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Sponge grounds of *Artemisina* (Porifera, Demospongiae) in the Iberian Peninsula, ecological characterization by ROV techniques

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Abstract

Artemisina Vosmaer, 1885 is a poecilosclerid microcionoid sponge genus with 20 valid species, seven of which have been recorded in the Atlantic Ocean.

The present study describes *Artemisina* sponge grounds in Iberia Peninsula. *A. transiens* is a sponge described in 1890 by Topsent in Galicia (Spain); *A. hispanica* was also collected in the north of Spain by Ferrer-Hernández (1917); World Porifera Database (WPD) considers at the moment both mushroom-shaped species as synonyms (van Soest *et al*., 2018), but we have only been able to check the types of *A. hispanica*. The studied samples were collected in Somos Llungo station and they correspond clearly to those described as *A. hispanica* by Ferrer-Hernández (1917) and it presents differences in the skeleton with respet to description of *A. transiens* in the literture. There are no more records after 1917 and there are no data of ecological characterisation nor is there a detailed description of its skeletal composition with Scanning Electron Microscopy. In the previous records the formation of sponge grounds of these species was not known.

Oceana, the largest international organization focused solely on protecting the world's oceans, has recorded the habitat of *Artemisina* in Atlantic and Cantabrian waters during a series of ROV cruises for the identification of marine areas with high ecological value that need protection. Its life conditions and associated fauna are described from direct observations for the first time.

Key words: Sponge aggregations, sponge associated fauna, ecology, taxonomy, Atlantic

Introduction

Sponge grounds are reservoirs of biodiversity for the United Nations Environment Programme (UNEP). In these deep-sea habitats, sponges create an environment that supports high biodiversity, provide refuge for fish species, and are a storehouse of novel chemical compounds, some of which are promising for pharmaceutical drug development (Hogg *et al*. 2010). There is a great need to improve awareness and understanding of sponge grounds, as many of them are not well-defined. *A. transiens* and *A. hispanica* are two poorly-known species and were not known to occur in dense fields until now.

In 2008, Oceana organized a cruise in Galicia and Cantabrian waters with the aim of identifying areas that should be protected due to their significant ecological value to improve the European network of marine protected areas (MPAs) (Aguilar *et al*. 2009).

This expedition on board the "Oceana's Ranger", a Ketch catamaran 21 m long, carried out 51 dives with an ROV (*Remote Operated Vehicle*); bringing about more than 88 effective filmed hours.

In ten different locations in Galicia and Asturias and in another one in the south of Spain, a sponge was registered with a characteristic *habitus* named "mushroom sponge" in the expedition.

This species was found at different depths (sometimes in high densities) but appeared to prefer waters deeper

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than 50 m. In order to identify and study it, a special dive with an ROV and divers was prepared to collect samples. As a result of this dive, 10 specimens were collected in the Somos Llungo area to the east of Peñas Cape (Asturias) at 48–50 m. deep; all of them globular pedunculate with apical oscules and an even surface, similar to description of *A. hispanica*.

Material and methods

During July and August 2008, Oceana performed an ocean-going expedition off the Atlantic Galician coast and the southern Gulf of Biscay, sailing around 1500 nautical miles (Fig 1).

A survey was made with the research boat *Ranger*, a Ketch catamaran 21 m long and 9.75 m wide. The ROV employed was a Phantom HD 2+2 from Deep Ocean Engineering, equipped with a digital camera of 750 resolution lines.

A total 51 ROV video transects between 9 m and 260 m deep, and 54 dives by divers between 0 and -35 m, were completed. ROV transects lasted between 1 and up to 4 hours depending on the location. It examined distances between 0.3 and 1.2 NM. The ROV sailed at 0.2–0.4 knots positioned a few centimetres above the seafloor with the camera slightly tilted downward so as to obtain a vision field of 1.5–2 m wide and a depth image of 4–5 m. The area surveyed per hour was of approx. 700–850 square metres.

10.2-megapixel Reflex photographic cameras and High Definition HDV video cameras were used by the scuba divers, while the Phantom HD2+2 was used by the ROV.

After sponges were located by the ROV, samples were taken by the scuba divers at 50 m in position 43º41.085'N–005º47.177'W. 4,000 photographs, as well as 88h09m of ROV recording and 18h21m of divers' filmed materials were collected. The area of seafloor covered was approx. 70,500 m^2.

21 out of 54 divers' dives and 34 out of the 51 ROV's dives were carried out from the southeastern Gulf of Biscay (Cantabrian Sea) to the Galician coast, where *Artemisina* findings were concentrated, collecting 7h06m of ROV recording and 5h07m of filmed materials and 1,500 photographs. Only those 34 ROV transects were taken into consideration in this analysis, covering 45,480 m^2.

Artemisina was found during 19 ROV's transects in 11 different locations 35–126 m deep (Table I).

The morphology of the seafloor of the Somos Llungo area was obtained during one cruise onboard R/V *Vizconde de Eza* in 2010 in the framework of the study of Vulnerable Marine Ecosystems on the INDEMARES Project (Figs. 1A–B). Navigation was provided by a differential GPS system integrated with the ship's central navigation system. Swath bathymetry data were acquired using a multibeam echosounder Simrad EM-300, which works with a transmission frequency between 26 and 34 kHz, swath opening up to 135º and 135 beams per ping. In addition to echosounding information, the backscattered reflectivity of the seafloor imaged by the multibeam transducers was also recorded in digital form. Data were logged and processed with SIS, Neptune and C-Floor software packages, obtaining a grid resolution of 5 m, with full seafloor coverage meeting the International Hydrographic Organization standards for marine hydrographical surveys. Analyses and representation of bathymetric data were performed with ArcGIS software.

Other material examined: *Artemisina hispanica* Ferrer-Hernández MMC 3/C/120 (5 specimens); MMC 3/C/184 (1 specimen) and MMC 3/C/199 (2 specimens).

In order to study the spicules, the organic matter was digested by nitric acid taken to the boiling point, following the protocols of Rützler (1978) and Cristobo *et al*. (1993). The data for spicule sizes are based on 25 measurements for each spicule category, comprising minimum, maximum and average lengths in micrometres (µm). Permanent preparations of skeletal architecture for the specimens were done. Spicules were examined with a Jeol 6100 Scanning Electron Microscope. The classification system adopted in this work is that proposed by Hooper (2002) in the Systema Porifera and updated in the World Porifera Database (Van Soest *et al*. 2018).

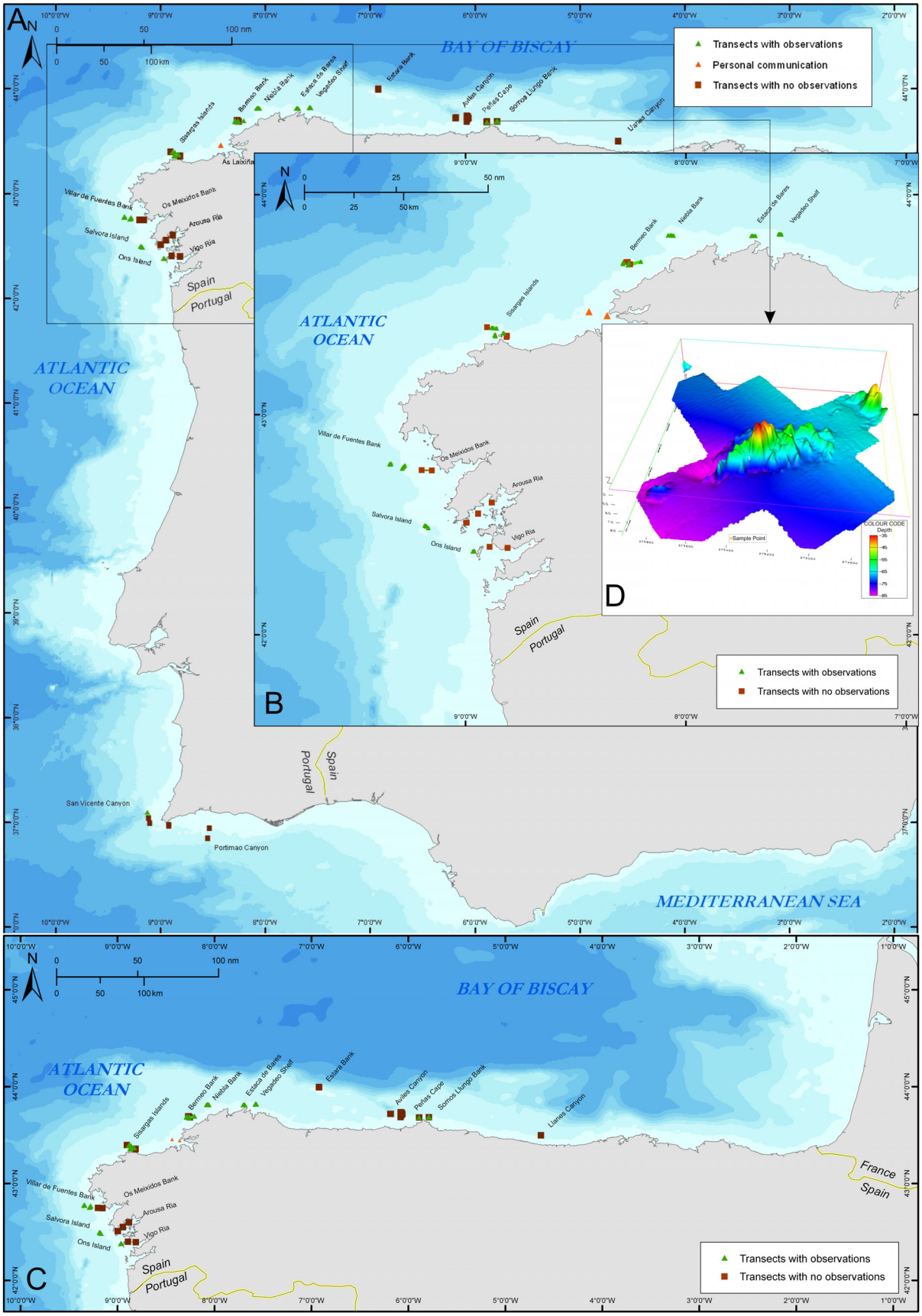

FIGURE 1. A–C. Sample localities of *Artemisina* showed the dives with ROV in the north of Spain (Atlantic Ocean and Cantabrian Sea). D. Coloured three-dimensional image of the Somos Llungo area (point of view from the south) mapped during the cruise INDEMARES Aviles-0410.

