VIERAEA	**Vol. 33**	477-494	Santa Cruz de Tenerife, diciembre 2005	ISSN 0210-945X

The genus *Actinia* in the Macaronesian archipelagos: a general perspective of the genus focussed on the North-oriental Atlantic and the Mediterranean species (Actiniaria: Actiniidae)

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OCAÑA, O., A. BRITO & G. GONZÁLEZ (2005). El género *Actinia* en los archipiélagos macaronésicos: una perspectiva general del género centrada en las especies del Atlántico Nororiental y el Mediterráneo (Actiniaria: Actiniidae). *VIERAEA* 33: 477-494.

RESUMEN: En los Archipiélagos macaronésicos se han citado cuatro especies pertenecientes al género *Actinia* (Ocaña, 1994; Monteiro *et al*., 1997): *A. virgata*, *A. nigropunctata*, *A. sali* y *A. schmidti*. La presencia de especies endémicas en Canarias y Madeira pone de manifiesto la importancia de dichas islas en la especiación de este género (den Hartog & Ocaña, 2003). *A. virgata*, descrita por Jonson en 1861 de Madeira, es redescrita en este trabajo, además se discute su relación taxonómica con *A. striata* considerada endémica del Mar Mediterráneo. Confirmamos la validez de *A. schmidti* Monteiro, Solé-Cava & Thorpe, 1997, especie cuya descripción se basó en evidencias genéticas. De la misma manera, *A. sali* Monteiro, Solé-Cava & Thorpe, 1997, también basada en caracteres genéticos, se discute y compara con otros taxones cercanos. De acuerdo con los estudios moleculares realizados por otros autores (Schama *et al.*, 2005), existen dos grupos de especies bien definidos pertenecientes al género *Actinia*, que también pueden ser reconocidos en base a caracteres morfológicos. Por ultimo, llamamos la atención sobre la importancia de combinar caracteres morfológicos y genéticos a la hora de entender bien la compleja taxonomía del genero *Actinia*.
Palabras claves: Macaronesia, *Actinia*, endemismo, cnidoma, morfología, sistemática.

ABSTRACT: Four different species belonging to the genus *Actinia* have been recorded in the Macaronesian sea waters (Ocaña, 1994; Monteiro *et al*., 1997): *A. virgata*, *A. nigropunctata*, *A. sali* y *A. schmidti*. The presence of some endemic taxa of the genus *Actinia* from Madeira and the Canary Islands finds out the importance of these Islands in the recent radiation of the genus (den Hartog & Ocaña, 2003). The poorly known *A. virgata* is redescribed, since Johnson made it description in 1861, and it is discussed in relation to *A. striata* from the Mediterranean Sea. The validity of the species *A. schmidti* Monteiro, Solé-Cava & Thorpe,1997 based on genetic characters is confirmed, and *A. sali* Monteiro Solé-Cava & Thorpe,1997 is discussed on the base of the nematocysts. According to morphological items there are two groups of *Actinia* species, although it can be also understood on the base of genetic evidence (Schama *et al.*, 2005). We also remark the convenience of combine genetic and morphological characters for a better understanding of the complex taxonomy of the *Actinia* genus.
Key words: Macaronesia, *Actinia*, endemism, cnidom, morphology, systematic.

INTRODUCTION

The genus *Actinia* is one of the most difficult genera for taxonomists focused on soft body hexacorals. As a constant, the species of *Actinia* present similar anatomical and histological characters, being the cnidom one of the main characteristics to distinguish the species of this genus (den Hartog & Ocaña, 2003). The genetic has also contributed remarkably to help the *Actinia* taxonomy and also to a better understanding of its systematic (Carter & Thorpe, 1979; Carter & Thorpe, 1981; Monteiro *et al*., 1997; Schama *et al.*, 2005). Regarding the common occurrence in the species of the genus *Actinia* of different colour varieties, several reproduction pathways and the habitat adaptations, we are aware that the opinions about this genus are subject to constant changes, unless a wide revision will be done. Certainly, cooperation between zoologist and geneticists working from two different starting points is necessary and desirable in order to a better knowledge of the differences between the species and populations of this difficult genus *Actinia*.

In Macaronesian waters there are four species belonging to *Actinia*, three of them should be considered endemism of the region: *A. nigropunctata* (Canary Islands and Madeira), *A. virgata* (Madeira) and *A. sali* (Cape Verde Islands). This is a considerable radiation of this genus attending to the short territory available. A plausible explication for such a phenomenon may be that the genetic isolation supported the speciation during the Pleistocene period (den Hartog & Ocaña, 2003; Brito & Ocaña, 2004) in some Macaronesian Islands. The absence of these species from the Azores (Wirtz *et al*., 2003) and the Morocco littoral (Ocaña, pers. obser.) supports the hypothesis.

We confirm the genetic evidence found out by Schama *et al*., 2005. We also find two different groups of *Actinia* species, but mainly on the base of the morphology of the homotrichs from the acrorhagi. Morphologically, both groups show two main differences concerning to the cnidom morphology: Group I presents homotrichs with

the tube arranged spirally all along and also p-mastigophores B1 in the filaments (see fig. 6); Group II presents homotrichs with the tube arranged spirally partially and absence of p-mastigophores B1 in the filaments.

MATERIAL AND METHODS

The material studied in the present work was mainly collected by intertidal and SCUBA diving sampling trips within the CANCAP expedition (Rijksmuseum Van Natuurlijke Historie of Leiden 1976-1986) (van der Land, 1987) and also the BENTHOS Project (Universidad de La Laguna 1980-1985). After those expeditions several scientific projects along the Canary Islands (FARMAMAR Expedition, 1990) and Madeira Archipelagos headed by La Laguna University and Museu Municipal do Funchal (1985-1994) have extended the collecting efforts in the area. The studied sites are located by UTM designations or geographic coordinates. Some material is deposited in the Nationaal Natuurhistorisch Museum, Leiden, The Netherlands (RMNH); Departamento de Zoología de la Universidad de La Laguna, Tenerife, Spain (DZUL, as DZ AA-); and the collection of the Museo del Mar de Ceuta (FMM-BM-AA-).

