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A REVIEW OF GERARDIIDAE (ANTHOZOA: ZOANTHARIA) FROM THE MACARONESIAN ISLANDS AND THE MEDITERRANEAN SEA WITH THE DESCRIPTION OF A NEW SPECIES

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ABSTRACT

We describe the new species of the zoanthid *Gerardia macaronesica* exclusively known from Macaronesian islands (Azores, Madeira, Canarias y Cabo Verde). Moreover, we offer diagnostic data in order to distinguish properly *G. macaronesica* from *G. savaglia* which is the other known species of the family Gerardiidae. The ecological requirements and the nature of the association between *G. macaronesica* and the antipatharians are discussed. A complete study of the cnidom measurements of both species is offered; in addition, the cnidom images of *G. savaglia* are also showed and some biogeographycal considerations are taking in account.

Key words: Zoanthids, Gerardiidae, Macaronesian islands and Mediterranean, new species.

RESUMEN

Se describe una nueva especie de zoantídeo, *Gerardia macaronesica*, conocida exclusivamente de las islas de Azores, Madeira, Canarias y Cabo Verde, y se dan las características de diagnóstico más importantes para distinguirla de la otra especie conocida de la familia, *Gerardia savaglia.* Además, se discute sobre las relaciones con otras posibles especies de Gerardiidae que se reparten por diferentes zonas geográficas. También se aportan datos ecológicos sobre ambas especies y se contempla el parasitismo como el tipo de asociación más plausible entre *G. macaronesica* y los antipatarios que la hospedan. Por primera vez se realiza un completo estudio de los nematocistos de ambas especies y la iconografía de los nematocistos de *G. savaglia*. Algunas consideraciones biogeográficas son expuestas.

Palabras clave: Zoantídeos, Gerardiidae, islas macaronésicas y Mediterráneo, nueva especie.

1. INTRODUCTION

Recent studies of Gerardiidae have been carried out by several authors in the Canary Islands and others Macaronesian archipelagos. These authors recorded a single species, *Gerardia savaglia* (=*Savalia savaglia*) from the Canaries, Madeira and Cabo Verde (see BRITO, 1983 [1] y 1985 [2]; OCAÑA *et al*., 1995 [25]). Unfortunately, the presence of *G. savaglia* in Macaronesian waters was a misidentification motivated by the lack of good identification descriptors in the literature (especially concerning to *G. savaglia*) and the similarities showed by both, *G. savaglia* and the present new species *Gerardia macaronesica*. As we pointed out previously (OCAÑA *et al*., 1995 [25]: 154), many taxonomical problems of zoanthids are increased due to the absence of appropriate descriptions of these species. A new species, *G. macaronesica*, is described; this species is widespread in the Macaronesian islands, from Azores to Cabo Verde, being absent from the Mediterranean.

G. savaglia is a well known species (although not well described) through the Mediterranean Sea, which was recorded also from Madeira by JOHNSON (1899) [15] named as *Gerardia lamarckii*. The presence of a protein skeleton was the reason argued by Johnson to include it into the Antipatharian. CARLGREN (1895) [4] merged the species into the Parazoanthidae family. This peculiar anatomical item (skeleton axis), unknown in any other group of soft hexacorals, plays an important role in the biology of these species and also supports the Gerardiidae family to be separated from the others (see OCAÑA *et al*., 1995) [25]. After this taxonomical paper, new material and information has been achieved on both Gerardiidae, the Mediterranean and the Macaronesian species. There are enough morphological similarities (colour, growth and size) between both species (*G. savaglia* and *G. macaronesica*) to think that there is only a single one. However, the autoecology and some other characters from the anatomy and the cnidom make a clear difference between both species.

The cnidom is one of the main characters in order to distinguish the species of sea anemones *sensu lato* (see SCHMIDT, 1972 [30] & 1974 [31]; OCAÑA, 1994 [24]) and we demonstrate in this paper that it is also important for taxonomical purposes in zoanthids. Obviously, zoanthids needs more descriptive information in order to define properly the species and the other taxonomical categories. *Sensu* SCHMIDT (1974 [31]: 544) *Gerardia* is merged into the recent Zoantharia in which are included all the zoanthids with special b-mastigophores (spirulae) in the column wall: *Parazoanthus* Haddon & Schackleton, 1891; *Epizoanthus* Gray, 1867, *Zoanthus* Lamarck, 1801 and *Gerardia* Lacaze-Duthiers, 1864. However, there is not descriptive information to assure that this particular cnidom character is present in all the species above mentioned. One of the major problems on zoanthids taxonomy is the absence of complete descriptions in order to recognize properly the species. Despite some authors offer enough anatomical information in the specialized bibliography (structure and placement of the sphincters and disposition of the mesenteries, among others), the cnidom characteristics were low considered and usually, not well valuated (see CARLGREN, 1937 [5] y 1938 [6]; PAX, 1952 [26]). A more recent paper (HERBERTS, 1972 [13]) takes in account some cnidom categories, however, still it is needed more cnidom information, images and measurements, together with the other characters, in order to distinguish accurately the zoanthids species.

G. macaronesica is the second species which belongs to Gerardiidae and described worldwide. We offer a complete description of this species and also a comparative study in order to distinguish *G. macaronesica* from *G. savaglia*. In addition, some cnidom data of other species (no described) from the Indopacific and New Zealand are documented.

According to HÄUSSERMANN (2003) [12] the genus *Savalia* Nardo, 1844 has taxonomical priority over *Gerardia* Lacaze-Duthiers, 1864. However, due to the wide use of the genus *Gerardia* in the recent literature, from 1864 till now, we decide to maintain it.

2. MATERIAL AND METHODS

The specimens from the Canaries studied in the present work was collected by scuba diving sampling trips during the Bentos Project (Universidad de La Laguna, 1980-1985) and other expeditions and scientific projects, headed by local institutions (Universidad de La Laguna, Museo de Ciencias Naturales de Santa Cruz de Tenerife), between 1985 and 1994. Other private organizations which organize colleting expeditions, as Farmamar Expedition (1990), also has contributed to collect more specimens of Gerardiidae along the Canary Islands. The material from Madeira Archipelago belongs to the Museu Municipal do Funchal (MMF) collections. The material from Cape Verde has been collected by scuba diving during several expeditions supported by different institutions from the Canaries (Museo de Ciencias Naturales de Santa Cruz de Tenerife; Universidad de Las Palmas de Gran Canaria; Gobierno de Canarias). The sample from Azores was sent by Universidade dos Açores, Departamento de Oceanografia e Pescas (DOP).

The material of *G. savaglia* was collected in two different western Mediterranean localities: Ceuta (Gibraltar Strait) and Banyuls (France). Other consulted specimens from the Indopacific and New Zealand has been facilitated by the Copenhagen Zoological Museum (ZMUC) and the Auckland Museum (AK) in order to make comparison with our species.

The holotype of *Gerardia macaronesica* is deposited in the Museo de Ciencias Naturales de Santa Cruz de Tenerife (TFMC). The paratypes are deposited in the Museo de Historia Natural de Madrid (MNCN), Museu Municipal do Funchal, Madeira (MMF) and Nationaal Natuurhistorisch Museum, Leiden (RMNH). Some colonies and most of the histological slides are also deposited in the collection of the Departamento de Biología Animal, Universidad de La Laguna, Tenerife (DZ ZG). Part of the material examined and also the permanent cnidom slides are deposited temporally in the private collection of O. Ocaña and it will be sent to the appropriate institutions, once the studies has been concluded.

Part of the material (specially the material from Canary Islands) were anaesthetized with menthol crystals and preserved in 8% formaldehyde. As some colonies come from different institutions and projects, most of them are fixed directly in alcohol, not relaxing previously the polyps. The general morphology and anatomy were studied by means of a stereo dissecting microscope. The anatomy and histology were studied following the Ramón y Cajal method for topographic staining. Mallory triple stain was also used (see GABE, 1968 [8]). Specimens of colonies from Canary Islands and Cape Verde and also from the Mediterranean were sectioned for histological purposes (more than 500 slides in a whole) and examined and studied with a light microscope equipped with Nomarski differential interference contrast optic system. Permanent slides of cnidom were prepared using glycerin gel, the same technique prepared for meiofauna (see OCAÑA, 1994 [24]).

The classification and terminology of nematocysts used is essentially after SCHMIDT (1972) [30], as adapted by den HARTOG *et al.* (1993) [11]. The surveys of the cnidom are summarized in tables, in which the means and ranges of length and width of nematocysts are included. A large collection of underwater images has been used in order to show the color and shape variations, some aspects of its autoecology and also the high variety of environment where the new species may occurs.

2. RESULTS

Orden Zoantharia Gray, 1870

Familia Gerardiidae Roche & Tixier-Durivault, 1951(=Savaliidae Nardo, 1844?)

Género *Gerardia* Lacaze-Duthiers, 1864 (=*Savalia* Nardo, 1844)

Gerardia macaronesica spec. nov.

Savaglia lamarcki, JOHNSON, 1899 [15]: 814-815, short description, the species is identified with *Gerardia savaglia* (=*Savalia savaglia*) and merged into the Antipatharian with doubts; Madeira and the Mediterranean Sea.
Gerardia savaglia, BRITO, 1983 [1]:89-91, figs. 1-3, autoecology and distribution; following JOHNSON (1899) [15], the species is identified as *G. savaglia*; the Mediterranean, north Morocco, Canary Islands and Madeira. BRITO, 1985 [2]:178-183, fig. 35, lam. 36, description, habitat and some ecological notes; colour images; Canary Islands, Madeira, Mediterranean and north Morocco. PÉREZ Y MORENO, 1990 [27]: 81, a repetition of some Brito's data, one colour image. OCAÑA *et al.*, 1995 [25]:153-164, figs. 2-4, colour images, complete study of the anatomy, histology and cnidom, ecological notes; Canary, Madeira and Cape Verde islands. WIRTZ, 1995 [32]: 52, exclusively a color image.