TABLE 1. ROV's ground verification and bionomic surveys in the Iberian Peninsula NW Spain

Sites ROV	Nº Dives, Time and m²)	Position & Depth of sampling transect	Position & Depth of *Artemisina* findings
Torre da Aspa (Portugal)	1	37.05,9819'N 009.07.2322'W (100-120 m)	37.05,9819'N 009.07.2322'W (100-120 m)
Vigo Ría	1, (0h39m), (520 m²)	42º23,694'N – 008º48.554'W & 42º23.675'N – 008º48.523'W (17-18 m)	(no findings)
Arousa Ría	3, (4h39m), (3,720 m²)	42º30.541'N – 008º59.799'W & 42º30.562'N – 008º59.659'W (19-23 m) 42º36.059'N – 008º52.771'W & 42º36.051'N – 008º52.878'W (9-18 m) 42º33.095'N – 008º56.552'W & 42º32.977'N – 008º56.584'W (9-22 m)	(no findings) (no findings) (no findings)
Ons Island	1, (1h36m), (1,280 m²)	42º22.880'N – 008º57.622'W & 42º22.753'N – 008º57.903'W (46-58 m)	42º22.803'N -008º57.937'W & 42º22.805'N -008º57.936'W (51-58 m)
Salvora Island	1, (3h50m), (2,867 m²)	42º29.146'N – 009º10.148'W & 42º29.844'N – 09º11.077'W (62-110 m)	42º29.587'N – 009º10.648'W & 42.29.706'N – 009º10.762'W (61-79 m)
Villar de Fuentes Bank	2, (5h35m), (4,467 m²)	42º46.489'N – 009º20.511'W & 42º46.661'N – 009º20.268'W (82-128 m) 42º45.327'N – 009º17.230'W & 42º46.184'N – 09º16.525'W (56-107 m)	42º46.514'N – 009º20.503'W & 42º46.607'N – 009º20.633'W (105-127 m) 42º45.387'N – 009º17.193'W & 42º45'797'N – 009º16.799'W (65-97 m)
Os Meixidos Bank	1, (1h57m), (1,560 m²)	42º44.887'N – 009º11.924'W & 42º44.797'N – 009.09.167'W (13-37 m)	42º44.887'N – 009º11.924'W (35 m)
Sisargas Islands	4, (4h39m), (3,720 m²)	43º23.715'N – 008º52.873'W & 43º23.563'N – 008º51.558'W (57-96 m) 43º21.212'N – 008º48.808'W & 43º21.538'N – 008º48.675'W (54-63 m) 43º21.438'N – 008º51.886'W & 43º21.900'N – 08º51.978'W (35-58 m) 43º22.226'N – 008º49.583'W & 43º22.288'N – 008º49.701'W (30-48 m)	43º23.678'N – 008º52.670'W & 43º23.638'N – 008º52.423'W (57-65 m) (no findings) 43º21.590'N – 008º51.921'W & 43º21.876'N – 008º51.969'W (35-55 m) 43º22.226'N – 008º49.583'W & 43º22.290'N – 008º49.668'W (43-47 m)
El Cuervo Bank	1, (2h18m), (1,840 m²)	43º23.853'N – 08º54.114'W & 42º23.987'N – 008º53.428'W (101-127 m)	(no findings)
Bermeo Bank	4, (7h16m), (5,814 m²)	43º41.000'N – 008º15.152'W & 43º41.004'N & 008º15.168'W (36-44 m) 43º41.638'N – 008º15.829'W & 43º41.596'N & 008º16.200'W (84-106 m) 43º41.741'N – 008º12.260'W & 43º40.768'N – 008º15.780'W (22-121 m) 43º41.676'N – 008º16.969'W & 43º41.142'N – 008º17.173'W (85-143 m)	(no findings) 43º41.641'N – 008º15.997'W (99 m) 43º41.433'N – 008º15.500'W & 43º41.431'N – 008º15.504'W (71-72 m) 43º41.553'N – 008º17.033'W & 43º41.518'N – 008º17.024'W (110-123 m)
Niebla Bank	1, (2h34m), (2,053 m²)	43º48.842'N – 008º03.388'W & 43º48.997'N – 008º04.175'W (38-105 m)	43º48.887'N – 008º03.813'W & 43º48.887'N – 008º04.818'W (50-52 m)
Estaca de Bares	1, (1h34m), (1,253 m²)	43º48778'N – 007º42.098'W & 43º48.848'N – 007º41.679'W (72-86 m)	43º48778'N – 007º42.098'W & 43º48.779'N – 007º41.093'W (72-74 m)
Vegadeo Shelf	1, (2h34m), (2.053 m²)	43º49.204'N – 007º34.001'W & 43º49.316'N – 007º34.640'W (116-128 m)	43º49.166'N – 007º34.436'W & 43º49.211'N – 007º34.309'W (116-126 m)
Estara Bank	1, (2h36m), (2,080 m²)	43º59.595'N – 006º55.143'W & 43.59º874'N – 006º55.263'W (189-253 m)	(no findings)

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TABLE 1. (Continued)

Sites ROV	Nº Dives, Time and m²)	Position & Depth of sampling transect	Position & Depth of *Artemisina* findings
Aviles Canyon	6, (9h33m), (7,640 m²)	43º42.995'N – 006º04.129'W & 43º43.999'N – 006º04.082'W (226-254)	(no findings)
		43º42.906'N – 006º03.871'W & 43º43.130'N – 006º03.867'W (195-235 m)	(no findings)
		43º42.281'N – 006º04.453'W & 43º42.308'N – 006º04.356'W (182-222 m)	(no findings)
		43º44.186'N – 006º04.751'W & 43º41.148'N – 006º04.738'W (219-224 m)	(no findings)
		43º43.159'N – 06º11.051'W & 43º43.204'N – 006º10.783'W (215-239 m)	(no findings)
		43º43.104'N – 006º03.577'W & 43º43.083'N – 006º03.733'W (201-243 m)	(no findings)
Peñas Cape	1, (1h13m), (973 m²)	43º40.910'N – 005º53.316'W & 43º40.945'N – 005º53.226'W (81-89 m)	43º40.919'N & 005º53.262'W (84 m)
Somos Llungo Bank	4, (3h54m), (3,120 m²)	43º41.162'N – 005º47.260'W & 43º41.136'N & 005º47.124'W (59-81 m)	43º41.167'N – 005º47.140'W & 43º41.141'N – 005º47.126'W (61-78 m)
		43º41.078'N – 005º47.213'W & 43º41.095'N & 005º47.199'W (49-60 m)	43º41.078'N – 005º47.213'W (54 m)
		43º41.062'N – 005º47.173'W & 43º41.088'N – 005º47.156'W (48-54 m)	43º41.096'N – 005º47.177'W & 43º41.118'N – 005º47.169'W (48-49 m)
		43º40.996'N -005º47.289'W & 43º41.022'N – 05º47.596'W (39-70 m)	43º41.008'N – 005º47.284'W & 43º41.031'N – 05º47.353'W (54-64 m)
Llanes Canyon	1, (0h39m), (520 m²)	43º29.927'N – 004º37.938'W & 43º29.892'N & 04º37.933'W (231-244 m)	(no findings)
Total	**34, (57h06m), (45,480 m²)**	**42º22.753'N - 008º57.903'W & 43º29.892'N & 04º37.933'W (9-254 m)**	**42º22.803'N -008º57.937'W & 43º41.167'N – 005º47.140'W (35-126)**

Systematics (Van Soest *et al*., 2018)

Phylum Porifera Grant, 1836

Class Demospongiae Sollas, 1885

Subclass Heteroscleromorpha Cárdenas, Pérez & Boury-Esnault, 2012

Order Poecilosclerida Topsent, 1928

Family Microcionidae Carter, 1875

Subfamily Ophlitaspongiinae de Laubenfels, 1936

Genus *Artemisina* Vosmaer, 1885

***Artemisina transiens* Topsent, 1890**

***Artemisina hispanica* Ferrer-Hernandez, 1917**

Description of collected specimens

***Artemisina hispanica* Ferrer-Hernandez, 1917**

Diagnosis: Globular pedunculate sponge with several apical oscules that are slightly raised. Mushroom appearance with main body ranging from spherical to elliptical shape. The surface is even but finely hispid; it is similar to the surface of Suberitidae species. Consistency is firm. Surface colour is white, beige, orange or cream-whitish. Ectosome is easily visible and clearer than choanosome. Choanosome is brownish and beige in the peduncle area. Size: up to 6 cm high x 5.5 cm in diametre (Fig 2).

Skeleton: Bigger styles are in a confused arrangement in the choanosome and they are arranged in bouquets near the ectosome where the small styles are perpendicular to the surface in a dense palisade. The points of styles protrude at the surface in a finely hispid fashion (Fig 3).

Spicules: Styles, palmate isochelae, toxas.

Megascleres: The ectosomal styles are smaller and clearly differentiated in size from those of the choanosome, they possess microspined heads: 84.92–(124.19)–243.3 X 1.28–(2.36)–3.85 µm; choanosomal styles likewise have microspined heads and others smooth heads: 307.56–(389.43)–487.04 X 3.05–(4.56)–6.3 µm.

Microscleres: Palmate isochelae: 18–(20)–22 µm; toxas thin, shallowly curved, with smooth apices: 38.07–(58.67)–11.29 µm long (Fig. 4).

Distribution: South European Atlantic Shelf (MEOW) (Marine Ecoregion of the World) (Van Soest *et al.* 2018). Galicia, Asturias, Santander (Spain) and São. Vicente Cape (Portugal) (Fig 1). Type locality: 43°44'50"N–8°12'0"W. 135 m deep, Galicia (Topsent, 1890, 1892). In this paper the distribution limit is increased, as well as the bathymetric distribution: 12–143 m. Collection information of previous records and newly collected specimens were archived in the PANGAEA data repository (https://doi.pangaea.de/10.1594/PANGAEA.892371).

Remarks. The genus *Artemisina* was erected by Vosmaer (1885) for the type species *Artemisina suberitoides*. The taxon has no real distinctive features, although it differs from other Microcionidae in lacking a distinctive choanosomal skeleton or definite sponging fibres, lacking echinating spicules and having a nearly radial ectosomal skeleton.

Due to these reasons, in this work, we describe the species using modern techniques like Scanning Electron Microscopy for the skeleton study and also provide many ecological data to characterize the habitat.

There are currently 20 valid species (Van Soest *et al*. 2018).

Artemisina transiens was described by Topsent (1890) from Galician waters and the type locality is close (8 Km) to our video transect in Bermeo Bank and similar depths (36–143 m).