The specimens were anaesthetized with menthol crystals and preserved in 8% formalin. The general morphology and anatomy were studied by means of a stereo dissecting microscope. The anatomical and histological details were studied following the Ramon y Cajal method for topographic staining (Gabe, 1968). Histology and nematocysts were examined and studied with a light microscope equipped with Nomarski differencial interference contrast optic system, although we include some images taken without the interference contrast optic system. Permanent slides cnidom were prepared using glycering gel, the same technique prepared for meiofauna (Ocaña, 1994). The used classification and terminology of nematocysts is essentially after Schmidt (1972, 1974), as adapted by den Hartog (1980), den Hartog *et al*. (1993) and by the present authors. The surveys of the cnidom are summarized in tables in which the means and ranges of length and width of nematocysts are included. Although the frequencies given are subjective impressions based on squash preparations, they do at least give some idea of the absolute and relative abundance of the types.

RESSULTS AND DISCUSSION

Actinia schmidti, Monteiro, Solé-Cava & Thorpe, 1997
(figs. 1 and 7a-d)

Actinia schmidti Monteiro, Solé-Cava & Thorpe, 1997: 432; just a very brief description, incomplete synonymous list. No Type material deposited with numbers.

Actinia equina mediterranea Schmidt, 1971:162-8; species comparative table and discussion; Schmidt, 1972: 63-7, description, ecology, cnidom, Mediterranean, Canary Islands and Madeira.

Actinia equina mediterranea; Ocaña, 1994:67-74, Anexo A/1, B/1-3, C/VI figs. 4 & 5, description, ecology, biological notes and discussion, Morocco, Ceuta, Cabo de Gata, Mar Menor, Islas Medas, Banyuls, Marsella, Naples, Adriatic sea, Canary Island and Madeira.

Material examined.- Tenerife: (FMM-BM-AA-6) El Tecorón, Los Silos, Mayo 2005, 1 specimen, G. González leg., intertidal, red colour. Gran Canaria: (DZ AA-3) Playa del Agujero, Gáldar, 9.x.1983, DS353152, 3 specimens, A. Brito leg., without gonads, intertidal, red colour. Fuerteventura: (DZ AA-2) Morrojable, Pájara, 14.iv.1981, ES635026, 5 specimens, A. Brito leg., gonads were present, intertidal, red colour; (DZ AA-1) Morrojable, Pájara, 23.ix.1982, ES635026, 1 specimen, A. Brito leg., in intertidal caves and crevices, small specimens inside, feeding on arthropoda, red colour; (DZ AA-110) Caleta del Cotillo, La Oliva, 26.vi.1994, ES966732, 1 specimen, O. Ocaña leg., 1 meter deep on stony bottom, red colour.; (DZ AA-111) Pozo Negro Bay, Antigua, 30.vi.1994, FS090335, O. Ocaña leg., shallow waters on stony bottom, red colour; (FMM-BM-AA-5) Playa del Valle, 9. viii. 2002, 1 specimen, O. Ocaña leg., intertidal, on upper littoral crevice. Other specimens were observed in different localities as: Gran Tarajal, Tuineje, 16.iv.1981, several specimens, on stones upper littoral; Majanicho, La Oliva, 18.ix.1982, intertidal, several specimens, in crevices and under stones; Ajuy beach, Pájara, 19.ix.1982, intertidal pools, several specimens; Morros Negros, Istmo de la Pared, Pájara, 20.ix.1982, several specimens, brown colour, intertidal crevices. Lanzarote: (DZ AA-5) El Risco beach, El Río, Haría, 10.viii.1990, FT459318, 1 specimen, O. Ocaña leg., intertidal, light exposed, red colour. Alegranza: (DZ AA-5) 30.iii.1983, 1 specimen, F. Capdevila leg., shallow waters. Portugal: Madeira: (DZ AA-6) Punta da Cruz, Funchal, 5.ix.1991, CB180119, 1 specimen, O. Ocaña leg., intertidal, on stone in small bay, green colour. Azores: (FMM-BM-AA-3) Sao Caetano (Porto da Prainha), Pico, 2.viii.2003, 4 specimens, O. Ocaña leg., intertidal, on crevice from vertical wall, green colour, with juveniles inside; (FMM-BM-AA-4) Ponta dos Capelinhos, Fayal, 29.vii.2003, 3 specimens, O. Ocaña leg., intertidal, on crevices from vertical wall, green and brown colour. Sesimbra (Portugal continental coast), (FMM-BM-AA-12), 38º26'N9º05'W, 13 specimens, 25.x.2002, O. Ocaña leg., intertidal in crevices, green, red, brown and orange colours, with juveniles inside.

Other material examined.- Ceuta, North Africa, The Mediterranean: (DZ AA-8) Punta de la Mala Pasada, 4.i.1990, 2 specimens, O. Ocaña leg., Upper intertidal, on walls, red colour. Torres de Alcalá, Morocco, The Mediterranean: (FMM-BM-AA-7) Cala Iris, 10.vi.2000, 4 specimens, O. Ocaña leg., upper littoral on boulder, red colour.

Material other species examined.- *Actinia sali*: Santiago Islands, Cape Verde Islands: (FMM-BM-AA-8) Tarrafal, 15.viii, 2002, 8 specimens, O. Ocaña leg., intertidal among "trotoir" crevices, red colour, juveniles inside.

Actinia tenebrosa: (NZOI Stn Z8864) (lot 73) Paratutai Island, Whatipu, Auckland West Coast (New Zealand), 9.viii.1996, 12 specimens, 37"03'S 174°31'E, O. Ocaña leg, intertidal; (NZOI Stn Z8866) (lot 108) Leigh Harbour (New Zealand), 13.viii.1996, 15 specimens, 36°17'S 174°49'E, O. Ocaña leg., intertidal; (NZOI Stn Z8860) Piha-Lion rock, Auckland West Coast (New Zealand), 7.viii.1996, 7 specimens, O. Ocaña leg., on rocks and also under stones, from upper to mesolittoral, red colour.