Type material

Holotype: (TFMCBMCN/000188), colony (13 cm high and 13,5 cm wide) with more than 1000 polyps growing on *Tanacetipathes cavernicola* Opresko (2001a) branches, almost all the axis of *T. cavernicola* covered by the zoanthid, some calcareous sea weeds and barnacles were noticed on the branches too; O. Ocaña coll., 14-08-2002, Punta Preta, Tarrafal, (Santiago, Cape Verde Islands), 20 m, scuba diving, 15º17'N 23º46'O. **Paratypes**: (MNCN 2.04/1079), branch of the same colony (with 100-150 polyps and 13 cm high) with some areas of the antipatharian not covered by the zoanthid; same data as holotype; (RMNH Coel. 32362), branch with 150-300 polyps and 23 cm high, with some areas of the antipatharian not covered by the zoanthid, several specimens of *Eunice torquata* were noticed living on the colony; same data as holotype; (MMF35616), branch with 100-200 polyps and 10 cm high, calcareous debris noticed; same data as holotype.

Other materials

Canary Islands: Tenerife: (DZ ZG-1) Las Caletillas, 28º21'N 16º21'O, 24-12-1980, 75 m, by entangled in the fishermen nets and traps, small colony growing on *Antipathella wollastoni*, G. Dionis leg.; (DZ ZG-2) Punta de Güímar, 28º18'N 16º20'O, 14-03-1981, 100 m entangled in the fishermen nets and traps, small colony growing on *Antipathella wollastoni*, G. Dionis leg.; (TFMC CN/0151) Playa Santiago, 28º15'N 16º50'O, 14-03-1989, 25 m collected by scuba diving, small colony growing on *Antipathella wollastoni* in vertical wall, O. Ocaña leg.; (DZ ZG-3) Punta Teno, 28º20'N 16º55'O, 15-09-1990, 40 m collected by scuba diving, small colonies growing on rock platforms and also on small specimens of *Antipathella wollastoni*, colour images (see Ocaña et al., 1995:163), O. Ocaña leg. Other specimens were observed, but not collected, on different areas of the island: Playa San Juan (Los Gigantes), colony growing on a dead axis of *A.wollastoni* placed in a vertical wall, 25 m. La Palma: (DZ ZG-4) Tazacorte, 28º21'N 16º21'0, 3-11-1990, 30 m collected by scuba diving, same specimens of a big colony growing on vertical wall, color images, O. Ocaña leg. El Hierro: (DZ ZG-5) Punta de los Frailes, 27º38'N 18º00'O, 3-04-1982, 23 m by dredge, small colony growing on *Antipathella wollastoni*, Taliarte Expedition leg.; (DZ ZG-6) Punta de los Frailes, 27º38'N 18º00'O, 07-1985, 35-45 m, by scuba diving, small portion of a colony growing on *Antipathella wollastoni* at the cave gate, A. Brito leg. Gran Canaria: (DZ ZG-7) Puerto de Sardina, 28º08'N 15º42'O, 5-10-1983, 12 m, by scuba diving, small colony growing on *Antipathella wollastoni*, other colonies were observed growing on walls, A. Brito leg.; (DZ ZG-8) Punta de la Sal (El Cabrón), 27º52'N 15º22'O, 6-06-1990, 30 m, by scuba diving, portion of a big colony growing on its own skeleton, F. Espino leg. Other specimens were observed, but not collected, on different areas of the island: El Cabrón (Arinaga), 10-20 big colonies growing on its own skeleton placed on a rocky platform with sand (color images), 30-40 m. Lanzarote: (DZ ZG-9) Puerto del Carmen, 29º03'N 13º32'O, 13-10-1981, 40 m, portion from a big colony growing on *A. wollastoni* and placed at the main cave gate, color image (see Brito, 1983 y 1985) T. Cruz leg.; (DZ ZG-10) Puerto del Carmen, 29º03'N 13º32'O, 22-06-1990, 55 m collected by scuba diving, portion from a colony growing on *A. wollastoni* placed in a crevice in a vertical wall with *L. pruvoti*, O. Ocaña leg. Many other specimens were observed but not collected around the Montaña Clara islet. Fuerteventura: (DZ ZG-11) Frente a Casas de Jacomar, 28º16'N 13º53'O, 21-06-1990, 35 m collected by scuba diving, portion from a big colony growing on *A. wollastoni* and placed in the middle of a small tunnel, O. Ocaña leg.

Madeira: (MMF25715) Cais do Porto Novo (south Madeira coast), N 32º 39' 629" W 16º 48' 390", 13-04-1994, 31 m collected by scuba diving, portion from a colony growing on *A. wollastoni* on its own skeleton, P. Wirtz leg.; (MMF27120) Antigo Cais do Porto Novo (south Madeira coast), N 32º 39' 779" W 16º 48' 224", 19-07-1997, 47 m, collected by scuba diving, P. Wirtz leg.

Azores: (DOP) Formigas Islets, 37º 16' 08"N 24º 46' 48"W, 25-08-2002, 25 m collected by scuba diving, several portion of colonies growing on *A. wollastoni*, not well preserved material, F. Tempera leg.

Cape Verde: Santiago: (DZ ZG-12) Caleta do Sao Martinho, 14º54N 23º34'O, 31-12-1987, 17 m, collected by scuba diving, portion of a big colony growing on *Tanacetipathes cavernicola*, crevice in a vertical wall with many specimens of *Eunice torquata* living on the colony, A. Brito leg.; (C-16), (Material from Universidad de Las Palmas-Life project to Cape Verde), no data, scuba diving collected, portion of a colony growing on *T. cavernicola*, F. espino leg. Other colonies were observed, but not collected: several sites of the Tarrafal Bay, between 20 and 35 m, in shadow habitats, associated with *T. cavernicola*, O. Ocaña leg; King fish, 15º16'N 23º46'O, 25-40 m, vertical walls, tunnels and caves, associated with *T. cavernicola*, O. Ocaña leg.; Faro de Tarrafal, 15º17'N 23º47'O, 25-35 m, big caves and tunnels with vertical walls, associated with *T. cavernico-*

la, strong current environment, O. Ocaña leg. Sal: we observed colonies in Santa María Bay, 16º35’N 22º54’O, 20-25 m, on vertical walls and crevices, associated with *T. cavernicola*, high sedimentation, O. Ocaña leg.; Palmeira Bay, 16º45’N 22º59’O, 25 m, vertical wall and gate caves, associated to antipatharian, O. Ocaña leg.

Description

Morphology: Several ways of growth and external appearances can occur in the present new species. In the case that the colony creates its own skeleton, a basal plate is generated where the polyps are asexually produced (Fig. 5e); after this the colony continues generating many branches in a single plane or in several of them. Sometimes the species may generate a poor developed ribbon like skeleton, hardly noticed without an accurate observation of the colony. Growing up on an antipatharian skeleton is the third way of growth showed by this new species, the characteristic spines of those are some identification characters in order to distinguish the antipatharian skeleton where the *G. macaronesica* may occurs. The colonies may reach one meter high.

In preserved material, the polyps measurements are variable between 0,2-1 cm high and 0,2-0,5 wide; due to the retraction stage the column can be cylindrical to flat mammiform; the texture should be roughly by the concentration of sand in the ectoderm of the polyp wall. In alive and expanded conditions the sizes increase considerably in two or three centimeters at least. Colonies with small polyps were frequently noticed in the material from Cape Verde. The tentacles present medium size in expanded conditions; they are pointed, to 42 in number, arranged in two, more or less, entacmeic cycles; we noticed 21 marginal teeth. The polyps are overhanging from coenenchyme, but extremely embedded polyps are noticed. Wide coenenchyme in the well developed areas with many polyps, fine and less developed in the extreme areas of the colony.

The species present several colours, from yellow to orange in the tentacles, the coenenchyme and the column (Fig. 5). As a consequence of the sediment accumulation and other conditions, not well cleared, the column can be brownish or whitish, or even pinkish in the column; the brownish column are typical from the colonies growing on antipatharians, although not exclusively. Fixed specimens turned into red colour frequently although orange or brownish are also possible.

Microanatomy and histology: The mesenteries present macrocnemic disposition, although one specimen showed an intermediate arrangement; there are 28 mesenteries in the pharynx region and 42 in the upper column region. Most of the mesenteries are connected with a short, low folded pharynx; a single siphonoglyph, larger than wider, is noticed (Fig. 2d).

The sphincter is well developed and mostly endodermal, although a final portion of it is considered mesogleal (see OCAÑA *et al*, 1995) [25] (see Figs. 5a y b). The mesenterial muscles are poorly developed, we failed in detecting retractor muscles and weak parietobasilar muscle only in some mesenteries. The tentacles present also a weak musculature and it is arranged in short process.

The ectoderm present to 80 µm thick, being in the column poorly developed. It presents glandular cells and b-mastigophores; there is a fine cuticle that covers the whole tissue. The tentacular ectoderm is well developed and presents several cnidom categories, in the pharynx we noticed a few nematocysts, absence of glandular cells and large cilia are observed in the siphonoglyph.

The mesogloea can reach to 120 µm thick; it presents a fine structure and more development in the column than in other anatomical areas. We noticed low cellular density, some lacunae with glandular content have been observed (Fig. 2c); sand incrustations are numerous especially in the outer part of the column. The mesogloea is hardly noticed in some areas of the mesenteries and the pharynx, wider in the siphonoglyph than in any other area of the pharynx.

The endoderm can reach to 80 µm thick, it is formed by absorption cells in the column and some glandular cells among those; commonly, not folded and it presents a low development. Most glandular cells are observed along the mesenteries; a very low development of the endoderm is noticed in some mesenterical areas. There are filaments unilobulated and trilobulated (Figs. 2 e and f) in the top of the mesenterial filaments. In the specimens studied, we observed gonads development in all the macrocnemes (Figs. 2 g and h).