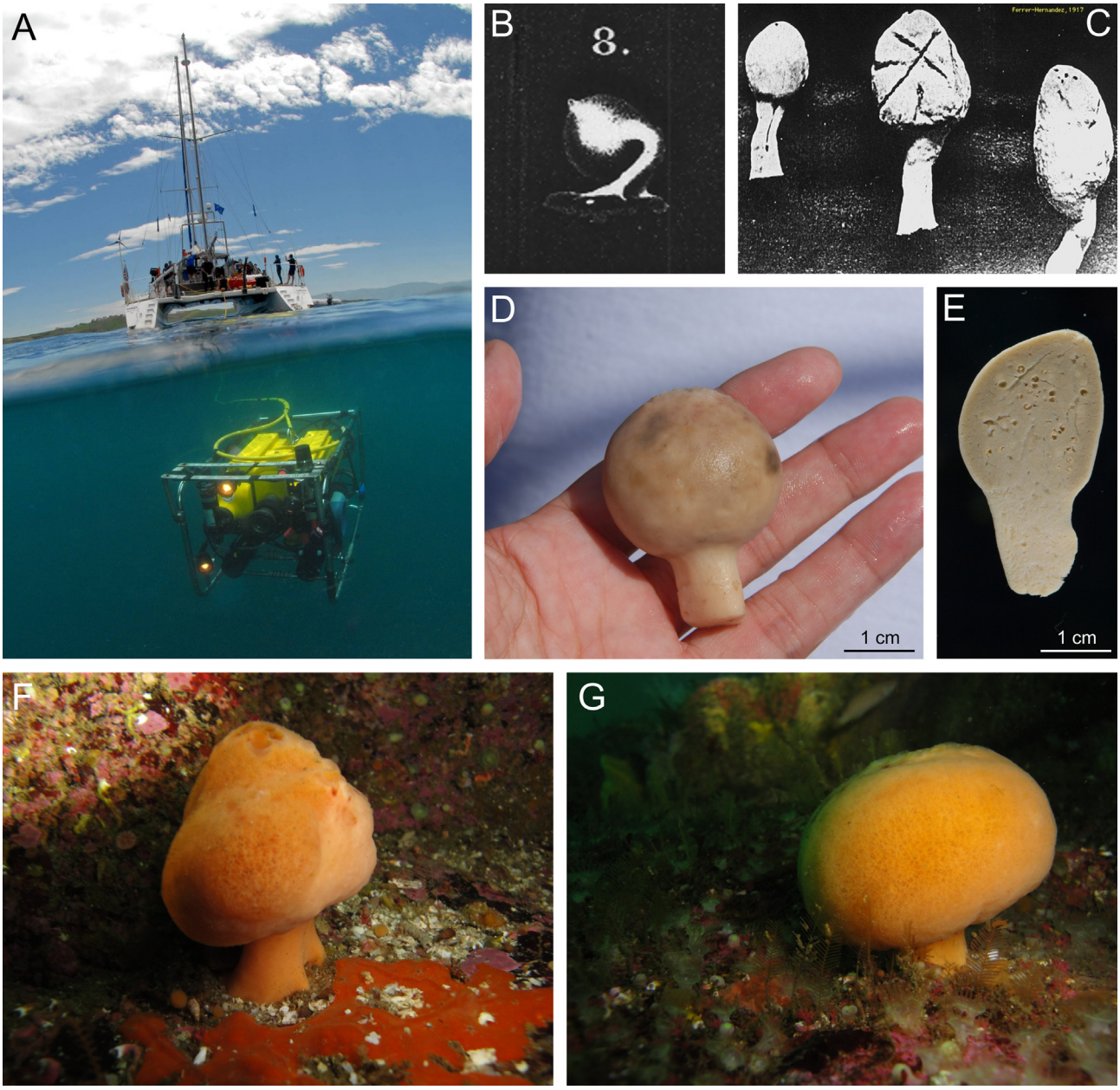

FIGURE 2. A. Oceana Ranger catamaran and Phantom ROV (courtesy Enrique Talledo). B. Original drawing of *A. transiens* in original description Topsent, 1892. C. *A. hispanica*, Ferrer Hernandez, 1917. D. Habitus of *A. hispanica,* fresh specimen of Somos Llungo bank. E. *A. hispanica* fresh cut specimen of Somos Llungo bank showing some embryos. F–G. Underwater photos of specimens of *Artemisina* 46 m deep in Golfo Artabro (courtesy of Javier Souto).

The specimens collected in this work in the locality of Somos Llungo correspond exactly to the specimens identified by Ferrer-Hernandez (1917) as *A. hispanica*. We have not been able to review the holotype of *A. transiens* and in the World Porifera Database (Van Soest *et al*. 2018), it is considered that they are synonymous species but there is no explanation as to that. Only Burton (1930) points out that: "There are many remarkable points of resemblance between this species and *A. transiens*, both from neighbouring localities, and I suspect that if the two holotypes could be re-examined and compared, they would be found to be conspecific". Therefore, Burton thinks that they could be the same species but without being demonstrated so far; thereby, we have decided in this work that both could be valid species until holotypes of both species would be compared. The most significant differences according to the descriptions published by both authors refer to the two clearly differentiated categories of styles in *A. hispanica*, the size of the toxa and the abundance of smooth styles mixed with the spiny ones.

Habitat and Ecological Characterization. Up to now, no ecological data have been recorded for this species (Van Soest *et al*. 2000; 2018).

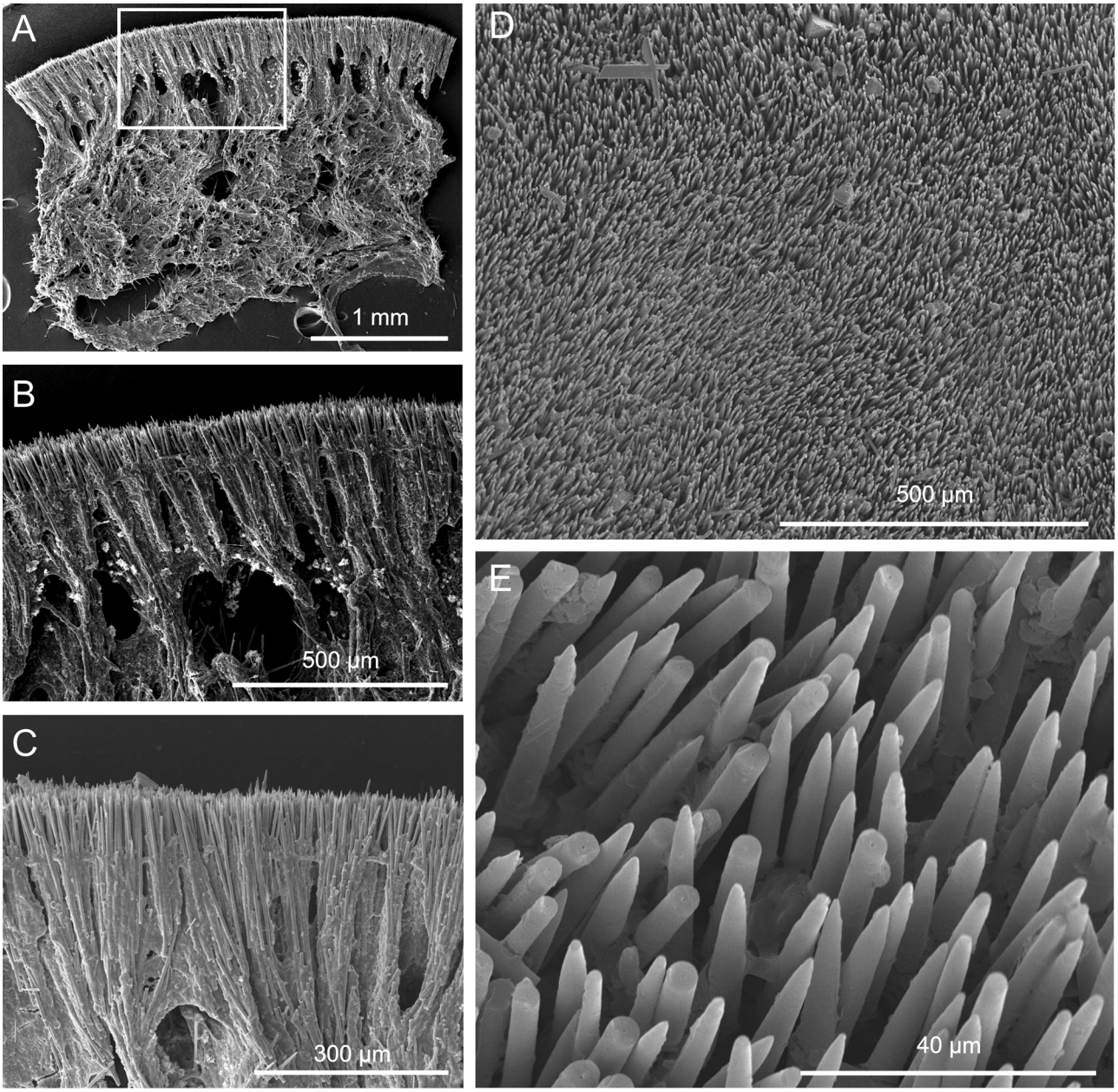

FIGURE 3. *A. hispanica* skeleton by Scannig Electron Microscopy. A. Thick section showing the ectosome and choanosome. B–C. Skeletal transversal arrangement of ectosome. D–E. Hispid surface of the sponge.

Sites ecological descriptions (Fig 1, Table 1 and Table 2)

1) Ons Island

Small rocky bank 1.4 NM W off Ons Island at -45/-60 m surrounded by sandy seafloor with ripple marks, many bivalve molluscs, and brachiopod remains. Rocks were widely covered by the corallimorpharian *Corynactis viridis,* hydrozoans (e.g. *Gymnangium montagui*) and several Demospongiae (*Cliona celata, Haliclona* (*Reniera*) *cinerea, Halichondria* (*Halichondria*) *panicea, Guitarra solorzanoi, Tedania* (*Tedania*) *urgorrii, Clathria* (*Microciona*) *atrasanguinea, Phakellia ventilabrum, Axinella dissimilis, A. polypoides* and other unidentified). Red algae Corallinaceae of the genus *Lithophyllum* and *Mesophyllum* were present in the shallowest parts. The brachiopod *Novocrania anomala* was very common, especially in the lower part of the rocks. Echinoderms weere well represented by species such as *Holothuria* (*Panningothuria*) *forskali, Echinus esculentus, Marthasterias glacialis* and *Echinaster* (*Echinaster*) *sepositus*. Other species were the anthozoans *Caryophyllia* (*Caryophyllia*)

smithii, Eunicella verrucosa, Leptogorgia sarmentosa, Alcyonium glomeratum, and *Cerianthus membranaceus,* the annelida *Bonellia viridis*, the foraminiferan *Miniacina miniacea*, the bryozoan *Reteporella grimaldi* and several annelid polychaetes. More common fish were *Labrus mixtus, L. bergylta* and *Trisopterus luscus*.

Artemisina cf. *transiens* was mainly found in the biggest and highest rocks, occupying walls with a 30–45º gradient and a NE orientation, although it was also found on the flat tops. It was absent from the small rocks. It created facies of a few decametres or square metres with the highest densities being 25–30 ind/m^2.

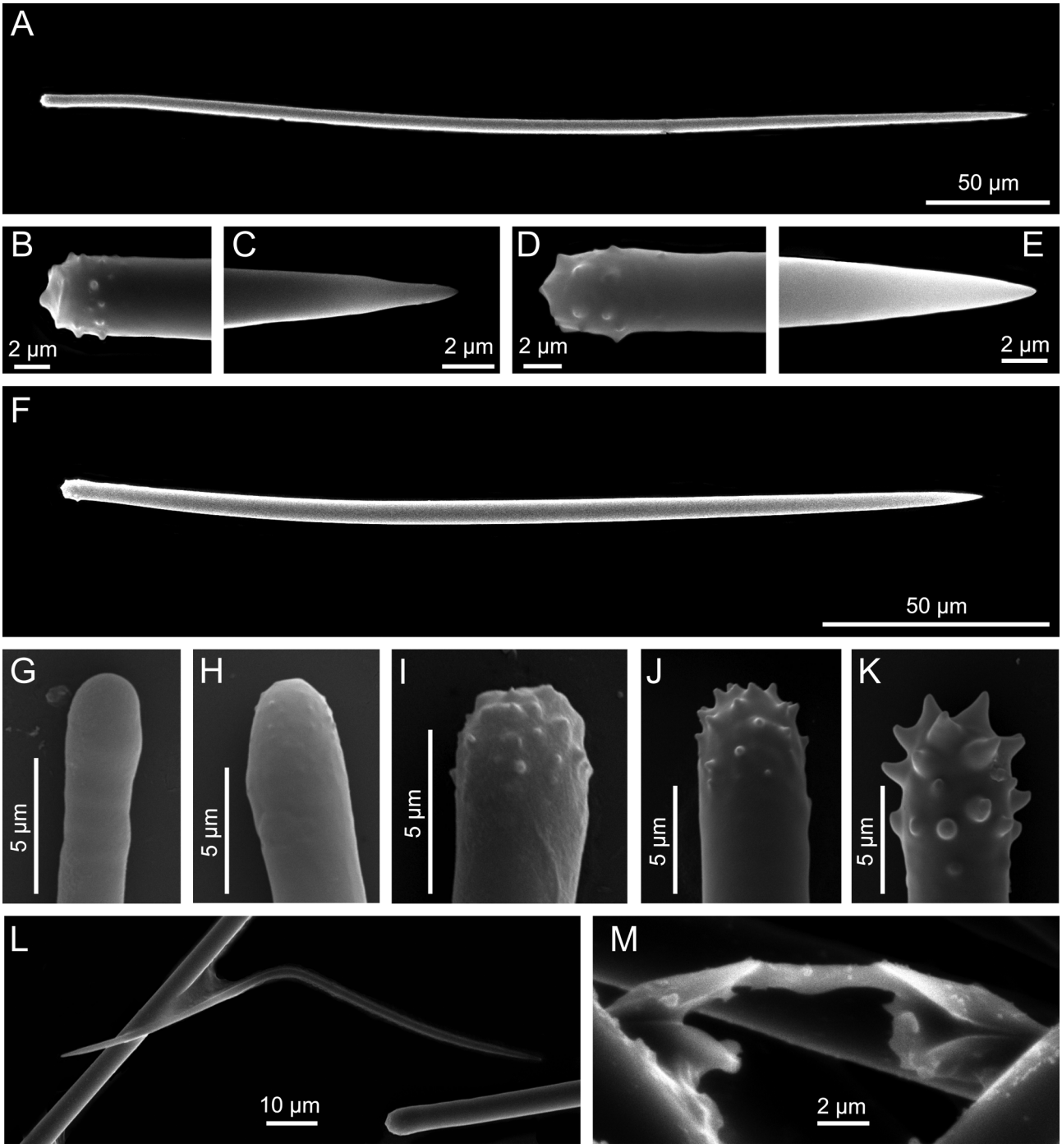

FIGURE 4. *A. hispanica* spicules by Scannig Electron Microscopy. A. Large style. B–C. Head and point of the large style. D–E. Head and point of the small style. F. Small style. G–K. Different morphologies of style heads. L. Toxa. M. Palmate isochela.

