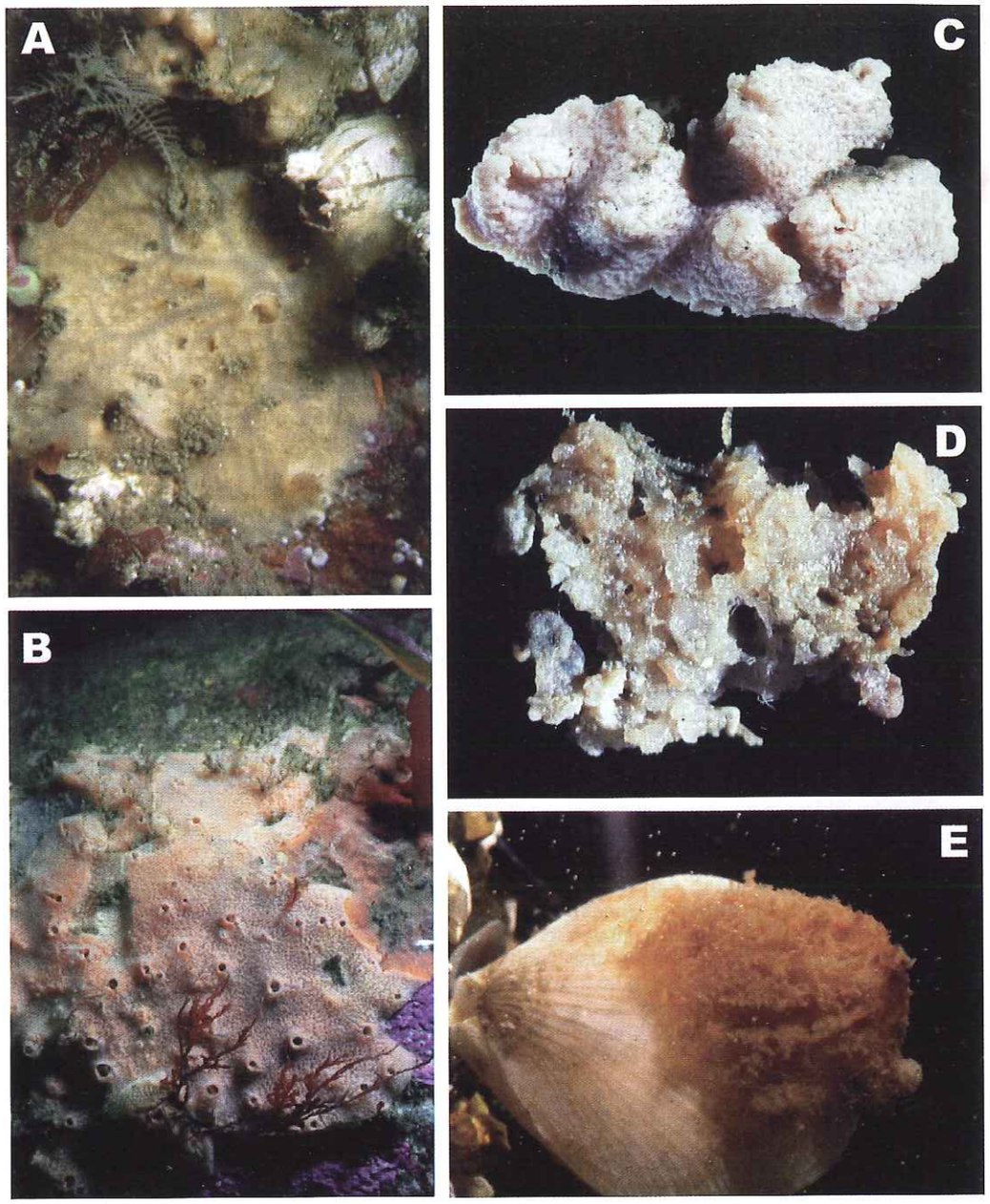

FIG. 17. Habitus of *Myxilla* species from Galicia. A, *M. macrosigma*. B, *M. rosacea*. C, *M. incrustans*. D, *M. iotrochotina*. E, *M. fimbriata*