Cnidom: A complete survey of the cnidom (measurements, categories and placement) of the material from different localities is presented in the table I. We noticed one category of spirocysts and several categories of the other nematocysts equipment: three categories of elliptical, some of them ovoid, spirulae (b-mastigophores); one category is the special spirulae only present in some groups of zoanthids, as the present genus. Three penicilli (p-mastigophores) categories: one category of elliptical to some ovoid penicilli A; one category of elliptical big penicilli E and other of rather small elliptical to ovoid penicilli E. There are also two categories of real, but not very conspicuous, homotrichs of elliptical shape, a third tiny category of nematocyst can be assume as a homotrich but it need confirmation.

Remarks.- The absence and the presence (or also the range of abundance) of some cnidom categories found in the studied material of *G. macaronesica,* along the distribution areas, should be explained as a part of the specific range of variation displayed by this taxon. Nevertheless, the different origins of the studied material and, specially, the differences of the conservation method used, should be also taking in account. Some tiny categories (as the small homotrichs from the wall) may be easily overlooked by the observer; moreover, the range of abundance of these capsules categories, in the polyps from different colonies, does not have to be underestimated. Other categories which are not very conspicuous, like the medium size homotrichs from the filament or pharynx, can be easily overlooked due to its own morphology and placement. We offer (see Fig. 1) an ideal nematocysts equipment for *G. macaronesica,* although, for identification matters we recommend to use the most common categories, always present in all the specimens from different populations studied by us (see table I and Fig. 1).

Table I: *Gerardia macaronesica*. Survey of the cnidom of five colonies from different localities. A: El Hierro, Canary Islands (DZZG-6). B: Santiago, Cabo Verde (DZZG-12). C: Holotype (TFMCBMCN/000188). D: Formigas Islets, Azores (DOP n/n). E: Madeira (MMF25715)

Organ	Origin	Nematocyst type	Mean and range (in parentheses) of length and with of nematocyst capsules in µ	N	Frequency
Column	A	Spirulae (c)	16,2 (13,3-17,8) × 5,7 (4,4-7,5)	12	Common
	B	Spirulae (c)	14,9 (12,2-15,5) × 5 (4,4-6,7)	30	Very common
	C	Spirulae (c)	13,7 (10-15) × 5,5 (4-6)	24	Very common
	C	Spirulae (e)	16 (15-17) × 3,8 (3,5-4)	2	Rare

Organ	Origin	Nematocyst type	Mean and range (in parentheses) of length and with of nematocyst capsules in µ	N	Frequency
	D	Spirulae (c)	13,9 (13-18) × 4,9 (4-7,5)	13	Common
	E	Spirulae (e)	17,4 (16-19) × 3,8 (3-4,5)	12	Common
	E	Spirulae (h)	17 × 2,5	1	Rare
	E	Spirulae (c)	14,4 (13-16) × 5,3 (4,8-6)	18	Common
	A	Penicilli E (a)	24,2 (22,8-25,5) × 10	2	Uncommon
	A	Penicilli E (b)	19,1 (18,9-19,4) × 7,1 (6,4-7,8)	2	Uncommon
	B	Penicilli E (a)	24,4 (23,3-26,6) × 10,4 (9,4-11,1)	5	Uncommon
	B	Penicilli E (b)	13,6 (13,3-14,4) × 6,8 (6,1-7,2)	4	Uncommon
	C	Penicilli E (a)	23 (21-25) × 9,3 (9-10)	4	Uncommon
	C	Penicilli E (b)	11 (10-12) × 5,8 (5,5-6)	3	Uncommon
	D	Penicilli E (b)	15,8 (14-17,5) × 6,1 (5-8)	9	Uncommon
	E	Penicilli E (b)	14,4 (11,5-17) × 5,3 (5-7,5)	13	Common
	C	Penicilli A (d)	14,5 (14-15) × 4,5 (4-5)	2	Rare
	D	Penicilli A (d)	16,5 × 4	1	Rare
	E	Penicilli A (d)	19 × 4	1	Rare
	C	Homotrichs (n)	9,5 (9-10) × 3,2 (2,8-3,5)	2	Rare
	D	Homotrichs (f)	10,6 (10-11) × 3,3 (3-4)	6	Uncommon
Tentacles	A	Spirocysts (i)	(11,1-22,2) × (2,2-4,4)	10	Very common
	B	Spirocysts (i)	(11,1-17,8) × (2,2-3,3)	10	Very common
	D	Spirocysts (i)	16,7 (10-25) × 2,5 (2-3)	3	Very common
	E	Spirocysts (i)	20 (15-25) × 3 (2-4)	2	Very common
	A	Spirulae (g)	17,6 (14,4-20) × 3,9 (2,8-4,4)	20	Common
	B	Spirulae (g)	16,6 (14,4-18,9) × 3,3 (2,2-4,4)	20	Common
	C	Spirulae (g)	17,1 (16-19) × 3,9 (3,5-4,8)	26	Very common
	C	Spirulae (h)	16 (15-17) × 2,3 (2-2,5)	2	Uncommon
	D	Spirulae (h)	16,5 (16-17) × 2,5	2	Rather-common
	D	Spirulae (g)	16,7 (15,5-18) × 3,9 (3,5-4,5)	8	Common
	E	Spirulae (g)	17,5 (15-19) × 3,8 (3-4,5)	19	Very common
	E	Spirulae (h)	16,6 (12-18) × 2,3 (1,8-3)	11	Rather-common
	A	Penicilli A (k)	17,8 (14,4-20) × 4,7 (3,7-4,4)	3	Rare
	B	Penicilli A (k)	16,7 × 4,4	1	Rare
	C	Penicilli A (k)	14 (12-15) × 4	3	Uncommon
	D	Penicilli A (k)	17 × 3,9 (3,8-4)	2	Uncommon
	E	Penicilli A (k)	17,8 (16-19) × 4,3 (3-5,5)	5	Uncommon
	A	Penicilli E (l)	15 (13,3-16,7) × 6,7 (5,6-7,5)	12	Common
	B	Penicilli E (a)	23,9 (22,2-25,5) × 10	2	Rare
	B	Penicilli E (l)	14,9 (13,3-16,7) × 6,5 (3,9-7,8)	25	Common
	C	Penicilli E (l)	13,3 (11-15) × 6,6 (6-7)	15	Common
	D	Penicilli E (l)	15 (12,5-17) × 5,9 (5-7)	25	Common
	E	Penicilli E (l)	13,1 (12-15) × 6,2 (5-7)	16	Common

Organ	Origin	Nematocyst type	Mean and range (in parentheses) of length and with of nematocyst capsules in µ	N	Frequency
	A	Homotrichs ? (j)	8,9 × 1,1	1	Rare
Pharynx	A	Spirulae (m)	19,2 (17,7-21) × 2,7	5	Rather-common
	B	Spirulae (m)	18,5 (15,5-22,2) × 3 (2,2-3,3)	11	Common
	C	Spirulae (m)	16 (15-18) × 3 (2,5-3,8)	6	Rather-common
	D	Spirulae (m)	16,9 (15-20,5) × 3 (2,5-3,5)	10	Common
	E	Spirulae (m)	18,6 (15-21) × 3 (2,8-3)	7	Rather-common
	A	Penicilli A (o)	14,4 × 4,4	1	Rare
	B	Penicilli A (o)	15,1 (13,3-16,7) × 3,7 (3,1-5,3)	5	Uncommon
	C	Penicilli A (o)	15,1 (14-16) × 3,9 (3,5-4)	7	Rather-common
	E	Penicilli A (o)	19 × 4,8	1	Uncommon
	A	Penicilli E (q)	25 (22,2-27,8) × 10,5 (10-11,1)	2	Rare
	A	Penicilli E (p)	15,3 (13,3-16,7) × 6,8 (6,1-7,8)	15	Common
	B	Penicilli E (q)	25,3 (31,1-27,8) × 9,8 (9,4-12,2)	13	Common
	C	Penicilli E (p)	13,4 (12-17) × 6,7 (5,5-8)	21	Very common
	C	Penicilli E (q)	24,3 (23-26) × 9,4 (8,5-10)	9	Rather-common
	D	Penicilli E (p)	14,9 (13-17) × 5,6 (4-7)	18	Very common
	D	Penicilli E (q)	26 × 8	1	Rare
	E	Penicilli E (p)	13,5 (13-15) × 6,6 (5,5-7)	16	Common
	E	Penicilli E (q)	26 (25-27) × 11,7 (11-12)	3	Rather-common
	B	Homotrichs (n)	9,8 (7,8-12,2) × 1,3 (1,1-2,2)	11	Common
	C	Homotrichs (n)	13,6 (12-15) × 2,7 (2,5-3)	5	Uncommon
	D	Homotrichs (n)	17,8 (17-19) × 3,5 (3-4)	6	Uncommon
	E	Homotrichs ? (j)	9,5 (9-10) × 2	2	Common
	E	Homotrichs (n)	14 × 2,8	1	Uncommon
Filaments	C	Spirulae (r)	16,1 (15-17) × 3,5 (3-4)	7	Uncommon
	A	Penicilli A (v)	16,5 (14,4-18,9) × 4,9 (3,9-6,7)	22	Common
	B	Penicilli A (v)	16,3 (14,4-18,9) × 4,9 (4,2-7,8)	21	Very common
	C	Penicilli A (v)	14,9 (13-16) × 4,2 (3,5-5)	15	Common
	D	Penicilli A (v)	17,2 (15-20) × 4,3 (3,5-5)	12	Very common
	E	Penicilli A (v)	15,3 (14-19) × 4,5 (3,8-5)	12	Very common
	A	Penicilli E (w)	24,2 (18,9-27,8) × 9,4 (6,7-10)	6	Uncommon
	A	Penicilli E (u)	17,5 (13,3-18,9) × 7 (5,6-8,7)	30	Very common
	B	Penicilli E (w)	25 (24,4-25,5) × 11 (10,9-11,1)	2	Rare
	B	Penicilli E (u)	14,5 (12,2-16,7) × 5,9 (5,5-7,2)	20	Common
	C	Penicilli E (w)	21,9 (20-26) × 9,6 (8,5-10)	17	Common
	C	Penicilli E (u)	13,2 (11-15) × 5,8 (5-7)	17	Very common
	D	Penicilli E (u)	15 (14-16) × 5,5 (5-6)	12	Very common
	D	Penicilli E (w)	24,5 (24-25) × 11,8 (11,5-12)	2	Uncommon
	E	Penicilli E (w)	25 × 10	1	Rare
	E	Penicilli E (u)	14,5 (13-18) × 6,4 (6-7,5)	16	Very common