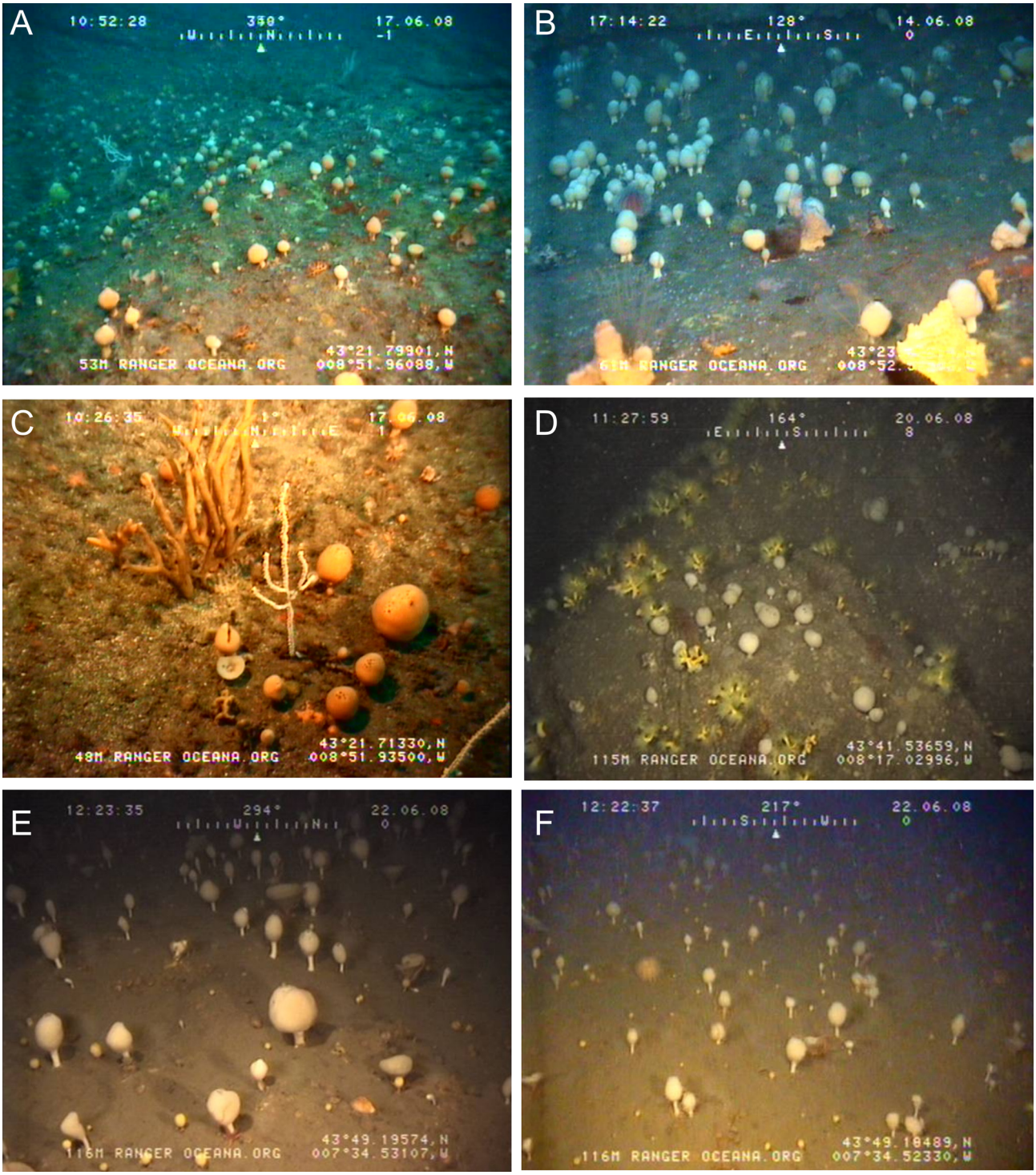

FIGURE 5. Images of habitats of *Artemisina* recorded by ROV. A Sisargas Islands 53 m. B. Sisargas Islands 61 m. C. Sisargas Islands 48 m. D. Bermeo Bank 115 m. E–F. Vegadeo self 116 m.

2) Salvora Island

Rocky bank 7 miles WNW off Salvora Island, 60 m to 110 m deep, with a sandy seafloor at the bottom. There were three main facies: a "forest" of the deep-sea scleractinian coral *Dendrophyllia cornigera*, a second one where the cup sponge *P. ventilabrum* dominated, and a third one of dense *Artemisina* cf. *transiens* communities. Sometimes, these three communities mixed, but normally one was predominant over the others: *D. cornigera* on deep rounded stone 80–110 m deep; *P. ventilabrum* on flat and small rocks 60–90 m deep; and *Artemisina* on big and sharply-pointed rocks 60–80 m deep.

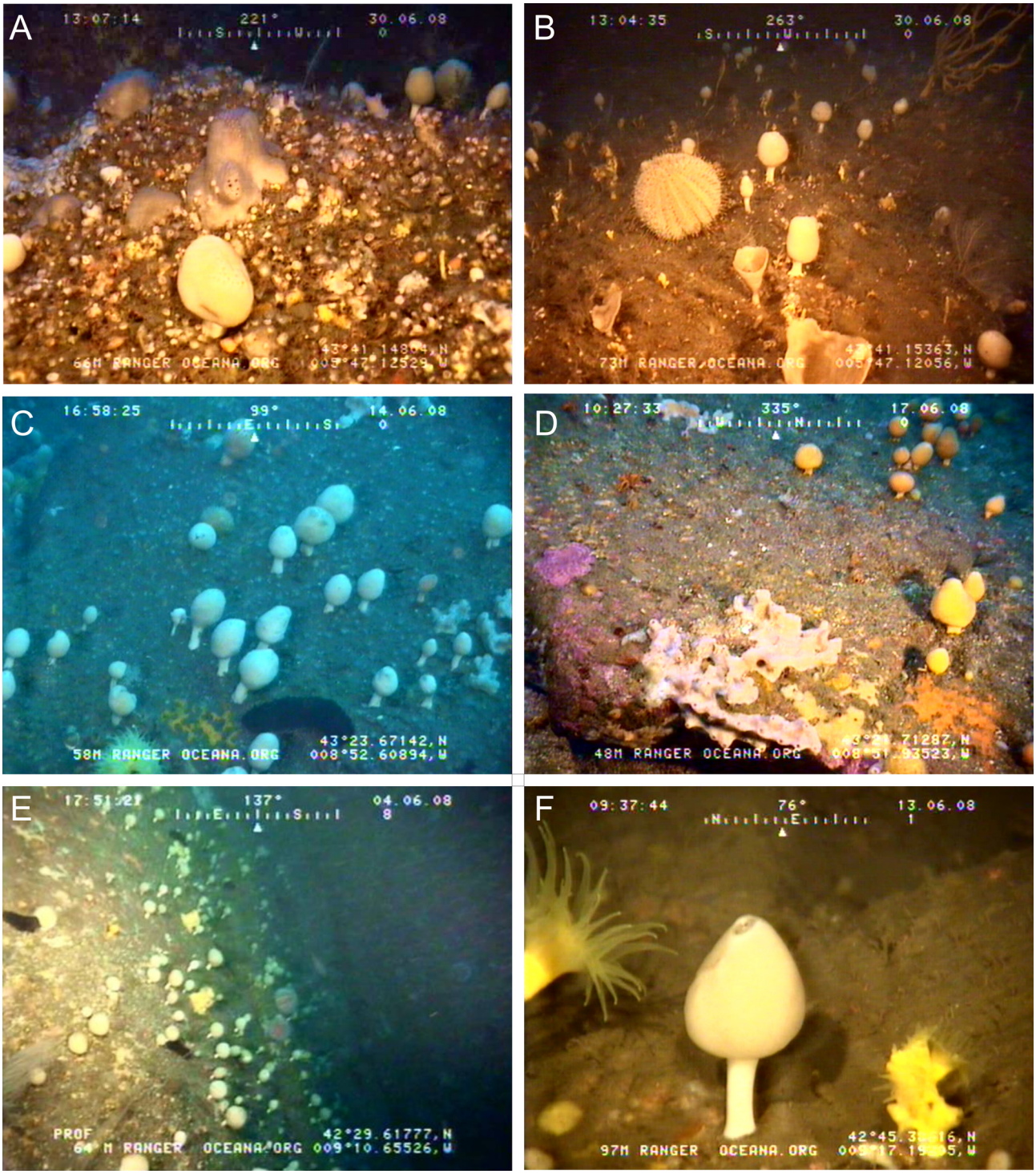

FIGURE 6. Images of habitats of *Artemisina* recorded by ROV. A. *A. hispanica* in Somos Llungo Bank 66 m. B. *A. hispanica* Somos Llungo Bank 63 m, 73 m. C. Sisargas Islands 58 m. D. Sisargas Islands 48 m. E. Salvora Island, 64 m. F. Villar de Fuentes Bank 97 m.

The most common fauna on this bank were Demospongiae (*A. dissimilis, A. polypoides, C. celata, H.* (*H.*) *panicea, G. solorzanoi, T.* (*T.*) *urgorrii, Desmacidon fruticosum, Geodia* sp. and *Quasillina* cf. *brevis*), hydrozoans (*Nemertesia anteninna, Sertularella* sp., *Polyplumaria flabellata, Aglaophenia* sp., *Abietinaria abietina, Diphasia nigra, D. alata, Tamarisca tamarisca* and *Lafoea* sp.), echinoderms (*E. esculentus, H.* (*P.*) *forskali, E.* (*E.*) *sepositus,* and *M. glacialis*), fish (*T. luscus, T. minutus, Labrus bergylta, L. mixtus, Coris julis, Ctenolabrus rupestris, Acantholabrus palloni, Serranus cabrilla, Helicolenus dactylopterus, Scorpaena notata* and *S. loppei*),

anthozoans (*C. viridis, E. verrucosa, Paramuricea* cf. *grayi, L. sarmentosa, Swiftia pallida, Antipathella subpinnata* and *Caryophyllia* sp.), molluscs (*Eledone cirrhosa, Octopus vulgaris, Charonia lampas, Calliostoma zizyphinum* and *Pteria hirundo*), brachiopods (*N. anomala, Megerlia truncata* and *Terebratulina* cf. *retusa*), annelida (*B. viridis*), tunicates (*Didemnum* sp.) and foraminiferans (*M. miniacea*).