Diagnosis (for a detailed description, see Schmidt, 1972).- Medium sized sea-anemone, 0.8-2.5 cm long and 2 to 4 cm broad. Rounded-elliptical; very adherent basal

disc which presents a well-developed limbus. Short and tender-like scapus with pronounced parapet, 15-48 rounded or reniform acrorhagi inside. The tentacles are entacmeic, they are arranged as 6+6+12+24. The first and second cycles of mesenteries are complete, the 3rd has well-developed macrocnemes and the last one has mainly microcnemes, but also some macrocnemes. Pharynx with many folds and two pronounced siphonoglyphs with aboral reticulate projections.

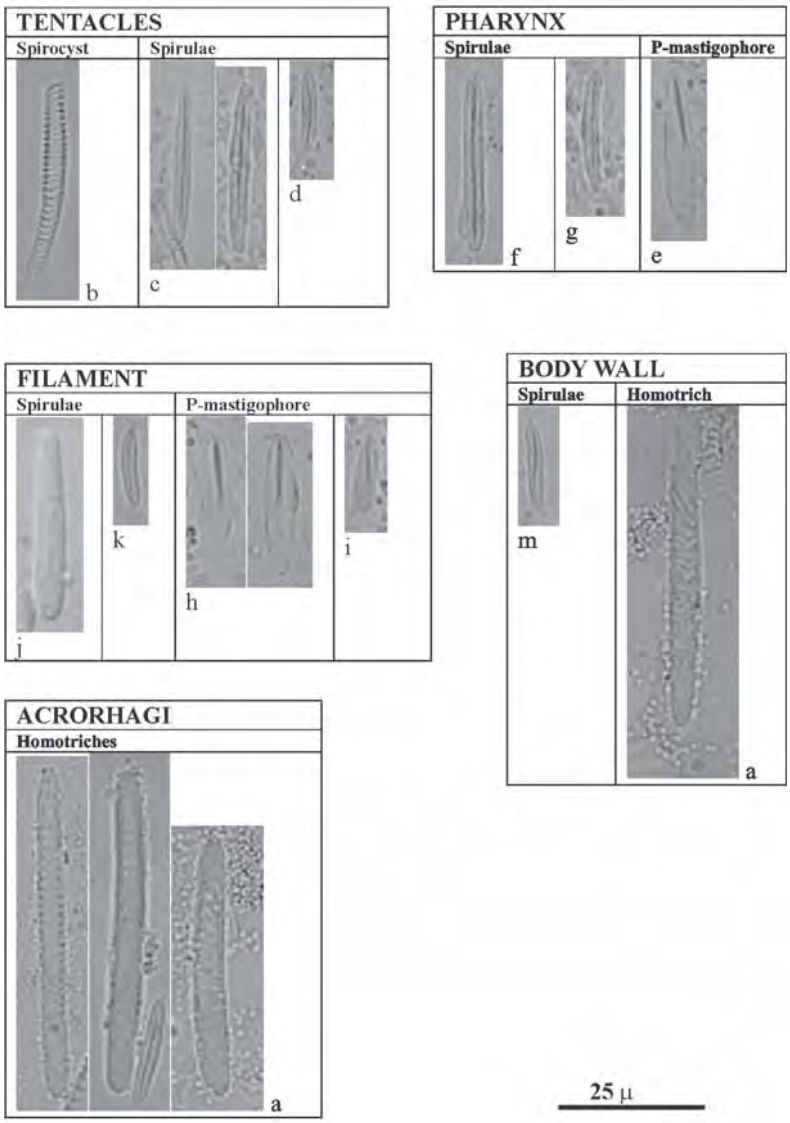

Figure. 1. Cnidome of *Actinia schmidti*. The letters refer to those in Tables I and II.

Table I. Survey of the cnidom of *Actinia schmidti* DZ AA-2

TISSUE		TYPE	LENGTH	WIDTH	Nº	ABUNDANCE
Acrorhagi	a	Homotrichs	49,7 (42,2-56,6)	4,3 (3,9-4,4)	10	Very common
Tentacles	b	Spirocysts	26,6 (16,7-33,3)	2,8 (2-3,3)	5	Very common
	c	Spirulae	21,7 (18,9-24,4)	2,6 (2-3,1)	15	Very common
	d	Spirulae	14,4	2,1 (1,8-2,2)	2	Sporadic
Pharynx	e	P-mastigophores	21,7 (21,1-22,2)	4,4	2	Sporadic
	f	Spirulae	26 (20-28,9)	2,9 (2,6-3,3)	11	Common
	g	Spirulae	13,9 (12,2-16,7)	2,3 (2,2-2,8)	10	Uncommon
Filament	h	P-mastigophores	21,5 (20-25,5)	4,1 (3,7-4,4)	11	Very common
	i	P-mastigophores B1	13,1 (12,2-14,4)	3,2 (2,2-3,9)	12	Common
	j	Spirulae	26,1 (25,5-26,6)	4,2 (3,9-4,4)	5	Uncommon
	k	Spirulae	14,1 (12,2-15,5)	2,3 (2-2,8)	8	Common
Body wall	m	Spirulae	16,5 (14,4-18,9)	2,1 (1,7-2,2)	12	Common
	a	Homotrichs	46,6 (35,5-51,1)	4,6 (4,2-5,5)	4	Uncommon
		Spirocysts				Presence

Table II. Survey of the cnidom of *Actinia schmidti* DZ A A-8

TISSUE		TYPE	LENGTH	WIDTH	Nº	ABUNDANCE
Acrorhagi	a	Homotrichs	62,4 (58,8-68,8)	4,1 (3,3-4,4)	10	Very common
Tentacles	b	Spirocysts	23,9 (16,7-33,3)	2,3 (1,7-3,1)	4	Very common
	c	Spirulae	26,1 (22,2-28,9)	2,4 (2-2,8)	12	Very common
	d	Spirulae	15,5	1,9 (1,7-2)	2	Sporadic
Pharynx	f	Spirulae	29 (26,6-32,2)	2,8 (2,2-3,1)	8	Common
	g	Spirulae	16,5 (14,4-20)	2,1 (1,7-2,2)	9	Common
Filament	h	P-mastigophores	23,3 (20-26,6)	4,7 (4,2-5,3)	10	Very common
	i	P-mastigophores B1	15 (12,2-18,9)	3,6 (3,1-4,2)	8	Common
	k	Spirulae	15 (13,3-17,8)	2,2 (1,7-2,8)	10	Common
	j	Spirulae	27,4 (24,4-28,9)	4,1 (3,7-4,4)	10	Common
		Spirulae	20,9 (18,9-22,2)	2,3 (2,2-2,8)	5	Uncommon
Body wall	m	Spirulae	16,3 (14,4-18,9)	2,1 (1,7-2,2)	15	Very common
	a	Homotrichs	53,9 (50-57,7)	4,2	2	Sporadic