Organ	Origin	Nematocyst type	Mean and range (in parentheses) of length and with of nematocyst capsules in µ	N	Frequency
	A	Homotrichs (t)?	9,2 (7,8-10) × 1,7 (1,4-2)	3	Rare
	B	Homotrichs (t)?	9,6 (7,8-12,2) × 1,8 (1,1-2,8)	17	Very common
	C	Homotrichs (s)	12,3 (11-13) × 3,3 (2,5-4)	4	Uncommon
	D	Homotrichs (s)	15 × 2,8	1	Uncommon
	D	Homotrichs (t)?	8,3 (8-9) × 2	3	Common
	E	Homotrichs (s)	13,4 (12-15) × 2,3 (2-2,5)	6	Uncommon
	E	Homotrichs (t)?	8,7 (8-10) × 2,1 (1,8-2,5)	6	Common

Ecology

Gerardia macaronesica is a typical species from circalittoral and deep infralitoral bottoms that often occur on *Antipathella wollastoni*, forming a very interesting association. This association is very characteristic around the Macaronesian islands, except in Cape Verde, where the zoanthids occur mostly on the antipatharian *Tanacetipathes cavernicola*. It has been collected from 12 (only in some special habitats) to 100 meters deep, although very little is known about its abundance in deeper bottoms. *G. macaronesica* is able to show several ecological adaptation forms, but on infralitoral bottoms always is placed in dark habitats, as vertical walls, cave gates, ruffs and big crevices, and in other habitats with the light conditions diminished. Big colonies with their own skeleton have been noticed at some special environments, where they find the ecological conditions to do it (this only has been observed in scarce sites at Canary Islands). These environments seem to be exposed places with high water movement. This is a key factor in order to understand the ecological distribution of this species. We find the most important concentration of *G. macaronesica* growing on its own skeleton in flat rocky and moderate sandy bottoms (Fig. 8a), but also in vertical walls at the exposed islets (Fig. 8b), both habitats with high water movements. The morphology of the colonies and branches orientation can be quite different from one colony to another, being more related to water movements than any other factor. In the exposed islets in Canary Islands (Montaña Clara, norte de Lanzarote) *G. macaronesica* was observed together with the gorgonian *Paramuricea grayii* and a species of the genus *Eunicella* still to be identified. In deep infralitoral and circalitoral bottoms, and with different environment conditions, the zoanthid can also form rather neglected or not very conspicuous populations growing on walls and crevices (also exclusively noticed at Canary Islands), with very poor skeleton development (OCAÑA *et al*., 1995) [25], like fine axis hardly noticed from the wall (Fig. 9b). In this habitat the polyp's density is lower than in the other, but the zoanthid can cover a big piece of the substrate (Fig. 9a).

The species grow on antipatarian on many occasions; some parts of the antipatarian coenenchyme are damaged and destroyed by the zoanthid. It seems to be a case of parasitism, where the zoanthid is growing on the antipatarian coenenchyme, covering it and including alive parts inside the colenteron. The final result is to get the antipatarian skeleton as an axis where grow up. Still, have to be studied if there is some absorption of substances that may bring some trophy benefits to the zoanthid, but it should be a plausible option to take it in account. Having demonstrated the serious damages that *G.macaronesica* causes on the antipatharians, we think that the inquilinism (see MORTON, 1989) [21] can not be simply applied to this question. There is not a truly satisfactory definition of parasitism, being the metabolic dependence the better understood criterion to recognize the parasitic association (MORTON, 1989) [21], but in spite of this, we do not consider appropriate to erect a new association category in order to accommodate our particular case. Although we can not offer any consistent prove of metabolic dependence in the present association, we consider this association a case of facultative parasitism, being the host skeleton the major goal, although we aware that it will not be the last word about this subject. It is well known by us that there are other species of parasitic actiniaria (Ocaña, den Hartog & Ofwegen, in prep.) or zoanthids worldwide, which are able to grow up on several species of Gorgonians and Hydroids (Zibrowius & Sinniger, in prep.).

In the Macaronesian archipelagos there are two species of antipatharian, both belonged to the Myriopathidae family, able to be parasitized by *G. macaronesica*. The commonest one is *Antipathella wollastoni* (Gray, 1857), a very common species spread along the whole islands group, another species *Tanacetipathes cavernicola* Opresko, 2001, has been exclusively noticed parasitized by the zoanthid in Cape Verde where is a common infralittoral species. We have observed the association between *A. wollastoni* and *G. macaronesica* in Azores (see Fig. 7a), Canaries and Madeira but it has not been observed yet in Cape Verde, where the zoanthids find a high dependence for *T. cavernicola* instead of. In both cases the zoanthids are able to form their own skeleton in marginal zones where the antipatharians do not offer skeleton to the zoanthids. As a consequence of the colonial structure differences showed by the antipatharians species, the way of the zoanthid placement is different for both antipatharian species: the bushy like growing (Fig. 6) is characteristic of the zoanthid placement on *T. cavernicola* (which presents a high density of short hard branches), so there is a high polyp's density which do not overhang much from the coenenchyme and they do not display many expansion using its own skeleton. In the case of *A. wollastoni* the colonial structure is quite different, as there are less branches density than in the other species, and those are soft and flexible (not the best place to bear the zoanthid). Less polyp's density is expected in those zoanthids growing on this antipatharian species as well as more expansion of the zoanthids using its own skeleton; the polyps are more overhanging from the coenenchyme (see Fig. 7b).

We noticed the presence of the decapod crustacean *Balsia gasti,* a well known gorgonian and other cnidarian commensal, but we did not find any specimens of the ascothoracic crustacean *Laura gerardiae*. On some colonies we found out two carnivorous mollusks: *Heliacus* sp., as well as the cnidarian predator *Coraliophilla meyendorfii* (M. Oliverio, com. pers.). The polychaeta *Eunice torquata* has been observed in association with *T. cavernicola*, although the species is quite common in the hard bottoms of Cape Verde from shallow waters to 91 meters deep (NÚÑEZ *et al*., 1999) [23].

Reproduction

Asexual reproduction by budding (from the polyp's wall and also among the coenenchyme) has been observed; as it is the way they form the colony. Sexual reproduction seems to be more appropriate to spread the species to another site. We find almost gonads development through all the seasons: gonads have been noticed in April (Madeira), August (Azores), July (Canaries), December but also August in Cape Verde.

Distribution

G. macaronesica is exclusively known from the Macaronesian archipelagos (Madeira, Canary Islands, Cape Verde and Azores). In Canary Islands is well known in all the islands and some inlets.

Name

The new species is named for its distribution patterns.

Gerardia savaglia (Bertoloni, 1819)

Gorgonia savaglia Bertoloni, 1819.
Gerardia lamarckii LACAZE-DUTHIERS, 1864 [16]: 169, genus description. LACAZE-DUTHIERS, 1865 [17]: 1-63, comparison with several species of Antipatharians, no plates. LACAZE-DUTHIERS, 1882 [18]: 10-17, 1 planche, description of the parasitic *Laura gerardiae*.
Gerardia savaglia, CARLGREN, 1895 [4]: 319-334, remarks the position into zoanthids and placed the species into Parazoanthiidae. ROCHE ET TIXIER-DURIVAULT, 1951 [28]: 402-409, plate 1, external description, anatomy (mesenterial cycles), bioquimical characters of the axis, merged into the Gerardiidae family. ROSSI, 1958 [29]: 1-7, figs. 1-3, Gerardiidae, some external characters, autoecology; Mediterranean (Egean Sea, Adriatic, Argelia, Genova Gulf). LAUBIER & THEODOR, 1967 [19]: 223-225, fig.1, Gerardiidae, some data of external anatomy and habitat, repetition of the Rossi's data, Banyuls –Sur-Mer. HERBERTS, 1972 [13]: 72, 142 y 144, cited only in the key, merged into Parazoanthiidae. Schmidt, 1974 [31]: 544, recent zoanthids. MANUEL, 1981 [20]: 78, merged into Parazoanthiidae. ZIBROWIUS, 1985 [33]: 349-352, on the associated species *Balssia gasti*. GILI *et al*., 1987 [9]: 13-17, short description, autoecology, comparative table, Catalonian coast. CALVÍN, 1995 [3]: 307, short description and some data about the habitat, color image of a colony with possibly its own skeleton, the Mediterranean.
Savalia savaglia, HÄUSSERMANN, 2003 [12]: 505, 1 abb., short description, and colour picture, merged into the family Savaliidae Nardo, 1844.