Artemisina created some facies of 20–50 ind/m^2 on walls with a gradient of 30º to 90º oriented to S, W, SSW and NW. It was also very common on rocky slopes close to vertical walls and below overhangs (never inside caves). Less frequently, scattered specimens were found among *D. cornigera* and *P. ventilabrum* facies and were commonly higher and elongated and had longer stalks.

3) Villar de Fuentes Bank

Sited 15.9 NM W off Lira-Carnota, Villar de Fuentes bank was a rocky bed alternating with coarse sandy bottoms, molluscs and brachiopods remains, and ripple marks.

Rocks were mainly occupied by extensive communities of *D. cornigera* and *P. ventilabrum.*

Species found on this bank include poriferans (*Pachastrella monilifera, Geodia* sp., *Geodia* cf. *barretti*, *Halichondria* cf. *bowerbanki*, *Haliclona* cf. *fistulosa*, *Suberites* cf. *carnosus*, *A. dissimilis, A. polypoides, Hymedesmia* (*Hymedesmia*) *paupertas, Antho* (*Antho*) cf. *dichotoma*, *D. fruticosum, C.* (*M.*) *atrasanguinea, Tedania* sp., *T. urgorrii* and *Plakortis* sp.), echinoderms (*H.* (*P.*) *forskali, Ophiothrix fragilis, E. esculentus, E. melo, M. glacialis* and *E.* (*E.*) *sepositus*), brachiopods (*N. anomala* and *M. truncata*), polychaetes (*B. viridis*, *Salmacina dysteri, Serpula vermicularis* and Sabellidae), hydrozoans (*P. flabellata, D. nigra,* hydrozoa indet.), anthozoans (*Caryophyllia* sp., Scleractinia indet., *C. viridis* and *C. membranaceus, Epizoanthus* sp., *Parazoanthus anguiconus*, *Savalia savaglia, A. subpinnata*, *E. verrucosa, Paramuricea grayi, L. sarmentosa, A. glomeratum* and *Veretillum cynomorium*), foraminiferans (*M. miniacea*), molluscs (*P. hirundo, C.lampas* and *O. vulgaris*), crustaceans (*Palinurus elephas*), tunicates (*Diazona violacea*), and fish (*S. cabrilla, L. mixtus, H. dactylopterus, Scorpaena scrofa, S. notata, S.* cf. *loppei, T. luscus, Lophius piscatorius, Conger conger, Zeus faber* and Gobiidae).

Most of the facies of *Artemisina* cf. *transiens* were between 80 and 105 m deep, although some animals were dispersed among *D. cornigera* and *P. ventilabrum* down to 125 m deep. But these specimens, as observed in Salvora, were elongated and had longer stalks. Densities were lower (up to 10 ind/m^2) than in previous localities.

4) Os Meixidos Bank

Tide-swept rocky outcrop 6.7 NM SW off Lira-Carnota that emerged during low tide and reached 60 m deep.

Shallower areas down to 30–40 metres weere covered by red and brown algae (e.g. *Lithophyllum incrustans*, *Mesophyllum* sp., *Peyssonnelia* sp. *Phyllariopsis purpurascens, Laminaria ochroleuca* or *Saccorhiza polyschides*). Kelps were small due to the strong currents and wave energy.

Demospongiae were covering many rocks, *C. celata, H.* (*H.*) *panicea, H.* (*R.*) *cinerea, Myxilla* sp., *C.* (*M.*) *atrasanguinea, Tedania* (*Tedania*) *pilarriosae, Antho* (*Antho*) cf. *involvens* and *Hymeniacidon* cf. *perlevis* being among the most common ones.

The hydroid *G. montagui* and the corallimorpharian *C. viridis* were widely distributed. Other cnidarians were *Parazoanthus axinellae*, *E. verrucosa*, *L. sarmentosa, Alcyonium digitatum, A. glomeratum, C.* (*C.*) *smithii* and *Aglaophenia* sp.

Once again, echinoderm biomass was high, with species like *E. esculentus, Gracilechinus acutus, Paracentrotus lividus, H.* (*P.*) *forskali, M. glacialis* and *E.* (*E.*) *sepositus.*

Other species were the bryozoan *Pentapora fascialis,* the crustacean *Balanus* sp., the polychaetes *Filograna implexa* and *Sabella spallanzanii* and the mollusk *Mytilus galloprovincialis*.

Upwellings in this bank made fish abundant, with *Trachurus trachurus, T. luscus, T. minutus, S. cabrilla, C. julis, L. mixtus, L. bergylta, C. rupestris, Parablennius gattorougine*, and even basking sharks (*Cetorhinus maximus*). High numbers of seabirds, including *Sula bassana*, *Larus* spp., and *Sterna hirundo*, fed around the bank.

The only isolated *Artemisina* cf. *transiens* was found at -35 m among low brown algae and *C. viridis*. Its shape, with a short stalk, was bigger and thicker than those found previously in deeper areas.

5) Sisargas Islands

The seafloor surrounding these small islands 1 NM N off San Adrian Cape was rocky around the isles to 30–70 metres deep where sandy beds occupied wide areas, sometimes with dispersed submerged rocks and rocky banks.

The biological diversity was very high, with 5 clearly distinguished areas: The infrallitoral submerged rocky bed of the isles with caves and overhangs down to -30 m alternating crustose fauna and flora with kelp forest. Upper circallitoral rocks down to -70 m highly covered by Demospongiae and hydrozoan with scattered anthozoans. Lower circallitoral rocks with higher sedimentation dominated by *D. cornigera* and *P. ventilabrum*. Transitional zone between small rocky outcrops and sandy bed with large communities of brittle stars (*O. fragilis* and *Ophiopholis aculeata*) and other echinoderms (*Leptometra celtica* and *Luidia sarsii*) and anomuran squat lobsters (*Munida sarsi*). A soft bottom with muddy sand and ripple marks, with also a high presence of echinoderms (*Spatangus purpureus, Parastichopus regalis* and *Anseropoda placenta*), triglids (*Chelidonichthys* spp. and *Trigla* sp.) pleuronectiformes and anglerfish (*L. piscatorius*).

The shallowest area had dense algae communities with mixed kelp forest (*S. polyschides*, *L. ochroleuca* and *L. hyperborea*) and other brown (*Cystoseira baccata, Dictyopteris polypodioides* and *Dictyota dichotoma*) and red algae (*Gelidium corneum*, *Corallina* sp., *Desmarestia ligulata*, *Halidrys siliquosa, Plocamium cartilagineum* and *Halurus equisetifolius*). Vertical walls, sheltered rocks, caves and overhangs had a rich and diverse fauna of bryozoans (*Caberea ellissii, Crisia eburnea*, *R. grimaldi*, *P. fascialis* and *Smittina cervicornis*), sponges (*Sycon* sp., *Leucosolenia botryoides*, *C.* (*M.*) *atrasanguinea*, *T.* (*T.*) *pilarriosae*, *Pachymatisma johstonia*, *Terpios gelatinosus*, *Chondrosia reniformis*, *Haliclona* spp., *Hemimycale columella*, *C. celata*, *H.* (*H.*) *panicea*, *Phorbas fictitius*, *Thymosia guernei* and *Hymeniacidon perlevis*), ascidians (*Botrylloides leachii*, *Polysyncraton lacazaei*, *Synoicum* sp, *Ciona intestinalis*, *Dendrodoa grossularia*, *Clavelina lepadiformis*, *Aplydium* spp., *Didemnum* sp., *Pycnoclavella nana* and *Pycnoclavella* sp.), polychaetes (*S. dysteri* and *S. spallanzanii)*, phoronids (*Phoronis hippocrepia*) and cnidarians (*A. glomeratum, E. verrucosa, Balanophyllia* (*Balanophyllia*) *regia*, *Caryophyllia* spp., *Epizoanthus* sp., *C. viridis, Aglaophenia kirchenpaueri*, *G. montagui*, *Sertularella* sp. and *A. abietina*).

In the upper circallitoral, *Artemisina* formed dense communities (30–60 ind/m^2) on top of many of the rocks between -35 and -65 m. Although some of the species found at shallower depths also continued here, other Demospongiae, such as *Axinella* spp., *G. solorzanoi*, *Adreus fascicularis*, *Amphilectus* cf. *fucorum*, *H.* (*H.*) *paupertas*, some patches of *Mesophyllum* sp., dense hydroid communities (*Sertularella* sp. *A. abietina* and *Diphasia* spp.) and scattered gorgonians such as *E. verrucosa* and *L. sarmentosa*, normally found with molluscs e.g. *P. hirundo*, *Simnia spelta* or *Calliostoma* sp. increasing with depth.

At the greatest depths on hard substratum, where turbidity and sedimentation was higher, *P. ventilabrum, D. cornigera* and brachiopods (*N. anomala* and *M. truncata*) were more common while *Artemisina* cf. *transiens* disappeared. Some sponges occupied a transition zone between *Artemisina* cf. *transiens* facies and *D. cornigera*/*P. ventilabrum* communities, such as *D. fruticosum*, *T.* (*T.*) *urgorrii*, *Plakortis* sp., *Phakellia* cf. *robusta*, *Clathrina lacunosa, P. monilifera* and some Geodiidae.

Echinoderms such as *E.* (*E.*) *sepositus*, *M. glacialis*, *H.* (*P.*) *forskali, E. esculentus* and *Echinus melo*, were widely distributed through this bathymetry, along with molluscs (*E. cirrhosa* and *O. vulgaris*), foraminiferans (*M. miniacea*), tunicates (*D. violacea*), hydroids (*N. anteninna*), black corals (*Antipathes* sp.), annelida (*B. viridis*), crustaceans *(Inachus* spp.) and fish (*S. cabrilla, Symphodus melops, C. rupestris, Centrolabrus exoletus, A. palloni, L. mixtus, L. bergylta, C. julis, Pollachius pollachius, T. luscus, T, minutus, Ammodytes tobianus, Scorpaena* spp., *T. trachurus* and *Raja montagui*), although species as the melon sea urchin (*E. melo*) and the curled octopus (*E. cirrhosa*) preferred the deepest parts.

On these islands, *Artemisina* cf. *transiens* occupied all kinds of big rocks, from the top and flat areas to walls with 30º to 90º gradients, and were also very common at the top border of overhangs and vertical walls oriented to E, SE and SW. Specimens among other fauna on flat tops were usually taller, elongated and had larger stalks.

6) Bermeo Bank

8 NM WNW off Cedeira, this rocky bank went from -28 m to -143 m presenting a wide diversity of habitats and communities. The top of the bank had kelp forest (*L. ochroleuca* and *L. hyperborea*), and a bit further down were coralline and other algae (*L. incrustans*, *Mesophyllum* sp., *Peyssonnelia* sp., *Neurocaulon* sp., *Sphaerococcus coronopifolius*, *Gelidium* sp. and *D. polypodioides*). Sponges and other sessile fauna appeared below -50/-60 m, and at -80 m deep the typical and widespread coral communities of *D. cornigera* dominated.

Contrary to other places, *Artemisina* cf. *transiens* occupied deeper areas mixed with *D. cornigera* and *P. ventilabrum*, and even smaller rocks with higher rates of sedimentation, reaching densities up to 10–20 ind/m^2. However, the specimens' morphologies follow the standard; sponges were elongated with long stalks when in flat

places and, especially when surrounded by other fauna, as in this bank, among hydroids as *Diphasia* spp. and *P. flabellata*.