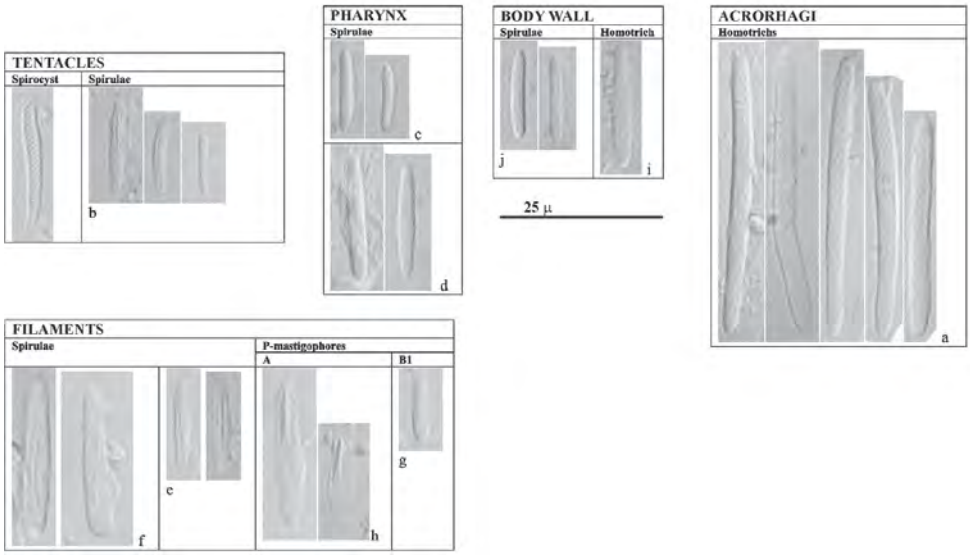

Figure. 2. Cnidom of *Actinia sali*. The letters refer to those in Table III.

Strong diffuse endodermical sphincter. Longitudinal muscles of the tentacles well-developed. Strong retractor muscles, reniform to diffuse. Parietobasilar muscle projecting detached pennon as free flaps. Basilar muscle with prominent ridges along both sides of the mesenteries (palm-like).

As expected in this species, we noticed the presence of p-mastigophores B1 in the filaments. All the studied specimens showed the characteristic homotrichs with the tube spirally arranged in their acrorhagi (fig. 1).

Remarks.- Monteiro *et al.* (1997), on the base of biochemical characters, have moved the subspecies *Actinia equina mediterranea* Schmidt, 1971 to a new species named *A. schmidti*. Although the constant presence of p-mastigophores B-1 in the mesenterial filaments and the morphological character of the homotrichs of *A. e. mediterranea* (tube arranged spirally all along, different from any other species in the area) and their measurements, specially the width of the capsules, as other slight cnidom differences are quite enough to separate this species from any other species of *Actinia* recorded in the North-eastern Atlantic and the Mediterranean. The work of Monteiro *et al.* (1997) has asserted remarkably what we have been thinking for the last years. As a matter of fact, there are difficulties to find morphological differences to separate species of *Actinia* genus, so we think that this biochemical character can be both a potential tool and other useful descriptor for the Actiniaria taxonomy. Although we agree with the species *A. schmidti* proposed by those authors it would had been desirable that the authors followed the taxonomical roles (accurate descriptions, type material deposited with collection numbers ...). Nevertheless, the Schmidt's description, together with the data showed in this paper, is enough to support taxonomically the new species.

According to Solé-Cava and Thorpe (1992), the sea anemones (Actiniaria) present a high level of genetic variation between geographically close populations and also

Table III. Survey of the cnidom of *Actinia sali* FMM-BM-AA-2

TISSUE		TYPE	LENGTH	WIDTH	Nº	ABUNDANCE
Acrorhagi	a	Homotrichs	54 (42-62)	4,1 (3,5-5)	15	Very common
Tentacles	b	Spirulae	16 (12-18)	2,5 (1,2-3,2)	10	Very common
Pharynx	c	Spirulae	15,8 (12-18)	1,9 (1,6-2)	10	Common
	d	Spirulae	22,2 (20-24)	3,1 (2,8-3,6)	10	Common
Filament	e	Spirulae	16,2 (14-18)	2,7 (2,4-2,8)	10	Common
	f	Spirulae	26,2 (22-30)	4,2 (3,2-4)	15	Common
	g	P-mastigophores	12,4 (12-12,8)	3 (2,8-3,2)	5	Rather common
	h	P-mastigophores	22,5 (18-26)	4,9 (3,2-6)	10	Very common

between sympatric populations of the same species, so genetically it would be quite difficult to define species of *Actinia*. Fortunately, in spite of the great genetic variability referred by those authors, the distinctive morphological characters of *Actinia* species remain constant through distant population, as it occurs to *A. schmidti* (=*A. e. mediterranea*) from the Mediterranean, Sahara coast, Madeira and Canary Islands.

Although Solé-Cava and Thorpe (1992) have found out significant genetic differences in *A. equina* colour races from British shores to recognize them as different species (as the case of *Actinia prasina*), Monteiro *et al*. (1997) assume that there are some contradictories data that amazingly link the green and orange morphs of *A.equina* from British shores. Furthermore, as we already knew about *A. schmidti* (=*A. e. mediterranea*) (Schmidt, 1971; Ocaña pers. obs.) and also about *Actinia nigropunctata* (den Hartog & Ocaña, 2003), the colour variation does not have to correspond necessarily with different species of *Actinia* genus.