Material examined

Ceuta: (Priv. Col.) Ciclón de fuera, North Bay, 35º54'N 5º17'O, 10-05-1998, 30 m, by scuba diving collecting, small piece of a big colony growing on its own skeleton (see Häussermann, 2003: 505 for color picture of this particular colony), rock and sand platform near a vertical wall colonized by *Paramuricea clavata* "forest", other small colonies were observed growing on *P. clavata*, O. Ocaña leg., (Priv. Col.). Sarchal, South Bay, 35º53'N 5º17'O, 15-01-2004, 30-35 m, by scuba diving collecting, some branches of a small colony growing on *P. clavata*, community of several gorgonians growing on a rocky platform, one specimen of the crustacean *Balssia gasti* living on the branches, copepoda in gut content, O. Ocaña leg. **France**: (ZMUC, no collection number) Banyusl Sur Mer, 42º29'N 3º08'E, 22-08-1968, 40 m, by scuba diving collecting, small piece of a colony growing on *P. clavata*, F. Fabricius leg.

Comparative material other species examined

Gerardia sp.: **New Zealand**: (AK 82153) Bay of Islands, Motuterakihi, Te Pahi island, 35º11.3'S 174º05.8'E, 23 m, by scuba diving collecting, small colony possibly growing on its own skeleton, smooth rock dome with sand-silt skirt, A. B. Stephenson leg. **Indopacific**: (X-489, ZMUC), zoanthid growing on antipatharian, medium size colony, no more data; (Z-9695/KAH-9901/59, ZMUC), zoanthid growing on its own skeleton or on gorgonacea, big colony, no more data; (TZ-61, ZMUC), zoanthid growing on its own skeleton or on gorgonacea, medium size colony collected by scuba diving.

Diagnosis (for a more accurate description see LACAZE-DUTHIERS, 1864 [16]; ROCHE ET TIXIER-DURIVAULT, 1951 [28]).

The species is known to occur growing on the gorgonian *Paramuricea clavata* or even with its own skeleton. When the species generates its own skeleton, as happen with *G. macaronesica* above described, a basal plate is generated where the polyps are asexually produced until the colony is generated with many branches in a single plane or in several of them.

In preserved material, the size of the polyps varies between 0,1-0,6 cm high and 0,2-0,5 cm wide. The column can be cylindrical to flat mammiform if the specimen is strongly retracted; texture roughly due to the concentration of sand in the ectoderm of the polyp wall. Medium size pointed tentacles, to 27 in number, arranged in two, more or less, entacmeic cycles; we noticed between 13-18 marginal teeth (sometimes those marginal teeth can not be noticed properly).

Polyps are overhanging from coenenchyme, but extremely embedded polyps are noticed. Wide coenenchyme in the well developed areas with many polyps, fine and less developed in the extreme areas of the colony.

The species present several colours, from yellow to orange in the tentacles, coenenchyme and column. We only detected pale yellow colonies (see Fig. 10). When fixed in formaline, the colonies turn to red colour.

Internal anatomy and microanatomy: Macrocnemic disposition of the mesenteries, there are 26-28 mesenteries. Pharynx short and not specially folded a single siphonoglyph larger than wider is noticed (Fig. 4b).

The sphincter is endodermal and not well developed, it seems to be weak (at least in the specimens tested) and difficult to be distinguished from the rest of the endodermal muscle, it covers half of the column more or less (Fig. 4a). Retractors and parietobasilar muscles weak and not observed properly. The tentacles present also a weak musculature and they are arranged in short process.

The ectoderm can reach 75 µm thick in the column and 100 µm thick in the tentacles, in the pharynx we noticed a few nematocysts, absence of glandular cells and large cilia are observed in the siphonoglyph. The mesogloea of the column wall can reach to 125 µm thick, present a fine structure and more development in the column than in other anatomical areas. We noticed low cellular density, but lacunae with glandular content are frequently observed; some sand incrustations were noticed in the outer part of the tissue, close to the ectoderm. The mesogloea is hardly noticed in some areas of the mesenteries and the pharynx, wider in the siphonoglyph than in any other area of the pharynx. In the inner face of the mesogloea of the column, it has been noticed a system of big lacunae like, with endodermal tissue and also big homotrichs (Figs. 4d, e and f). These areas are common along the column wall; the endoderm associated to them can reach to 120 µm thick. We only have observed unilobulated filaments. All the macrocnemes bear gonads in the specimens studied (Fig. 4c).

Cnidom: A complete survey of the cnidom (measurements, categories and placement) of the material from the two Mediterranean localities studied is in Table II (see also Fig. 3). We noticed one category of spirocysts and several categories of the other nematocysts equipment: three categories of elliptical, some of them ovoid, spirulae (b-mastigophores); one category is the special spirulae only present in some groups of zoanthids as the present genus. Two penicilli (p-mastigophores) categories: one category of elliptical to some ovoid penicilli A and one category of elliptical big penicilli E especially common in the special areas of the endoderm of the wall (see description above).

Table II. *Gerardia savaglia.* Survey of the cnidom of two colonies from different Mediterranean localities. A: Ceuta (North Africa) (Priv. Col.). B: Banyuls (France) (ZMUN/ n/n)

Organ	Origin	Nematocyst type	Mean and range (in parentheses) of length and with of nematocyst capsules in µ	N	Frequency
Column	A	Spirulae (c)	15,6 (13-20) × 12,4 (10-15)	5	Uncommon
	A	Spirulae (d)	16 × 2	1	Rare
	B	Spirulae (c)	13,1 (9-16) × 10,6 (9-12)	10	Uncommon
	A	Penicilli A (b)	16,5 (13-20) × 4 (3-5)	2	Rare
	A	Penicilli E (a)	18,5 (14-21) × 9,3 (8-11)	51	Very common
	B	Penicilli E (a)	18,2 (16-20) × 9,1 (8,5-10)	20	Very common
Tentacles	A	Spirocysts (e)	20 (15-25) × 2,8 (2-3,5)	2	Very common
	B	Spirocysts (e)	20 (15-25) × 2,8 (2-3,5)	2	Very common
	A	Spirulae (h)	18 (16-20) × 3 (2,5-4)	28	Common
	A	Spirulae (g)	22 (20-27) × 4,8 (4-5,5)	4	Uncommon
	B	Spirulae (h)	17,8 (16-23) × 3,3 (2,8-4)	23	Common
	B	Spirulae (g)	24,4 (22-27) × 4,5 (4-5)	12	Rather-common
	A	Penicilli A (f)	19,2 (15-23) × 4,4 (4-5)	11	Uncommon
	B	Penicilli A (f)	18 × 4	1	Rare
	A	Penicilli E	26 × 10	1	Rare
Pharynx	A	Spirulae (i)	16,6 (13-20) × 3,2 (2,5-4)	37	Rather-common
	B	Spirulae (i)	14,2 (12-16) × 4,3 (3,5-5)	11	Rather-common
	A	Penicilli A (j)	17 (15-19) × 4,8 (4-5,5)	2	Rare
Filaments	A	Penicilli A (k)	13,6 (12-15) × 4,5 (3,5-5)	14	Common
	B	Penicilli A (k)	14,2 (12-16) × 4,3 (3,5-5)	13	Common

Ecology

G. savaglia is a typical species from circalittoral bottoms (see ZIBROWIUS, 1985 [33]; GILI *et al.*, 1987 [9]; CALVÍN, 1995 [3]) frequently found associated to *Paramuricea clavata*. In the Strait of Gibraltar area the species commonly occurs in association with

P.clavata (O. Ocaña, personal observation). Although other species of gorgonians has been recorded in association to the zoanthids (see ROCHE et TIXIER-DURIVAULT, 1951[28]). We also noticed some colonies growing with its own skeleton (Fig. 10), in this case a basal plate is generated in order to erect the colony (see diagnosis); other colonies growing on its own skeleton has been recorded in the literature (ROSSI, 1958 [29]). In the case the species is growing on *P. clavata*, it is noticed some expansion of the zoanthids, using its own skeleton. *G. savaglia* (as happen also with *G. macaronesica*) only generate its skeleton in some areas where the gorgonian do not offer the appropriate support; a similar phenomenon was observed previously by ROCHE et TIXIER-DURIVAULT (1951 [28]: 405). We always find colonies in some habitats with high biodiversity patterns and constant water movement, although it can not be too strong; locally *G. savaglia* colonies have been always observed inside the gorgonians "forest" or very close to those. The common occurrence of *G. savaglia* on the gorgonian *P. clavata* it seems to be, according to ROCHE et TIXIER-DURIVAULT (1951 [28]), a similar parasitic phenomenon also observed in *G. macaronesica* on antipatharian species.

G. savaglia is a planctonic captor, able to prey on several species of copepods as we noticed rest of these (partially digested) inside the coelenteron as a gut content. We find also the decapod *Balssia gasti* in association with one of the colony (for more information about it see ZIBROWIUS, 1985 [33]).

Reproduction

Asexual reproduction has been noticed by budding in several polyps following a similar patterns find in *G. macaronesica*. We find gonads development in the specimens studied on May and August, but specimens analyzed on January do not present any gonads what is consistent with the Mediterranean environmental conditions.

Distribution

G. savaglia it seems to be a species rather known in the western Mediterranean (Catalonian coast, Baleares, Algerian coast, Naples and Geneva Gulfs and the Strait of Gibraltar) including the Adriatic Sea and apparently less common in the Levantin basin where has been exclusively recorded from Aegean Sea.

4. DISCUSSION

Biogeographical remarks

Gerardia macaronesica is considered here as a endemic element, exclusively known from the Macaronesian waters. The presence of this taxon along the whole Macaronesian archipelagos and the coexistence with the endemic antipatharians, where frequently the zoanthids is hosted, support the later hypothesis.