Surrounded by soft bottoms with ripple marks and biogenic remains of corals, brachiopods, molluscs and echinoderms where echinoderms (*L. celtica, O. fragilis, O. aculeata, Amphiura* sp. and *P. regalis*) and fish (*Scyliorhinus canicula*, *Chelidonichthys cuculus*, *C. lucerna*, *C. lastoviza*, *Aspitrigla* cf. *obscura*, *Lepidorhombus boscii* and *Capros aper*) were common.

Other common fish in the area were *T. luscus*, *T. minutus*, *P. pollachius*, *C. exoletus*, *L. bergylta*, *L. mixtus*, *C. julis*, *A. palloni*, *Diplodus vulgaris*, *S. scrofa*, *H. dactylopterus*, *Z. faber*, *C. conger*, *T. trachurus* and *S. cabrilla.*

Demospongiae were highly abundant on the rocks, with species such as *Plakina* sp., *Haliclona* cf. *fistulosa*, *T.* (*T.*) *urgorrii*, *D. fruticosum*, *G. solorzanoi*, *Phakellia* cf. *robusta*, *Axinella polypoides*, *A. dissimilis*, *Raspalia* (*Clathriodendron*) cf. *hispida*, *Amphilectus* cf. *fucorum*, *Antho* (*Antho*) *dichotoma*, *A. fascicularis*, *P. monilifera*, *H.* (*H.*) *paupertas*, *Iophon nigricans*, *Suberites* cf. *carnosus*, *Haliclona* sp., *H. cinerea*, *Polymastia* sp., *C. celata*, *C.* (*M.*) *atrasanguinea*, *Myxilla* sp., *Laxosuberites* sp., *Geodia* sp. and *P. monilifera*.

Echinoderms maintained a high biomass, thanks to *O. fragilis*, *G. acutus*, *E. melo*, *E. esculentus*, *E.* (*E.*) *sepositus*, *Luidia ciliaris*, *M. glacialis*, *Aslia lefevrei* and *H.* (*P.*) *forskali*.

Also common were brachiopods (mainly *N. anomala*), foraminiferans (*M. miniacea*), polychaetes (*S. vermicularis*, *F. implexa* and *Polydora* sp.), cnidarians (*C.* (*C.*) *smithii*, *L. sarmentosa*, *E. verrucosa*, *Paramuricea* cf. *grayi*, *Acanthogorgia hirsuta*, *A. glomeratum*, *A. digitatum*, *C. membranaceus*, *C. viridis*, *P. axinellae*, *D. alata*, *D. nigra*, *P. flabellata* and *G. montagui*), molluscs (*P. hirundo* and *O. vulgaris*), annelida (*B. viridis*), crustaceans (*P. elephas* and Mysida indet.), bryozoans (*S. cervicornis* and *R. grimaldi*), ascidians (*Didemnum* sp.), etc.

7) Niebla Bank

Niebla can be considered the twin bank of Bermeo. Only 11 miles NE off this, and 8.3 NM from Ortegal Cape, its characteristics were very similar; the top was in the euphotic zone at 30 m deep covered by kelp (mainly *L. ochroleuca*) and other algae communities (*L. incrustans*, *L. byssoides* and *Peyssonnelia* sp.), and reaching more than 100 m in depth, where *D. cornigera / P. ventilabrum* communities lived surrounded by detritic sandy bottoms. On this soft bed, species as the flatfish *Arnoglossus thori*, the triton snail *C. lampas,* the holothurian *P. regalis* and the elasmobranch *S. canicula* can be found.

Artemisina cf. *transiens* was not as abundant as in Bermeo bank and only had facies of 1–5 ind/m^2 on rocks around 55 m deep highly covered by *C. viridis*.

Among the species on this bank there were echinoderms (*M. glacialis*, *E. melo*, *E. esculentus*, *G. acutus* and *H.* (*P.*) *forskali*), cnidarians (*E. verrucosa*, *A. hirsuta*, *Caryophyllia* sp., *D. cornigera*, *S. savaglia*, *Antipathes* sp. and *D. alata*), sponges (*C. celata*, *H.* (*H.*) *panicea*, *Halichondria* cf. *bowerbanki*, *Haliclona* (*Rhizoniera*) *rosea*, *H. cinerea*, *H.* cf. *fistulosa*, *Plakina* sp., *H. columella*, *Geodia* sp., *Axinella* sp., *A. polypoides*, *A.* (*A.*) *dichotoma*, *T.* (*T.*) *urgorrii*, *Phakellia* sp. and *P. monilifera*), brachiopods such as (*N. anomala* and *Terebratulina retusa*), foraminiferans (*M. miniacea*), molluscs (*Berthellina edwarsii, P. hirundo* and *O. vulgaris*), polychaetes (*B. viridis*, *S. dysteri* and *S. spallanzanii*), and fish such as *L. mixtus*, *L. bergylta*, *C. julis*, *C. rupestris*, *C. exoletus*, *Symphodus* sp., *A. palloni*, *T. luscus*, *P. pollachius*, *Z. faber*, *T. trachurus* and *Mullus* sp.

8) Estaca de Bares

2.4 NM NW off Estaca de Bares Cape the seabed was rocky with small to medium rocks but no big elevations were observed. This zone covered several hectares and was mixed in the same place with a muddy sand seafloor. Most of the rocks were partially covered by sediment.

The sponge *Artemisina* cf. *transiens* was less abundant than in other rocky bottoms surveyed and normally appeared dispersed among other also sponges that were also scattered, mainly Axinellidae, as *P. ventilabrum*, *A. polypoides*, *A.* cf. *rugosa*, *A. damicornis* or *A. dissimilis*, but also other Demospongiae, such as *A.* (*A.*) *dichotoma*, *D. fruticosum*, *A. fascicularis*, *C.* (*M.*) *atrasanguinea*, *Microciona* cf. *laevis*, *T.* (*T.*) *urgorrii*, *Mycale* (*Mycale*) *lingua*, *Myxilla* sp., *Haliclona* cf. *fistulosa*, *Ciocalypta penicillus*, *Polymastia boletiformis*, *Geodia* cf. *barretti*, *Spongosorites* sp., etc.

This mixed seabed made it possible to find together species from both soft and hard bottoms.

Fauna identified included echinoderms (*E. melo*, *E. esculentus* and *H.* (*P.*) *forskali*, *P. regalis*, *L. ciliaris* and *E.* (*E.*) *sepositus*), cnidarians (*D. cornigera*, *E. verrucosa*, *L. sarmentosa*, *P. axinellae*, *P. anguiconus*, *S. savaglia* and

Diphasia sp.), molluscs (*Calliostoma* sp., *Hypselodoris* sp. and *P. hirundo*), polychaetes (*B. viridis*, *Lanice conchilega*, *F. implexa* and Sabellidae), crustacean Mysida indet., the bryozoan *S. cervicornis*, brachiopods and fish (*C. julis*, *C. rupestris*, *C. exoletus*, *S. cabrilla*, *Scorpaena* sp. and *S. notata*).

9) Vegadeo Shelf

11 NM north off Viveiro Ría, the seabed was muddy-sandy with biogenic remains and ripple marks with dispersed flat rocks partially or totally covered by sediment and some rockier areas.

The most important community was that of *P. ventilabrum*. *Artemisina* cf. *transiens* was found scattered on rocks with this facies but in some areas its presence was higher than *P. ventilabrum*, reaching densities up to 5–10 ind/m^2 *versus* 1–5 ind/m^2 at most in the cup sponge. Other sponges were not so abundant but still some Demospongiae could still be found; *Antho* (*Antho*) cf. *dichotoma*, *D. fruticosum*, *P. monilifera*, *Tedania* sp., *T.* (*T.*) *urgorrii*, *Myxilla* sp. and *Phakellia* sp.

Together with the sponges, the most important biomass was that of brachiopods (mainly *N. anomala*) and of echinoderms, with important facies of brittle stars (*O. fragilis*, *O. aculeata* and *Amphiura* sp.), crinoids (*L. celtica* and *Antedon* sp.), holothurians (*P. regalis* and *H.* (*P.*) *forskali*), sea urchins (*E. melo*, *E. esculentus* and *G. acutus*) and starfish (*Astropecten* sp., *E.* (*E.*) *sepositus*, *Hacelia* cf. *attenuate* and *M. glacialis*).

D. cornigera was also present but the colonies were not as big as on other rocky areas surveyed. Other cnidarians present were *Caryophyllia* cf. *cyathus*, *Epizoanthus arenaceus*, *P. anguiconus*, *C. membranaceus*, *Alcyonium* sp., *Parantipathes hirondelle*, *P. flabellata* and *Diphasia* sp.

Other species in the area were the polychaetes *B. viridis*, *Spirobranchus triqueter, L. conchilega* and *S. vermicularis*, the bryozoan *R. grimaldi*, the crustaceans *Inachus* sp., *Goneplax rhomboides*, *Galathea strigosa* and *Munida rugosa*, the molluscs *Calliostoma* sp., *Sepia officinalis* and *O. vulgaris*, and the fish *S. cabrilla*, *C. cuculus*, *C. lucerna*, *Gadiculus argenteus*, *Trisopterus minutus*, *Gaidropsarus vulgaris*, *A. palloni*, *L. mixtus*, *Arnoglossus* sp., *Lepidorhombus whiffiagonis* and other pleuronectiformes and Gobiidae.

Unlike the *Artemisina* cf. *transiens* individuals in the other sites surveyed, the ones at this site were found on rocks highly covered with sediment. They also created large facies in deeper areas (-110/-126 m). On the morphology of the specimens, many of them had longer stalks and although they displayed variation in sizes, the biggest ones were larger than in other places.

10) Peñas Cape

In the submerged outcrops 4.7 NW off Peñas Cape the surrounding seabed was detritic sand with coarse sand and gravel.

Main facies were those of sponges (*P. ventilabrum* and *Artemisina* cf. *transiens*), brachiopods (*N. anomala* and others) and hydrozoans (*P. flabellata*, *Sertularella* spp. and *Halecium halecinum*).

Anthozoans were scarcer, although *C.* (*C.*) *smithii*, *D. cornigera*, *E. verrucosa* and *C. viridis* were present.

Other sponges were not numerous, but *A. fascicularis*, *A.* (*A.*) *dichotoma*, *D. fruticosum*, *Phakellia robusta*, *Axinella* sp., *Quasillina* cf. *brevis* and *C. celata* were observed.

Other species recorded were echinoderms (*O. fragilis*, *G. acutus*, *E. melo*, *L. ciliaris* and *H.* (*P.*) *forskali*), polychaetes (*S. vermicularis* and *Protula* sp.), molluscs (*P. hirundo*), foraminiferans (*M. miniacea*) and fish (*S. cabrilla*, *Scorpaena* sp., *S. porcus*, *Limanda limanda* and *S. canicula*).

Artemisina cf. *transiens* was found in communities of 5–15 ind/m^2 but only on located spots. They were fixed on small rocks and partially covered by sediments.

11) Somos Llungo Bank

This was another rocky bank in the area of Peñas Cape, some 4.5 NM NE offshore. Some rocks had vertical walls, overhangs, caves and other features, allowing a rich and wide biodiversity to grow. The top of the bank was at -45 m making the development of algae communities possible. At the bottom, 85 m deep, the bed was detritic sand but muddy in some areas, with some ripple marks.

The rocks weere almost completely covered with faunal communities. Demospongiae were the widest-spread phylum with tens of species that were mixed together, although Axinellidae and Microcionidae were the ones that show the densest facies.