Actinia sali, (see Monteiro *et al.*, 1997) present morphological characters (see Table III and Fig. 2) close to *A. schmidti*, however the genetic analysis remark the differences between these species (see Schama *et al.*, 2005). Both species belong to the same group of the genus *Actinia* (Group I: tube arranged spirally all along and presence of p-mastigophores B-1 in the filaments –see Fig. 6–), being the main morphological character to distinguish both species the absence of larger spirulae (=b-mastigophore) in the tentacles of *A. sali*. The occasional absence of acrorhagi in specimens of *A. sali* (Ocaña, 1994), and the viviparous pathway found also for us (Ocaña, 1994; see Table III) as well as Monteiro *et al.* (1997), may be achieved as additional taxonomical characters.

Sensu Schmidt (1972) there are two Mediterranean forms of *A. equina mediterranea*, *A. equina mediterranea* form I and *A. equina mediterranea* form II; both are here recognized as morphological variation of the species *A. schmidti* (see Monteiro *et al.*, 1997). According to Schmidt (1972) there are several morphological and biological characteristics in order to maintain them as two different taxa. Form I is oviparous, normally big and it occurs on rather shaded places, from 0 down to 1 meter depth, while form II is small, flat and only occurs in the upper littoral on rocks and in exposed pools; this form is exclusively viviparous.

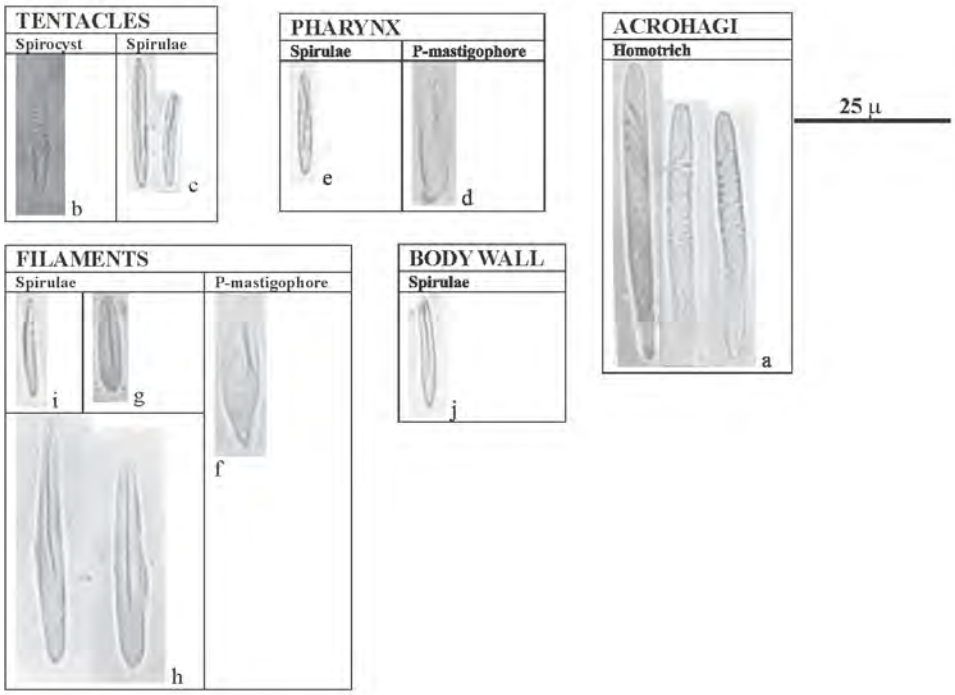

Figure. 3. Cnidom of *Actinia virgata*. The letters refer to those in Table IV.

In the Central Macaronesian, Canary Islands and Madeira, we only have recorded *A. equina mediterranea* form I (*A. schmidti*). This taxon is very rare and, indeed, is not widespread in the archipelagos (see material examined). In Madeira we were able to collect only one specimen; apparently it is more common in Lanzarote, and especially in Fuerteventura. This is the nearest Island to the North-African coast and perhaps this explains, in part, the abundance of this taxon at that Island. We also recorded *A. equina mediterranea* (=*A. schmidti*) in Azores and along the Atlantic Moroccan coast (Ocaña, pers. obser.).

Actinia virgata Johnson, 1861
(figs. 3, 4 and 7 i)

Actinia virgata Johnson, 1861: 301-302, brief external description, habitat and reproduction pathway, Madeira. Tur, 1989: 53, synonym with *A. striata*.

Actinia equina virgata Comb. nov. Ocaña, 1994: 75-82, Anexo A/2, B/4-6, C/VI figs. 6-9, description, ecology, biological notes and discussion, Canary Island and Madeira.

Material.- RMNH 24995, Madeira, Seixal, 9.ix.1991, CB037335, 10 m, O.Ocaña leg., 1 specimen, under stone on stony bottom, reddish to blue colour with vertical stripes, colour picture.

Other studied material.- *Actinia striata*: (DZ AA-90) Caños de Meca (Cádiz-Spain), 3-1990, P.J. López leg., 1 specimen, infralittoral, 8 juveniles inside of coelenteron; (FMM-BM-AA-11) French Mediterranean (France), 7-1990, J.C. den Hartog leg., 2 specimens, infralittoral 2 m depth; (FMM-BM-AA-9) El Quemado beach, Al-Hoceima (Morocco), 11.vi.2000, O.Ocaña leg., 1 specimens, under stones on stony bottom, 2 m depth, whitish column with fine reddish stripes; (FMM-BM-AA-10) Cala Iris, Morocco, 29.ix.2001, O.Ocaña leg., 3 specimens, under stones, on shallow waters from 1 to 2 m depth, reddish column with fine pinkish stripes. *Actinia cari*: 83-624 (Museu de Zoologia/Barcelona), 1 specimen, Catalonian coast; Dugi Otok island, Adriatic Sea, 44º03'04''N 14º59'00''E, 19.i.2000, P. Kruzic leg., 2 specimens, 0.5 meters, under stones. *Actinia fragacea*: Morocco, (FMM-BM-AA-13) Sidi Rahal (South of Casablanca), 29.vii.2000, 3 specimens, O. Ocaña leg., in intertidal crevices and holds, plateaus colonized by numerous algae, big specimens with red colour and green spots; (FMM-BM-AA-14) Sidi Abad (South El Jadida-Hotel El Repos beach), 30.vii.2000, 7 specimens, O. Ocaña leg., in crevices among *Sabellaria alveolata* in large plateau zones mainly colonized by red algae, red colour and green spots; (FMM-BM-AA-15) Bhiha beach, North Essauira, 30.vii.2000, 5 specimens, O. Ocaña leg., in pools crevice, large intertidal plateaus, red colour and green spots; (FMM-BM-AA-16) Sidi Ifni beach, 1.viii.2000, 3 specimens, O.Ocaña leg., in small crevices and also understones, sometimes partially buried, red colour and green spots; (FMM-BM-AA-17) Sidi M'gahi, (Asilah), 17.vi.2000, 4 specimens, O. Ocaña leg., in crevices among *Sabellaria alveolata*, red colour and green spots; (FMM-BM-AA-18) Punta Siri (Tetuan), 11.ii.2001, 2 specimens, O. Ocaña leg., understones in shallow waters (1-2 m depth), red colour and green spots.