Other endemic Macaronesian anthozoan, as the Actiniaria *Actinia nigropunctata* den Hartog y Ocaña, 2003, has been recently described, although in those cases, the Pleistocene climatic events seems to play an important role and was used by some authors to justify the presence of endemic species in macaronesian waters (see den HARTOG & OCAÑA, 2003

[10]). We should consider this hypothesis: *G. macaronesica* was generated as a consequence of the Pleistocene isolation suffered by Macaronesian waters from Africa coast, but as a difference of these Pleistocene species, there is not consistent proves about the origin of *G. macaronesica* during the Pleistocene period. Attending to the current Macaronesian geographical and ecological distributions of the zoanthid, it seems more plausibly that it existed before the glacial period and could survive to those fluctuant climatologic changes on circalittoral or upper bathyal bottoms. The actual presence of the zoanthid in the Cape Verde and, especially, in the Azores support the latter hypothesis of having survived during Pleistocene times. According to HOEK (1987) [14], the climatic perturbations could not bring the destruction of most of littoral species from the Azores in opposition to the most accepted idea (see MORTON *et al*., 1998 [22]); some new records of Actiniaria from Azores (Ocaña *et al*. in prep.) support the latter idea. The high ecological possibilities of *G. macaronesica* are consistent with this assertion and invite to think about that particular idea.

The abundance of *G. macaronesica* in Cape Verde call to explore the possibility the zoanthids as a Guinean element than could reach the Macaronesian archipelagos, thanks to the warm periods suffered during the Pleistocene. If we assume the last argument, it will be no rare that the species could even occur on other similar habitat from close related places as some spots of the Mauritanian, Senegal coasts and also at Guinea Gulf, extending its distributional range. Following the same argument, it can be also possible that *G. savaglia* may be a relict Guinean species that could support the cold periods inside the Mediterranean. A similar phenomenon is well known in some species of fishes such us the pomacentrids *Chromis chromis* (Lusitanic-Mediterranean) and *Chromis limbata* (Macaronesic-Guinean) (EDWARDS, 1986 [7]). *G. macaronesica* can occur apparently very little (at least in the typical habitats available with scuba diving equipment) in the Azores than in the other islands group, this remarks the northern distributional limit of this taxon. The occurrence of *G. macaronesica* in association with *Antipathella wollastoni* remarks this antipatharian to be the most common macaronesian host-substrate. Regarding this assertion there are not much possibilities to find *G. macaronesica* further north than the Azores.

Comparison with other species

G. macaronesica is a new species of Gerardiidae and it constitutes the second species of such family described worldwide, being *G. savaglia* the first species which belong to such family, which has been already described. The great shape similarity and other anatomical characters between both species of *Gerardia* studied in the present paper and the lack of appropriate description of the *G. savaglia* in the literature gets us into the confusion, and we failed in recognizing our Macaronesian material as a new taxon (see OCAÑA *et al*., 1995 [25]). Fortunately, the intuition of Dr. Zibrowius (com. in litt.) put us in alert of this affair as he always felt they were different taxa.

G. macaronesica and *G. savaglia* present different cnidom equipments. The species *G. macaronesica* presents a high number of cnidom categories, meanwhile *G. savaglia* present less cnidom categories, being less armed in a general sense. The absence of penicilli E (p-mastigophores and even holotrichs by other authors) in most of the tissues of the species *G. savaglia* is one of the main cnidom differences which makes this species different from *G. macaronesica* (see Figs. 1 and 3). In addition, *G. macaronesica* differs from *G. savaglia* in having common elliptical capsules of special spirulae (special b-mastigophores *sensu* SCHMIDT, 1974 [31]) in the body wall (see Fig. 1) meanwhile *G. savaglia* presents a rounded scarce category of special spirulae (see Fig. 3). There are also some minor, but constant differences, among the cnidom morphological categories and others, this differences are related with the measurements and placement of the cnidom through the tissues (see Tables I and II). Spirocysts are specially concentrated in the tentacles, although they are also spread throughout all the tissues, being very common in the pharynx and the filaments of both species of Gerardiidae. We find also some small, other tiny, inconspicuous homotrichs categories in *G. macaronesica* not found in *G. savaglia*. Some slight cnidom differences between colonies (see Table I) from different localities has to be archived as a part of the variation range of the species through the Macaronesian waters. Part of these cnidom differences should be also due to the fixed methodology applied to the material which should bring some difficulties to study the material. Differences in the cnidom of the body wall should be also due to the quantity of the sand included in the body wall of the specimens.

From the point of view of the morphology and histology, both species are very similar in general, however the species differs in having different number of tentacles as a constant character among them, being high the number in *G. macaronesica*. Both species present an endodermal sphincter but it is less developed in *G. savaglia,* meanwhile in *G. macaronesica* we noticed it to be stronger and with some mesogloeal portion (although still have to be confirmed if this character can be considered constant) (see OCAÑA *et al*., 1995 [25]; see Figs. 2a and b). The presence of a remarkable system of big lacunae-like along the column of the body wall in *G. savaglia,* is the main micro anatomical difference between both species. These lacunae (see Figs. 4d and e) are absent from *G. macaronesica* and they present endodermal content and also concentration of big homotrichs (holotrichs *sensu* other authors) (see Fig. 4f).

G. macaronesica differs also from other possibly Gerardiidae from more distant regions. The taxonomical relation of *G. macaronesica* and *G. savaglia* with those specimens tentatively identified as *Gerardia* sp. from New Zealand (Ocaña & den Hartog, in prep.) seems to be rather close; the absence of penicilli E (holotrichs from other authors) from the filaments and the presence of a different morphological category of especial spirulae (b-mastigophores from other authors) in the body wall of the material from New Zealand make enough differences with those Mediterranean and Macaronesian species. Unfortunately, the other examined material was not fixed in formaline and this complicates enormously the taxonomical work, especially in the cnidom concern. However, the different sizes categories found in all the specimens examined differ from what was found in *G. savaglia* and *G. macaronesica*. The material from Indopacific (ZMUC/X489) is growing on antipatharian too, but showed a characteristic feature in the mesogloea of the body wall not found in the other zoanthids. The other material studied from the Indopacific (ZMUC/TZ61; ZMUC/Z9695) are possibly in association with gorgonians skeleton (although we can not assure it) and present different cnidom measurements than what is expected from our Mediterranean and Macaronesian material. The possible *Gerardia* sp. (ZMUC/Z9695) present small and rather neglected homotrichs in the body wall, also found in some material identified as *G. macaronesica* (see Table I and Fig. 1).

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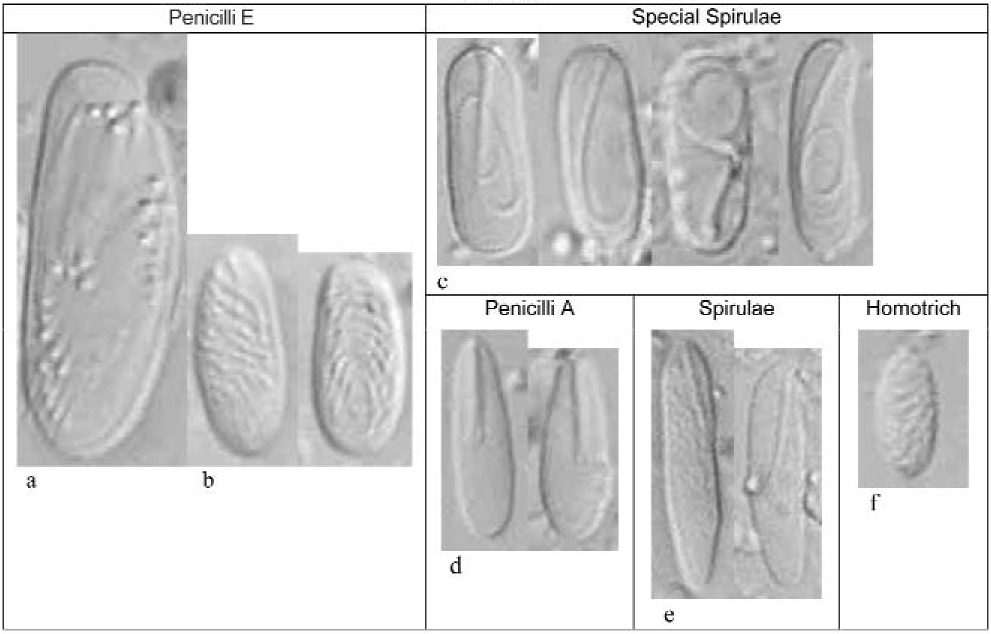
COLUMN



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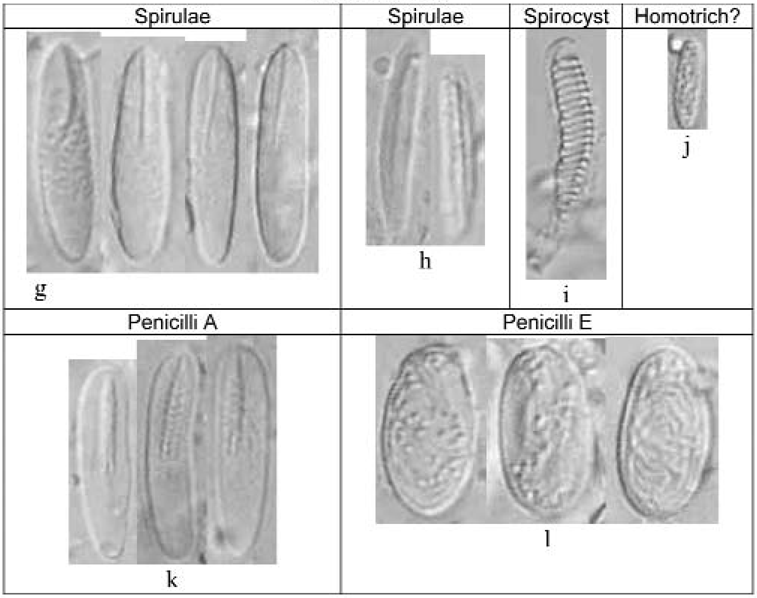

Figure 1. Cnidom of *Gerardia macaronesica*. The letters refer to those in Table I.