The species found included *A. dissimilis, Axinella* sp., *A. polypoides*, *A. flustra*, *P. ventilabrum*, *P. robusta*, *A.*

fascicularis, *G. solorzanoi*, *Artemisina*, *D. fruticosum*, *T.* (*T.*) *urgorrii*, *Geodia* cf. *barretti*, *Pachymatisma johnstonia*, *C. reniformis*, *H.* (*H.*) *panicea*, *H.* (*R.*) *cinerea*, *C. celata, Petrosia* (*Petrosia*) *ficiformis*, *P.* cf. *crassa*, *P. boletiformis*, *P. mamillaris*, *Dysidea* sp. and others.

The other most important phylum was the cnidarians, with the anthozoans *D. cornigera*, *L. sarmentosa*, *E. verrucosa*, *P. grayi*, *A. glomeratum*, *P. anguiconus*, *P. axinellae*, *Epizoanthus* sp. and *C. viridis*, the last one being the most abundant species, although *E. verrucosa* could form dense "forests". Also important were the hydrozoans *H. halecinum*, *D. alata*, *G. montagui*, *A. abietina*, *Sertularella* spp., *P. flabellata*, *Eudendrium* sp., *Lafoea* sp. and *Aglaophenia tubulifera.*

Other species were the echinoderms *E. melo*, *E. esculentus*, *E.* (*E.*) *sepositus*, *M. glacialis* and *H.* (*P.*) *forskali*, the brachiopods *N. anomala* and *T. retusa*, the foraminiferan *M. miniacea*, the bryozoan *Cellaria fistulosa, P. fascialis* and *S. cervicornis*, the polychaetes *F. implexa*, *S. vermicularis*, *S. spallanzanii* and other Sabellidae, the fish *Aspitrigla* cf. o*bscura*, *S. cabrilla*, *D. vulgaris*, *Mullus barbatus barbatus*, *L.bergylta*, *L. mixtus*, *C. julis*, *Symphodus* sp., *C. rupestris*, *C. exoletus*, *A. palloni*, *Scorpaena loppei*, *Scorpaena* sp., *L. piscatorius*, *P. pollachius*, *T. luscus*, *Parablennius gattorougine*, *T. trachurus*, some pleuronectiformes and *S. canicula*, the crustaceans *Pagurus* sp. and several Mysida indet. and the molluscs *O. vulgaris*, *P. hirundo*, *Pruvotfolia pselliotes*, *C. zizyphinum*, *C. lampas* and *Euspira nitida.*

Artemisina hispanicca was widely distributed and occurred at high densities (up to 30–60 ind/m^2) on this bank. The most abundant facies were in the biggest rocks with less turbidity and sedimentation. Some specimens found have two stalks.

12) Golfo Artabro

The species was recorded in As Laixiñas, Golfo Artabro, off Ría de Ares (43.46005ºN–8.42348ºW 31/07/2011, 46 m) and Bajo del Zorrón, Golfo Artabro, off Ría de Ferrol (43.455ºN–8.3474ºW 08/08/2014, 38 m) Javier Souto (Pers.com.) (Fig 2A–B).

Conclusions

Artemisina grounds have been found always on rocky beds from 35 to 126 metres deep. It seems to prefer big, sloped rocks with low turbidity and low sedimentation between -50 and -90 m, but it also occurs on small and flat rocks partially or fully covered by sediment down to -126 m.

Although it can be fixed on rocks with different slopes, grades and orientation, including vertical walls, overhangs, the entrance of caves, slabs, etc., this sponge is more abundant in areas typically occupied by suspensivorous species like gorgonians. The density of these sponge grounds can reach up to 50–60 ind/m^2, looking like "mushroom fields" (Figs. 5 and 6).

A characteristic of its morphology is that when specimens are found in areas with high degrees of sedimentation or in places where they must compete with other fauna, the shape of the sponge becomes more elongated and the stalk grows taller.

The typical community where this species occurs is dominated by Demospongiae. Most common species found along with it are those of its own order Poecilosclerida (e.g. *D. fruticosum*, *T.* (*T.*) *urgorrii*, *G. solorzanoi*, *C.* (*M.*) *atrasanguinea*, *A.* (*A.*) *dichotoma* etc.) and those of the order Axinellida (*Phakellia* spp., *Axinella* spp. and *A. fascicularis*). In many places it occupies a transitional zone between the deep-sea coral (*D. cornigera*) and the cup sponge (*P. ventilabrum*) fields. Cnidarians are also common, sometimes the sponges share substrate with dense communities of *C. viridis* or hydrozoans, and even scattered gorgonians.

Brachiopods are also highly abundant on rocks occupied by *Artemisina* but they choose two different niches; while brachiopods show big colonies in the lower part of the rocks, the sponge prefers the upper zone.

Acknowledgements

To Jean Vacelet in recognition to a long life dedicated to the study of sponges in many and varied fields of research, for his help to authors solving doubts and for his limitless friendship.

TABLE 2. List of associated flora and fauna of *Artemisina* grounds found on the Ons Island (1), Salvora Island (2), Villar de Fuentes Bank (3), Os Meixidos Bank (4), Sisargas Islands (5), Bermeo Bank (6), Niebla Bank (7), Estaca de Bares (8), Vegadeo Shelf (9), Peñas Cape (10) Somos Llungo Bank (11). In Golfo Artabro we haven't any data regarding associated flora and fauna. Depth range is the depth in meters of the shallowest and the deepest record. Taxa not identified to species level or as putative species are marked with an asterisk (*).

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
OCHROPHYTA												<30
Cystoseira baccata (S.G.Gmelin) P.C.Silva, 1952					X							<30
Desmarestia ligulata (Stackhouse) J.V.Lamouroux, 1813					X							<30
Dictyopteris polypodioides (A.P.De Candolle) J.V.Lamouroux, 1809					X	X						<30
Dictyota dichotoma (Hudson) J.V.Lamouroux, 1809					X							<30
Halidrys siliquosa (Linnaeus) Lyngbye, 1819					X							<30
Laminaria hyperborean (Gunnerus) Foslie, 1884					X	X						<30
Laminaria ochroleuca Bachelot de la Pylaie, 1824				X	X	X	X					<30-40
Phyllariopsis purpurascens (C.Agardh) E.C.Henry & G.R.South, 1987				X								30-40
Saccorhiza polyschides (Lightfoot) Batters, 1902				X	X							<30-40
RODHOPHYTA												
Corallina sp.					X							<30
Gelidium corneum (Hudson) J.V.Lamouroux, 1813					X							<30
Gelidium sp.						X						28
Halurus equisetifolius (Lightfoot) Kützing, 1843					X							<30
Lithophyllum incrustans Philippi, 1837				X		X	X					30-40
Lithophyllum byssoides (Lamarck) Foslie, 1900							X					30
Lithophyllum sp.	X											45-60
Mesophyllum sp.	X			X	X	X						30-70
Neurocaulon sp.						X						28
Peyssonnelia sp.				X		X	X					28-40
Plocamium cartilagineum (Linnaeus) P.S.Dixon, 1967					X							<30
Sphaerococcus coronopifolius Stackhouse, 1797						X						28

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
FORAMINIFERA												
Miniacina miniacea (Pallas, 1766)	X	X	X		X	X	X			X	X	35-125
PORIFERA												
Adreus fascicularis (Bowerbank,1866)					X	X		X		X	X	35-89
Amphilectus cf. *fucorum*					X	X						35-80
Antho cf. *dichotoma*			X						X			80-128
Antho (*Antho*) *dichotoma* (Linnaeus, 1767)						X	X	X		X		50-89
Antho cf. *involvens*				X								30-60
Axinella cf. *rugosa*								X				72-86
Axinella damicornis (Esper, 1794)								X				72-86
Axinella dissimilis (Bowerbank, 1866)	X	X	X			X		X			X	39-125
Axinella flustra Topsent, 1892											X	39-81
Axinella polypoides Schmidt, 1862	X	X	X			X	X	X			X	39-125
**Axinella* spp.					X		X			X	X	35-89
*Axinellidae indet.											X	39-81
Ciocalypta penicillus Bowerbank, 1862								X				72-86
Clathria (*Microciona*) *atrasanguinea* (Bowerbank, 1862)	X		X	X	X	X		X				<30-125
Clathrina lacunosa (Johnston, 1842)					X							35-70
Cliona celata Grant, 1826	X	X		X	X	X	X			X		<30-110
Chondrosia reniformis Nardo, 1847					X						X	<3081
*Demospongiae indet.	X											45-60
Desmacidon fruticosum (Montagu, 1814)		X	X		X	X		X	X	X	X	35-128
Dysidea sp.											X	39-81
Geodia cf. *barretti*			X					X			X	39-125
Geodia sp.		X	X			X	X					50-125

…….*continued on the next page*

TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
*Geodiidae indet.					X							35-70
Guitarra solorzanoi Cristobo, 1998	X	X			X	X					X	35-110
Halichondria cf. *bowerbanki*			X				X					55-125
Halichondria (*Halichondria*) *panicea* (Pallas, 1766)	X	X		X	X		X				X	<30-110
Haliclona cf. *fistulosa*			X			X	X	X				50-125
Haliclona (*Reniera*) *cinerea* (Grant, 1826)	X			X		X	X				X	30-81
Haliclona (*Rhizoniera*) *rosea* (Bowerbank, 1866)							X					55
**Haliclona* spp.					X	X						<30-80
Hemimycale columella (Bowerbank, 1874)					X		X					<30-55
Hymedesmia (*Hymedesmia*) *paupertas* (Bowerbank, 1866)			X		X	X						35-125
Hymeniacidon perlevis (Montagu, 1814)					X							<30
Hymeniacidon cf. *perlevis*				X								30-60
Iophon nigricans (Bowerbank, 1858)						X						50-80
Laxosuberites sp.						X						50-80
Leucosolenia botryoides (Ellis & Solander, 1786)					X							<30
Microciona cf. *laevis*								X				72-86
*Microcionidae indet.											X	39-81
Mycale (*Mycale*) *lingua* (Bowerbank, 1866)								X				72-86
Myxilla sp.				X		X		X	X			30-128
Pachastrella monilifera Schmidt, 1868			X		X	X	X		X			35-128
Pachymatisma johnstonia (Bowerbank in Johnston, 1842)					X						X	<30-81
Petrosia cf. *crassa*											X	39-81
Petrosia (*Petrosia*) *ficiformis* (Poiret, 1789)											X	39-81
Phakellia cf. *robusta*					X	X						35-80
Phakellia robusta Bowerbank, 1866										X	X	39-89

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
Phakellia sp.							X	X				55-128
Phakellia ventilabrum (Linnaeus, 1767)	X	X	X		X	X	X	X	X	X	X	39-128
Phorbas fictitius (Bowerbank, 1866)					X							<30
Plakina sp.						X	X					50-80
Plakortis sp.			X		X							35-125
Polymastia boletiformis (Lamarck, 1815)								X			X	39-86
Polymastia mamillaris (Müller, 1806)											X	39-81
Polymastia sp.						X						50-80
Quasillina cf. *brevis*		X								X		60 - 110
Raspailia (*Clathriodendron*) cf. *hispida*						X						50-80
Spongosorites sp.								X				72-86
Suberites cf. *carnosus*			X			X						50-125
Sycon sp.					X							<30
Tedania (*Tedania*) *pilarriosae* Cristobo, 2002				X	X							<30-60
Tedania sp.			X						X			80-128
Tedania (*Tedania*) *urgorrii* Cristobo, 2002	X	X	X		X	X	X	X	X		X	35-128
Terpios gelatinosus (Bowerbank, 1866)					X							<30
Thymosia guernei Topsent, 1895					X							<30
CNIDARIA												
Abietinaria abietina (Linnaeus, 1758)		X			X						X	<30-110
Acanthogorgia hirsuta Gray, 1857						X	X					50-80
Aglaophenia kirchenpaueri (Heller, 1868)					X							<30
Aglaophenia tubulifera (Hincks, 1861)											X	39-81
Aglaophenia sp.		X		X								30 - 110
Alcyonium digitatum Linnaeus, 1758				X		X						30-80