Table IV. Survey of the cnidom of *Actinia virgata* RMNH 24995

TISSUE		TYPE	LENGTH	WIDTH	Nº	ABUNDANCE
Acrorhagi	a	Homotrichs	44,8 (40-50)	3,7 (3,3-4,4)	10	Very common
		Spirocysts				Presence
Tentacles	b	Spirocysts	22,2 (12,2-27,8)	3 (2,2-3,3)	4	Very common
	c	Spirulae	19,7 (14,4-23,3)	2,1 (2-2,2)	12	Very common
Pharynx	d	P-mastigophores	22,2	3,3	1	Sporadic
	e	Spirulae	16,5 (14,4-21,1)	2,1 (1,7-2,2)	10	Common
		Spirocysts				Presence
Filament	f	P-mastigophores	19,2 (16,7-22,2)	4,4 (3,3-5,6)	10	Common
	g	Spirulae	15,3 (14,4-18,9)	3,8 (3,3-4,4)	10	Common
	h	Spirulae	36,6 (27,8-37,5)	4,3 (3,9-4,4)	10	Common
	i	Spirulae	14,7 (13,3-15,5)	1,8(1,7-2)	10	Common
Body wall	j	Spirulae	17,9 (13,3-18,9)	2,1 (1,7-2,2)	11	Common
		Spirocysts				Presence

Description.- Small to medium sized sea anemone, 0.7 to 2 cm long and 0.7 to 1.5 cm broad in fixed material. The base is circular with a well-developed limbus. Very short conical and tender column with pronounced parapet with 10 to 20 rounded acrorhagi inside. The disc is wide, in the centre it can develop a conspicuous hypostome. Rather short, pointed, and very sticky tentacles. There are, at least, 5 cycles of tentacles 6+6+12+24+48=96, the last cycle being incomplete. Tentacles are entacmeic, however big tentacles, as those from the first cycles, can be present in the last cycles.

The column exhibits an indigo-red colour with wide black strips, tentacles and disc are dark brown; the acrorhagi have an indigo-red colour.

There are 4 cycles of mesenteries arranged as, 6+6+12+24=48. The first and second cycles are complete, the 3rd consists of macrocnemes, and the last one has poorly developed macrocnemes and mainly microcnemes. Large and hyperfolded pharynx (75% or more of which is folded) with two well-developed siphonoglyphs.

The column ectoderm presents two different glandular cells and it shows a brush border-like morphology. In the pedal disc the brush border-like is more conspicuous, a slight periderm observed.

The mesogloea of the column has a fibrillose structure and doesn't show main thicker zones, the cellular density is low, the lacunae are common and they hardly have any content. The mesogloea of trilobulated filaments shows a high cellular density.

Well-developed folding endoderm along the column, with great number of mucous cells. Zooxanthellae were not noticed.

In the pharynx there are furrows with wide mesogloea projections, the ectoderm is glandular-like and it presents few nematocysts. There are two siphonoglyphs with aboral reticulate projections.

Table V. Survey of the cnidom of *Actinia striata* FMM-BM-AA-1

TISSUE		TYPE	LENGTH	WIDTH	Nº	ABUNDANCE
Acrorhagi	a	Homotrichs	53,4 (48-60)	3,8 (3,5-4)	15	Very common
Tentacles	b	Spirulae	22,6 (20-30)	2,4 (2-2,8)	20	Very common
	c	Homotrichs ?	18,9 (14-24)	3 (2,4-3,6)	10	Common
Pharynx	d	Spirulae	26,7 (24-30)	2,3 (2-3)	10	Common
	e	Spirulae	12,9 (10,5-16)	1,5 (1,5-1,6)	10	Common
	f	P-mastigophores	24	4	1	Uncommon
Filament	g	P-mastigophores	20,3 (16-24)	4 (3,6-5,6)	15	Very common
	h	Spirulae	29,8 (25-34)	3,7 (3,2-4,5)	15	Very common
	i	Spirulae	15,4 (14-18)	2,8 (2,4-3,2)	10	Common
	j	Spirulae	12,1 (10-16)	1,6 (1,2-2)	15	Very common
Body wall	l	Spirulae	20,4 (19,2-22)	2,3 (1,6-3,2)	10	Very common
	k	Spirulae	30	4	5	Rather common
	m	Spirulae	13,2	2,4	1	Rare

Circular muscle from column and base poorly developed. Diffuse endodermic sphincter. Tentacular longitudinal muscles generally well-developed, in the oral disc the ectodermical musculature is even a bit more developed than in the tentacles. Generally the retractor and parietobasilar muscles are weak and slightly developed, in perfect macrocnemes the retractor is diffuse while in the 3rd cycle the macrocnemes are restricted, more developed and more or less reniform. Parietobasilar muscles weak, only detached pennon as free flaps on some macrocnemes of the 3rd cycle. Basilar muscles distinct, visible as ridges along both sides of the mesenteries (palm-like).

Cnidom.- Spirocysts are very small, 1 category of homotrichs, 3 types of spirulae and only one type of p-mastigophores.

Homotrichs.- They are enlarged, elliptical, and very common capsules with the tube spirally arranged; this category occurs exclusively in the acrorhagi.