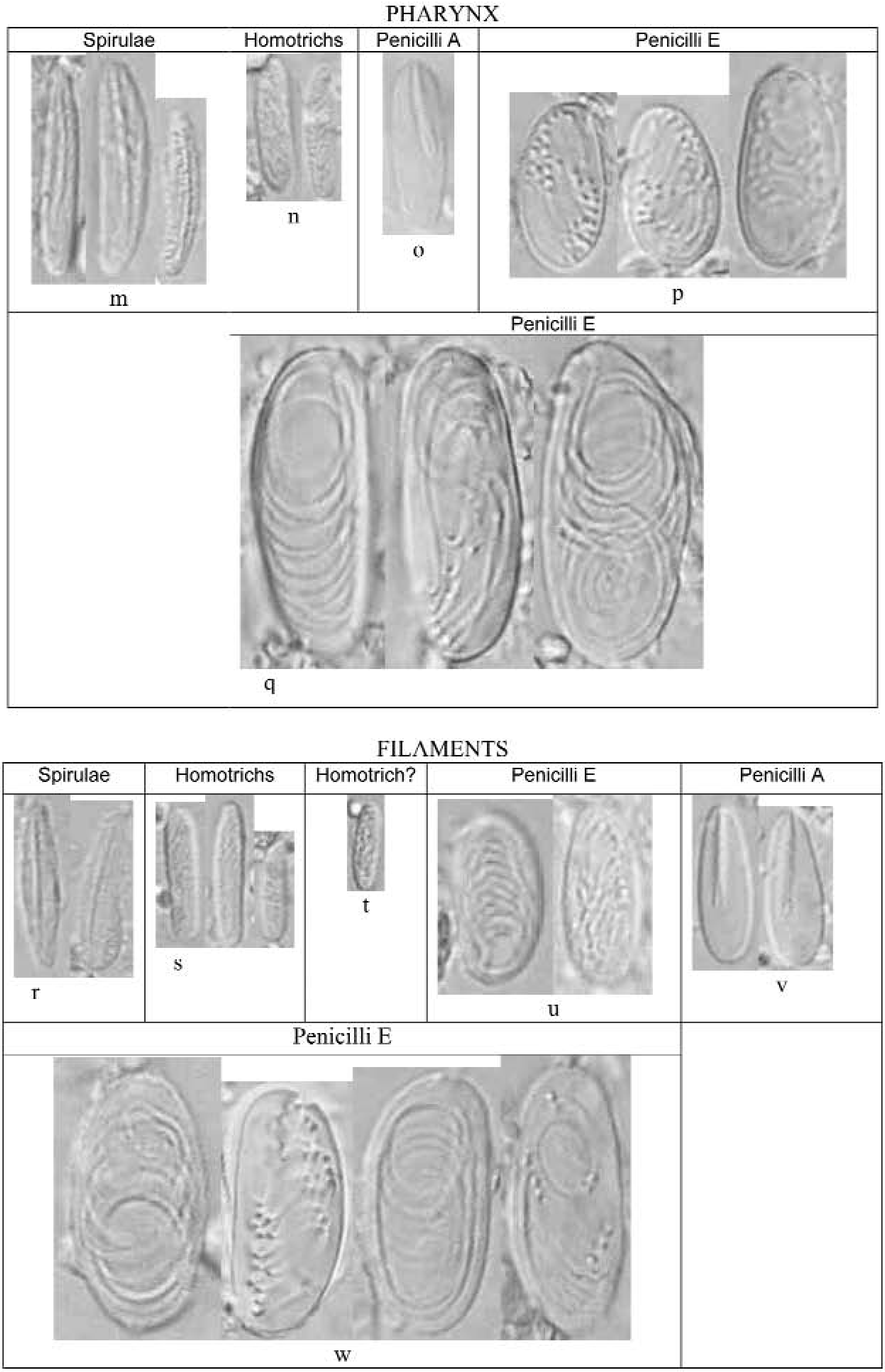

Figure 1. Continued.

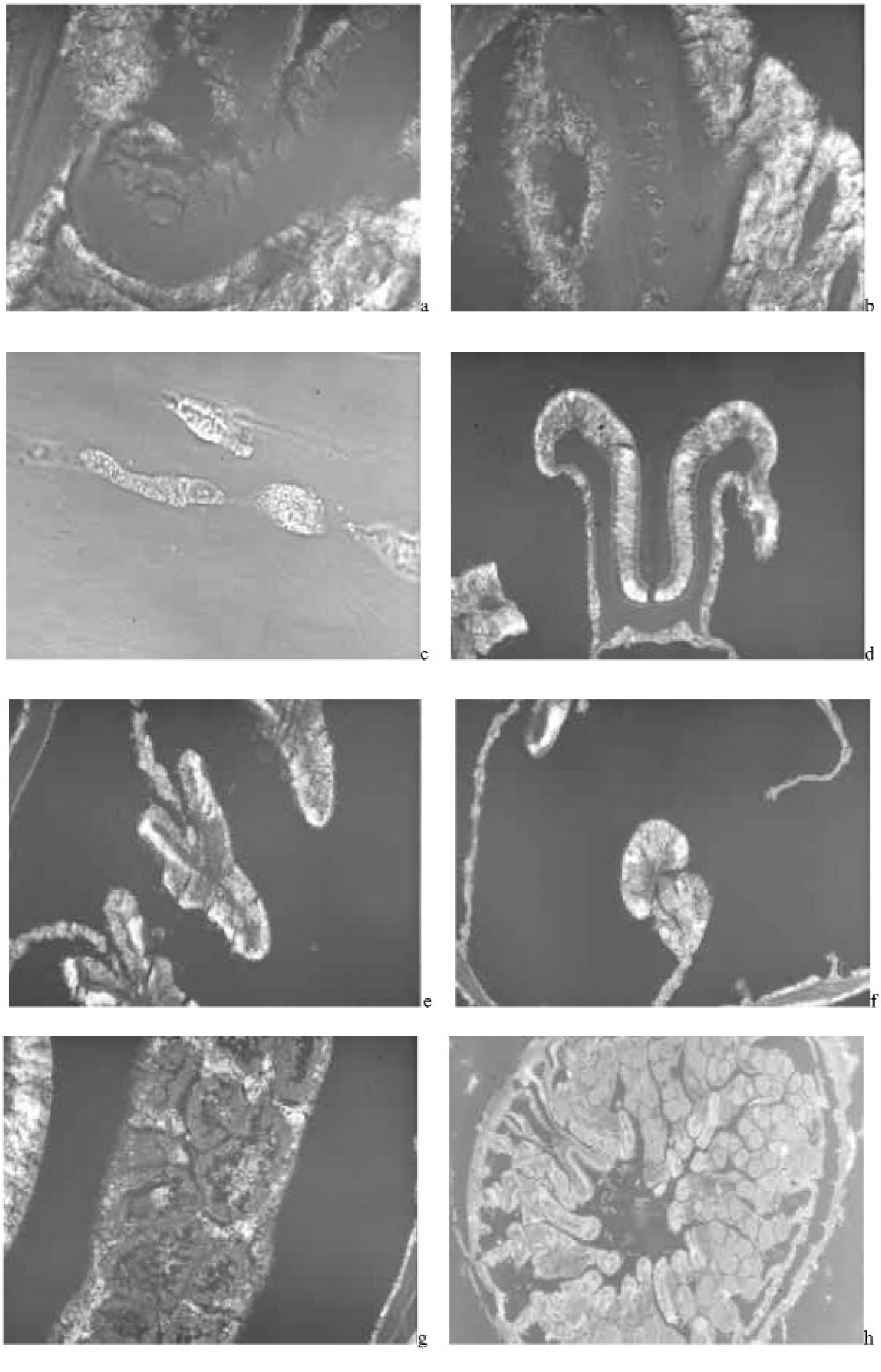

Figure 2. Histology and microanatomy of *Gerardia macaronesica*: **a**, sphincter; **b**, detail of the mesogloeal portion of the sphincter; **c**, mesogloeal lacunae; **d**, siphonoglyph; **e**, trilobulated filament; **f**, unilobulated filament; **g**, spermatogonium; **h**, ovule.