DISCUSSION

Currently thirty-eight genera are assigned to Myxillidae (Hooper & Wiedenmayer, 1994), although recent revisions, such as Hajdu et al. (1994), Bergquist & Fromont (1988) and others, recognise fewer than these as correctly residing here. In Galicia species of *Myxilla* are amongst the more common sponges, both in terms of biomass and diversity. A key to species in the NE Atlantic is presented in Table 1. As compared to species from other latitudes, *Myxilla* from Galicia have certain unique characteristics in their morphology, habitat and distribution, as discussed below.

Specimens of *M. incrustans* from the Ría de Ferrol show some differences in morphology of their tornotes as compared to specimens from other locations in Galicia. In the samples from Ferrol the tornotes have asymmetrical ends, one forming a tyle with a small elliptic head, perfectly defined by a tiny pre-capitular narrowing, and the other having a certain degree of polymorphism ranging from a spear-shaped tip to irregular shaped tips as illustrated in Figures 3-4. Other authors (e.g. Boury-Esnault et al., 1994) have described smooth tornotes with almost no spines.

Myxilla iotrochotina is very similar to *M. rosacea* but differs externally in its much smaller size and the fact that it forms small scales. *Myxilla rosacea,* on the other hand, is usually massive and frequently has considerable osculiferous chimneys, whereas the skeletal arrangement in both species is similar. The spicular composition is also similar; with acanthostyles, tornotes, and sigmas, but whereas *M. rosacea* has arched spatuliferous isochelae, *M. iotrochotina* has characteristic tridentate chelae with a straight spicular stem and three short teeth on the ends. On this basis we question the identification of *Dendoryx iotrochotina* from the Baleric Islands (Bibiloni, 1990), as it lacks tornotes with spiny ends and the isochelae are also different.

The descriptions of *M. macrosigma* by Boury-Esnault (1971) and Boury-Esnault & Lopes (1985) agree with specimens described here from Galicia, highlighting one of the traits used to identify this species (viz. its mucus appearance). Acanthostyles have few spines, and the stem is practically bare; on the head spines are very scarce and may even be absent totally which gives the spicule the appearance of a true style. Comparisons between our samples from the Ría de Ferrol and paratypes collected from Banyuls-sur-Mer revealed greatly similar lengths, widths, and maximum and minimum values of acanthostyles and tornotes between these populations. In morphological appearance, however, specimens from Ferrol have a slight thickening on the ends of many tornotes. The morphology of sigmas is comparable to the original description. Sigma sizes are, curiously enough, those that show the greatest discrepancy of the four spicular types, even though the maximum and minimum values of the two populations are found to lie within the range of dimensions originally described for the species (20-70µm). The isochelae are similar in terms of size and shape.

Myxilla rosacea has considerable polymorphism in its external morphology, which may be attributed to microhabitat differences between localities (Bidder, 1923), among other factors. The most common form found in Galicia is massive, encrusting rocks and forming an irregular cushion 1-4cm thick, sometimes producing up to 20 digitiform oscular chimneys. Spicules also undergo great variations in morphology from one specimen to another, especially the acanthostyles as previously noted by Descatoire (1969), where the hispidation may be sparse, moderate or dense, with all intermediate stages. Other spicular elements (tornotes, isochelae) have a greater morphological homogeneity, whereas sigmas may be separated into two size classes. The skeletal arrangement also presents variations in terms of the geometry and arrangement of the meshes of choanosomal acanthostyles, which may be relatively slack and confused, related to the number of spicules forming skeletal meshes. The ectosomal skeleton is bouquet-shaped, a structure which has not been cited frequently in previous records of this species.

Myxilla fimbriata on the coast of Galicia is typical of this species from other localities in its habitus, habitat and size although showing slight differences in spicule sizes as compared to those provided by Lundbeck (1910) and Descatoire (1966). In specimens from Galicia all types of spicules are generally smaller than those from Ingolf and Glenan, as demonstrated in Table 1.

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