Spirulae.- There are three morphological main categories: 1) elliptical enlarged widespread along the tissues; 2) ovoid enlarged or short, exclusively from filaments; 3) elliptical wide, only present in the filaments.

P-mastigophores.- We only noticed type A. As far as we know this category is always present in the filaments of Actiniidae, and also in other families.

The relative abundance of the cnidom categories is presented in table IV.

Habitat.- The species has been exclusively recorded from the intertidal to shallow waters, down to 10 m depth. We found it in shaded places on stony intertidal plateaus but also under stones on stony bottoms. In all those places it can occur with *A. nigropunctata* and *Anemonia melanaster*.

We do not find any trace of brooding inside but viviparism can occur in this species (Johnson, 1861: 302).

Remarks.- Unfortunately there is no type material of *A. virgata*, it seems that Johnson (1861) neither designated type material nor deposited it in any Museum or Academic Institution. According to the ICZN (article 75), we are able to designate a Neotype of *A. virgata* in order to clarify the taxonomic status and others of this taxon (see 75.3 qualifying conditions of ICZN). However, attending to the scarce material available of this species we wait for further findings of such a taxon.

A. virgata has only been collected at Madeira Island, being recorded by Johnson in 1861. After him, we have only found it again at Madeira, although we were looking for it at the Canary Islands and other Macaronesian Archipelagos. This species has no p-mastigophores B1 but the homotrichs from the acrorhagi present their tubes arranged spirally but not all along (belong to Group II, see figs. 3 and 6), as expected for most of the species of this genus; however, we found a broad and rather unusual spirulae category in the filaments, not recorded by us in most species of *Actinia* before.

Actinia striata has longitudinal red stripes as a constant characteristic, having some resemblance with *A. virgata* which remarkably "always" shows conspicuous broad black stripes along the column (according to our material, some images from CANCAP, and the description of Johnson). However, the exclusive presence in Madeira of *A.virgata*, and some colour and cnidom characteristics differentiate the two species, moreover, the presence of conspicuous cinclides in the upper part of the column of *A. striata* (Tur, 1989) make this species quite different to *A. virgata*. Furthermore, *A. virgata* always has smaller

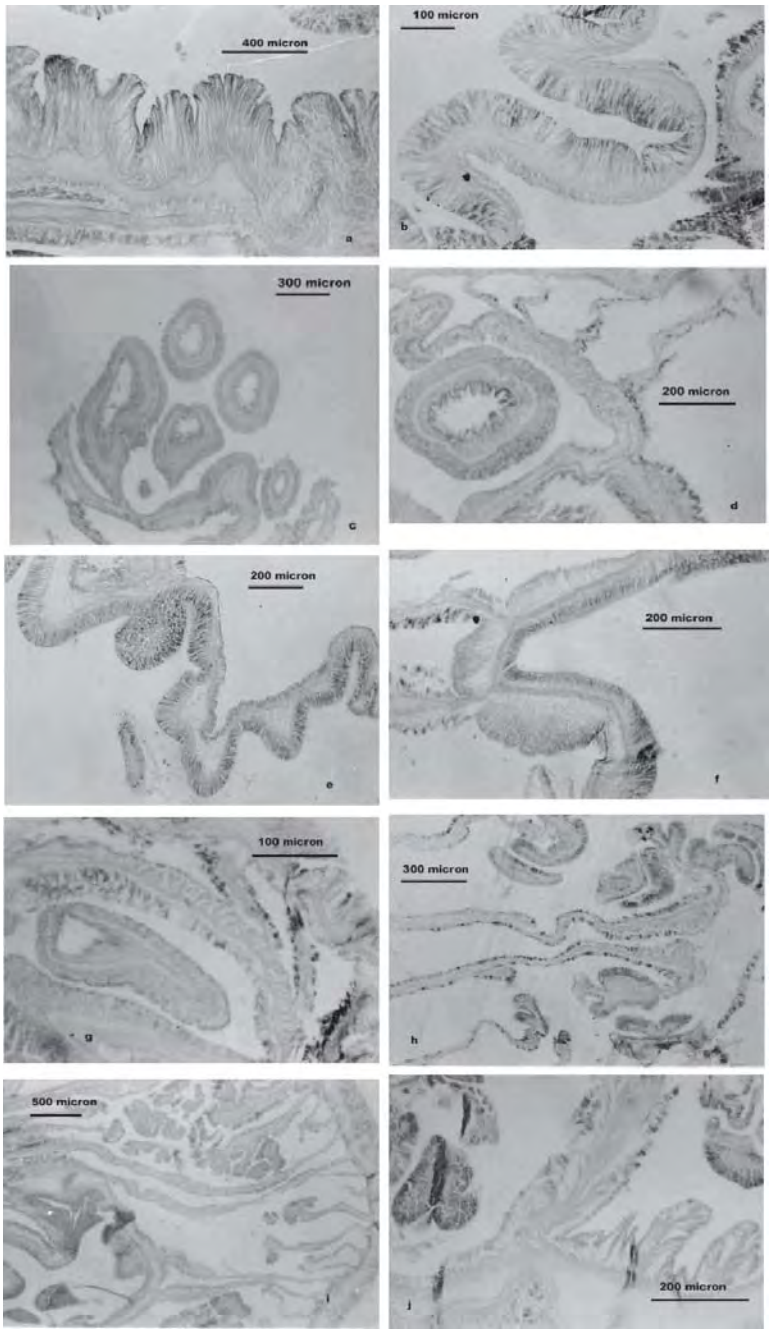

Figure. 4. Histology of *Actinia virgata*. a) body wall ectoderm; b) body wall ectoderm detail; c) cross sectioned tentacles; d) cross sectioned tentacles detail; e) cross sectioned pharynx; f) cross sectioned siphonoglyph; g) sphincter; h) parietobasilar muscles, retractor muscle; i) retractor muscle; j) basilar muscle.