…….continued on the next page

TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
Alcyonium glomeratum (Hassall, 1843)	X		X	X	X	X					X	<30-125
Alcyonium sp.									X			116-128
Antipathella subpinnata (Ellis & Solander, 1786)		X	X									60-125
Antipathes sp.					X		X					35-70
Balanophyllia (*Balanophyllia*) *regia* Gosse, 1853					X							<30
Caryophyllia cf. *cyathus*									X			116-128
Caryophyllia (*Caryophyllia*) *smithii* Stokes & Broderip, 1828	X			X		X				X		30-89
**Caryophyllia* spp.		X	X		X		X					<30-125
Cerianthus membranaceus (Gmelin, 1791)	X		X			X			X			45-128
Corynactis viridis Allman, 1846	X	X	X	X	X	X	X			X	X	<30-125
Dendrophyllia cornigera (Lamarck, 1816)		X	X		X	X	X	X	X	X	X	39-128
Diphasia alata (Hincks, 1855)		X				X	X				X	39-110
Diphasia nigra (Pallas, 1766)		X	X			X						50-125
**Diphasia* spp.					X	X		X	X			35-128
Epizoanthus arenaceus (Delle Chiaje, 1823)									X			116-128
Epizoanthus sp.			X		X						X	<30-125
Eudendrium sp.											X	39-81
Eunicella verrucosa (Pallas, 1766)	X	X	X	X	X	X	X	X		X	X	<30-125
Gymnangium montagui (Billard, 1912)	X			X	X	X					X	<30-81
Halecium halecinum (Linnaeus, 1758)										X	X	39-89
*Hydrozoa indet.	X		X									45-125
Lafoea sp.		X									X	39-110
Leptogorgia sarmentosa (Esper, 1789)	X	X	X	X	X	X		X			X	30-125
Nemertesia anteninna (Linnaeus, 1758)		X			X							35-110
Paramuricea grayi (Johnson, 1861)			X								X	39-125

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
Paramuricea cf. *grayi*		X				X						50-110
Parantipathes hirondelle Molodtsova, 2006									X			116-128
Parazoanthus anguiconus (Norman, 1868)			X					X	X		X	39-128
Parazoanthus axinellae (Schmidt, 1862)				X		X		X			X	30-86
Polyplumaria flabellata Sars, 1874		X	X			X			X	X	X	39-128
Savalia savaglia (Bertoloni, 1819)			X				X	X				55-125
*Scleractinia indet.			X									80-125
**Sertularella* spp.		X			X					X	X	<30-110
Swiftia pallida Madsen, 1970		X										60 - 110
Tamarisca tamarisca (Linnaeus, 1758)		X										60 - 110
Veretillum cynomorium (Pallas, 1766)			X									80-125
ANNELIDA												
Bonellia viridis Rolando, 1822	X	X	X		X	X	X	X	X			35-128
Filograna implexa Berkeley, 1835				X		X		X			X	30-86
Lanice conchilega (Pallas, 1766)								X	X			72-128
*Polychaeta indet.	X											45-60
Polydora sp.						X						50-80
Protula sp.										X		81-89
Sabella spallanzanii (Gmelin, 1791)				X	X		X				X	<30-81
*Sabellidae indet.			X					X			X	39-125
Salmacina dysteri (Huxley, 1855)			X		X		X					<30-125
Serpula vermicularis Linnaeus, 1767			X			X			X	X	X	39-128
Spirobranchus triqueter (Linnaeus, 1758)									X			116-128

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
ARTHROPODA												
Balanus sp.				X								30-60
**Inachus* spp.					X				X			35-128
Galathea strigosa (Linnaeus, 1761)									X			116-128
Goneplax rhomboides (Linnaeus, 1758)									X			116-128
*Mysida indet.						X			X		X	39-86
Munida rugosa (Fabricius, 1775)									X			116-128
Munida sarsi Huus, 1935					X							35-70
Pagurus sp.											X	39-81
Palinurus elephas (Fabricius, 1787)			X			X						50-125
MOLLUSCA												
Berthellina edwarsii (Vayssière, 1897)							X					55
Calliostoma sp.					X			X	X			35-128
Calliostoma zizyphinum (Linnaeus, 1758)		X									X	39 - 110
Charonia lampas (Linnaeus, 1758)		X	X				X				X	39-125
Eledone cirrhosa (Lamarck, 1798)		X			X							35 - 110
Euspira nitida (Donovan, 1804)											X	39-81
Hypselodoris sp.								X				72-86
Mytilus galloprovincialis Lamarck, 1819				X								30-60
Simnia spelta (Linnaeus, 1758)					X							35-70
Octopus vulgaris Cuvier, 1797		X	X		X	X	X		X		X	35-128
Pruvotfolia pselliotes (Labbé, 1923)											X	39-81
Pteria hirundo (Linnaeus, 1758)		X	X		X	X	X	X		X	X	35-125
Sepia officinalis Linnaeus, 1758									X			116-128

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
PHORONIDA												
Phoronis hippocrepia Wright, 1856					X							<30
BRYOZOA												
Caberea ellissii (Fleming, 1814)					X							<30
Cellaria fistulosa (Linnaeus, 1758)											X	39-81
Crisia eburnea (Linnaeus, 1758)					X							<30
Pentapora fascialis (Pallas, 1766)				X	X						X	<30-81
Reteporella grimaldi (Jullien, 1903)	X				X	X						<30-128
Smittina cervicornis (Pallas, 1766)					X	X		X			X	<30-86
BRACHIOPODA												
*Brachiopoda indet.								X		X		72-89
Novocrania anomala (O.F. Müller, 1776)	X	X	X		X	X	X		X	X	X	39-128
Megerlia truncata (Linnaeus, 1767)		X	X		X							60-125
Terebratulina cf. *retusa*		X										60 - 110
Terebratulina retusa (Linnaeus, 1758)							X				X	55-81
ECHINODERMATA												
Anseropoda placenta (Pennant, 1777)					X							35-70
Antedon sp.									X			116-128
Amphiura sp.						X			X			50-128
Aslia lefevrei (Barrois, 1882)						X						50-80
Astropecten sp.									X			116-128
Echinaster (*Echinaster*) *sepositus* (Retzius, 1783)	X	X	X	X	X	X		X	X		X	30-128

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
Echinus esculentus Linnaeus, 1758	X	X	X	X	X	X	X	X	X		X	30-128
Echinus melo Lamarck, 1816			X		X	X	X	X	X	X	X	35-128
Gracilechinus acutus (Lamarck, 1816)				X		X	X		X	X		30-128
Hacelia cf. *attenuata*									X			116-128
Holothuria (*Panningothuria*) *forskali* Delle Chiaje, 1823	X	X	X	X	X	X	X	X	X	X	X	30-125
Leptometra celtica (M'Andrew & Barrett, 1857)					X	X			X			35-80
Luidia ciliaris (Philippi, 1837)						X		X		X		50-89
Luidia sarsii Düben & Koren in Düben, 1844					X							35-70
Marthasterias glacialis (Linnaeus, 1758)	X	X	X	X	X	X	X		X		X	30-128
Ophiopholis aculeata (Linnaeus, 1767)					X	X			X			35-128
Ophiothrix fragilis (Abildgaard in O.F. Müller, 1789)			X		X	X			X	X		35-128
Paracentrotus lividus (Lamarck, 1816)				X								30-60
Parastichopus regalis (Cuvier, 1817)					X	X	X	X	X			35-128
Spatangus purpureus O.F. Müller, 1776					X							35-70
CHORDATA												
Acantholabrus palloni (Risso, 1810)		X			X	X	X		X		X	35-128
Ammodytes tobianus Linnaeus, 1758					X							35-70
**Aplydium* spp					X							<30
Arnoglossus sp.									X			116-128
Arnoglossus thori Kyle, 1913							X					>100
Aspitrigla cf. *obscura*						X					X	39-81
Botrylloides leachii (Savigny, 1816)					X							<30
Capros aper (Linnaeus, 1758)						X						50-80
Centrolabrus exoletus (Linnaeus, 1758)					X	X	X	X			X	35-86

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
Cetorhinus maximus (Gunnerus, 1765)				X								30-60
Chelidonichthys cuculus (Linnaeus, 1758)						X			X			50-128
Chelidonichthys lastoviza (Bonnaterre, 1788)						X						50-80
Chelidonichthys lucerna (Linnaeus, 1758)						X			X			50-128
**Chelidonichthys* spp					X							35-70
Ciona intestinalis (Linnaeus, 1767)					X							<30
Clavelina lepadiformis (Müller, 1776)					X							<30
Conger conger (Linnaeus, 1758)			X			X						50-125
Coris julis (Linnaeus, 1758)		X		X	X	X	X	X			X	30-110
Ctenolabrus rupestris (Linnaeus, 1758)		X		X	X		X	X			X	30-110
Dendrodoa grossularia (Van Beneden, 1846)					X							<30
Didemnum sp.		X			X	X						<30-110
Diazona violacea Savigny, 1816			X		X							35-125
Diplodus vulgaris (Geoffroy Saint-Hilaire, 1817)						X					X	39-81
Gadiculus argenteus Guichenot, 1850									X			116-128
Gaidropsarus vulgaris (Cloquet, 1824)									X			116-128
Gobiidae indet.			X						X			80-128
Helicolenus dactylopterus (Delaroche, 1809)		X	X			X						50-125
Labrus mixtus Linnaeus, 1758	X	X	X	X	X	X	X		X		X	30-128
Labrus bergylta Ascanius, 1767	X	X		X	X	X	X				X	30-110
Lepidorhombus boscii (Risso, 1810)						X						50-80
Lepidorhombus whiffiagonis (Walbaum, 1792)									X			116-128
Limanda limanda (Linnaeus, 1758)										X		81-89
Lophius piscatorius Linnaeus, 1758			X		X						X	35-125
Mullus barbatus barbatus Linnaeus, 1758											X	39-81

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TABLE 2. (Continued)

Taxon	1	2	3	4	5	6	7	8	9	10	11	Depth
Mullus sp.							X					55
Parablennius gattorougine (Linnaeus, 1758)				X							X	30-81
*Pleuronectiformes indet.									X			116-128
Pollachius pollachius (Linnaeus, 1758)					X	X	X				X	35-81
Polysyncraton lacazaei (Giard, 1872)					X							<30
Pycnoclavella nana (Lahille, 1890)					X							<30
Pycnoclavella sp.					X							<30
Raja montagui Fowler, 1910					X							35-70
Scyliorhinus canicula (Linnaeus, 1758)						X	X			X	X	39->100
Scorpaena notata Rafinesque, 1810		X	X					X				60 -125
Scorpaena loppei Cadenat, 1943		X									X	39-110
Scorpaena cf. *loppei*			X									80-125
Scorpaena porcus Linnaeus, 1758										X		81-89
Scorpaena scrofa Linnaeus, 1758			X			X						50-125
**Scorpaena* spp.					X			X		X	X	35-89
Serranus cabrilla (Linnaeus, 1758)		X	X	X	X	X		X	X	X	X	30-128
Symphodus melops (Linnaeus, 1758)					X							35-70
Symphodus sp.							X				X	39-81
Synoicum sp					X							<30
Trachurus trachurus (Linnaeus, 1758)				X	X	X	X				X	30-81
Trisopterus luscus (Linnaeus, 1758)	X	X	X	X	X	X	X				X	30-125
Trisopterus minutus (Linnaeus, 1758)		X		X	X	X			X			30-128
Trigla sp.					X							35-70
Zeus faber Linnaeus, 1758			X			X	X					50-125

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