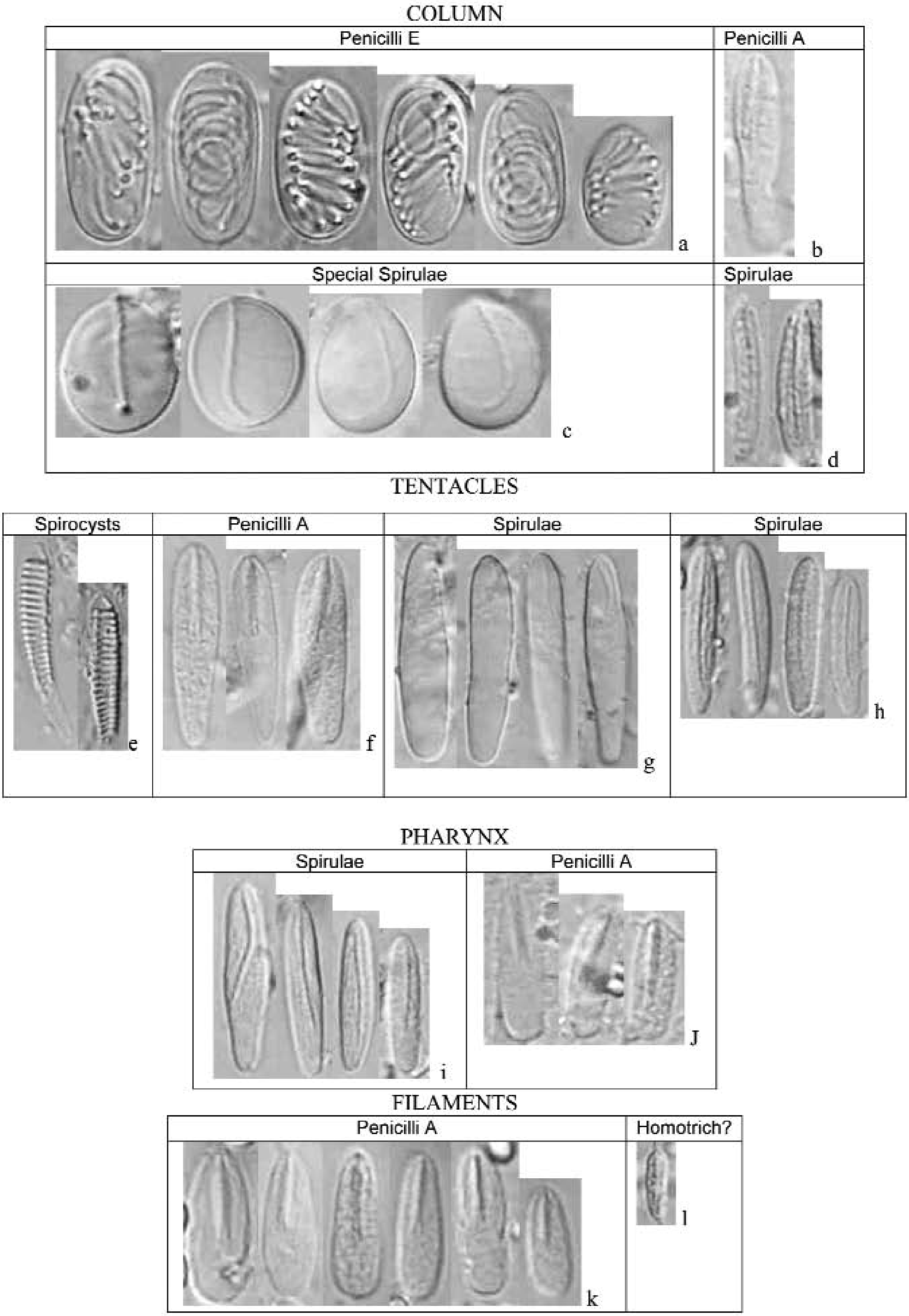

Figure 3. Cnidom of *Gerardia savaglia*. The letters refer to those in Table II.

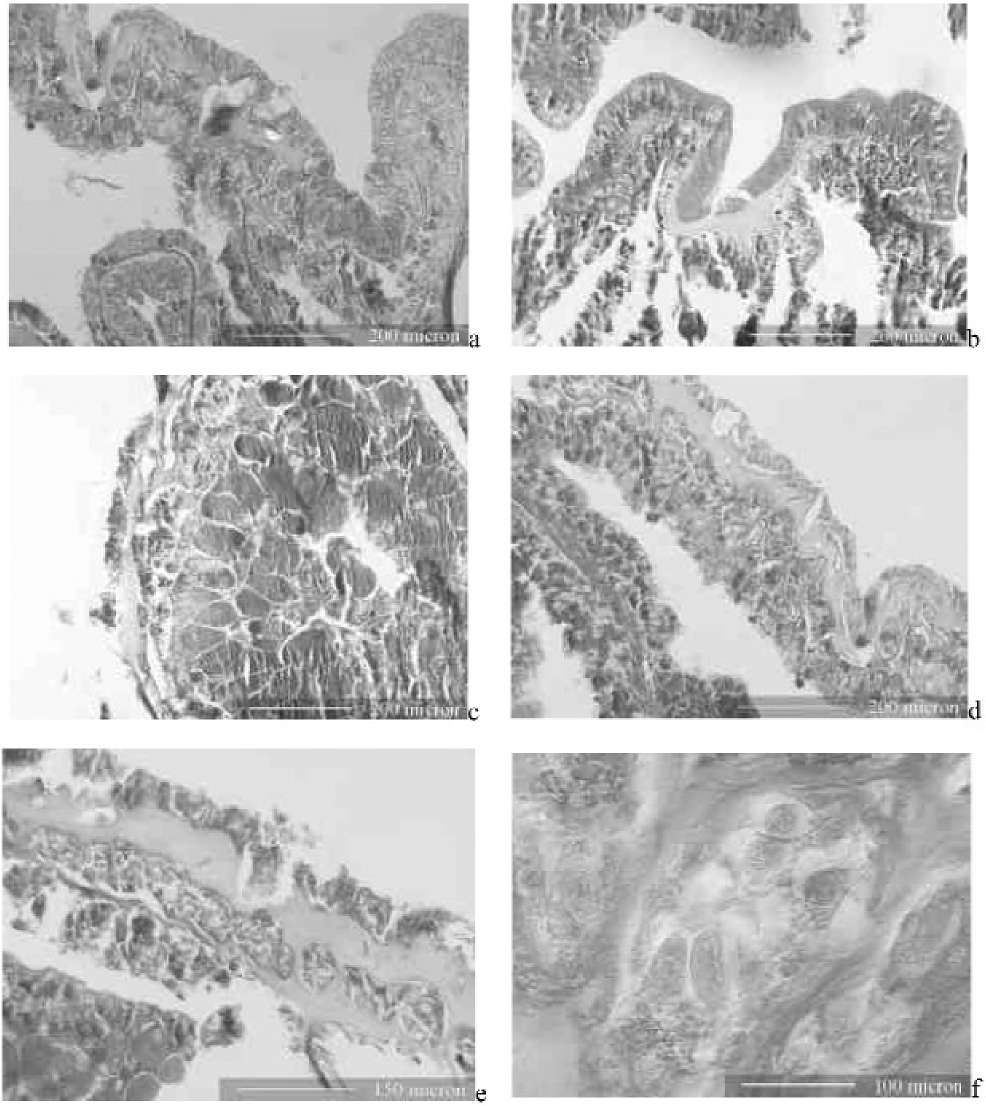

Figure 4. Histology and microanatomy of *Gerardia savaglia*: **a**, sphincter; **b**, pharynx and siphonoglyph; **c**, ovule; **d**, lacunae system of the body wall; **e**, lacunae system of the body wall and detritus holes; **f**, homotrichs in the lacunae system.

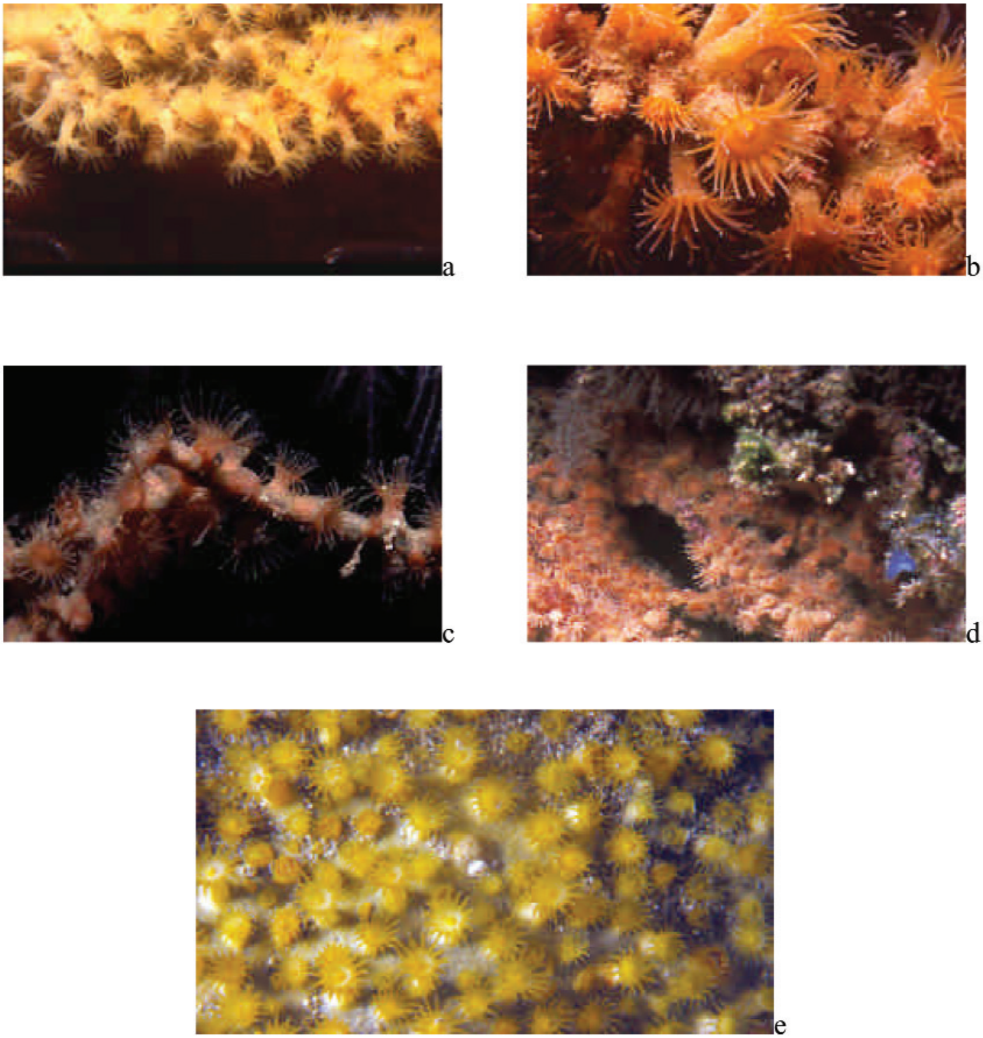

Figure 5. Polyps morphology and coloration of *Gerardia macaronesica*: **a**, detail of a colony from Gran Canaria (El Cabrón); **b**, detail of a colony from Canaries; **c**, detail of a colony from Cape Verde; **d**, detail of a colony from Cape Verde (Tarrafal); **e**, detail of the basal plate of a colony growing on its own skeleton from Gran Canaria (El Cabrón).