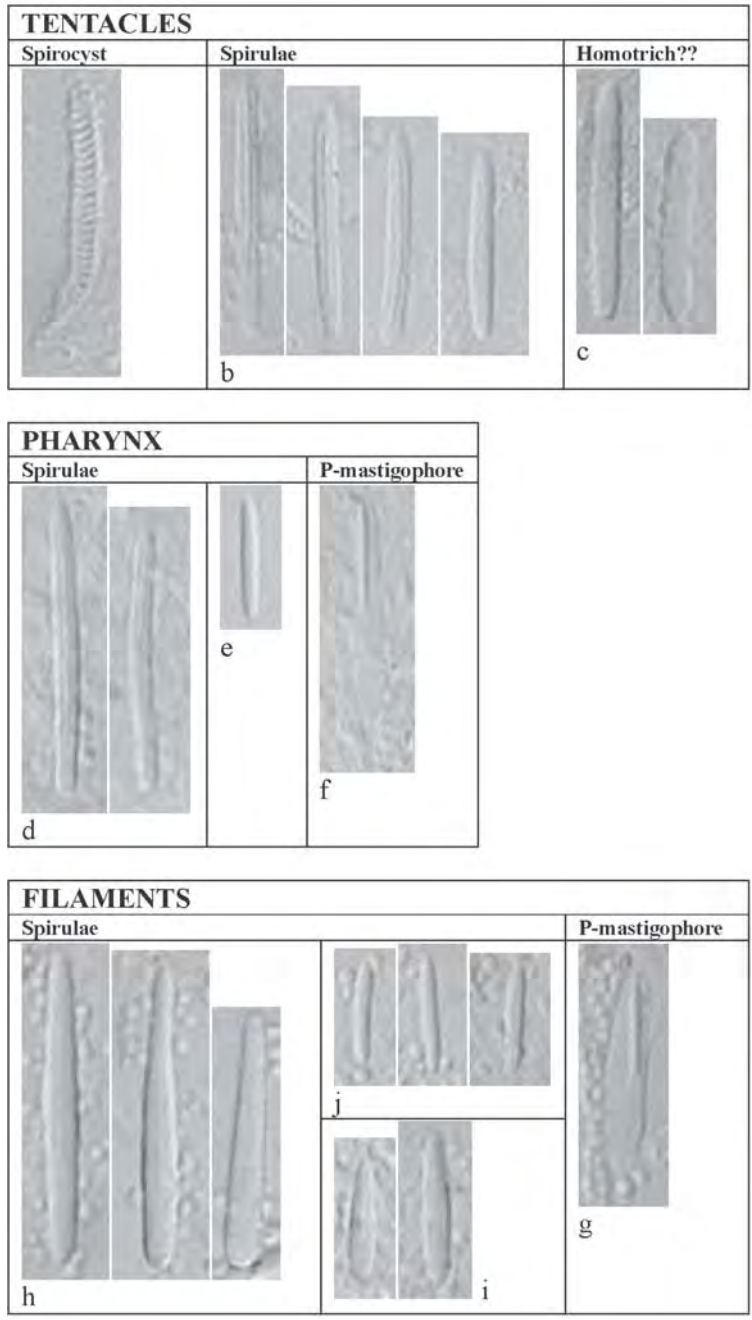

Figure. 5. Cnidom of *Actinia striata*. The letters refer to those in the Table V.

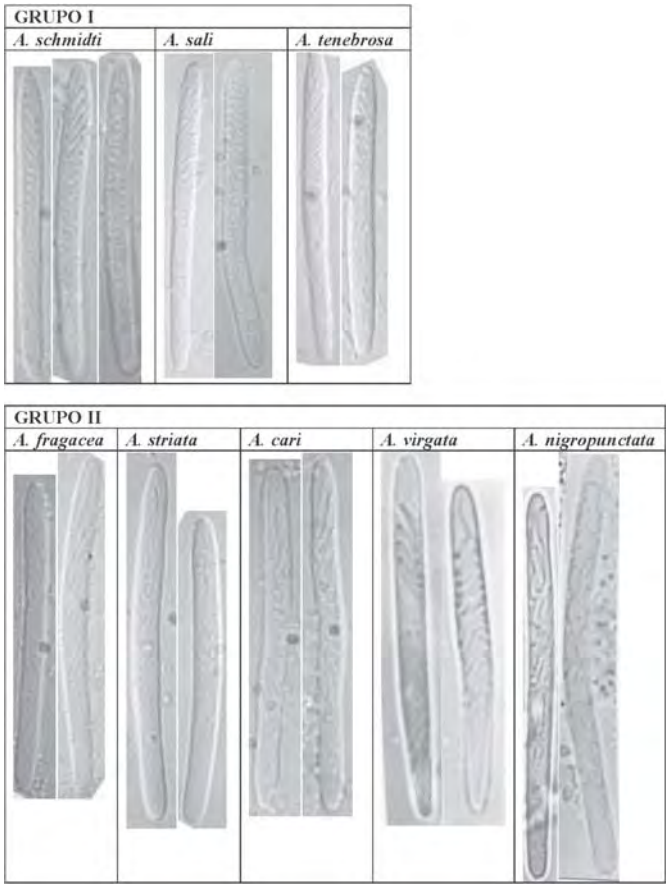

Figure. 6. Homotriches comparative.

spirulae in the pharynx than those present in *A. striata* (see Schmidt, 1972; table V, fig. 5); we confirmed this, even in small specimens of *A. striata*. However, the material of *A. virgata* is scarce and new specimens should be tested in order to distinguish the species properly from *A. striata*. The relation between both species is also remarkable as they are the only ones with colour stripes along the column. A genetic analysis will be important in order to understand the similarity between both stripes species.

Both, *A. virgata* and *A. nigropunctata* should be considered as endemisms from Macaronesian waters and they are supposed to be generated during Pleistocene period (den Hartog & Ocaña, 2003). Schama *et al.* (2005) mention that our hypothesis about the origin of *A. nigropunctata* (den Hartog & Ocaña, 2003) cannot be supported by the molecular clock used by them. Unfortunately these authors (Schama *et al.*, 2005) misunderstood our hypothesis as we did not established the last glaciations period as the time *A. nigropunctata* was generated, but the Pleistocene period. According to den Hartog & Ocaña (2003) *A. nigropunctata* was possibly generated along the Pleistocen period and this is consistent with the molecular clock available for those authors (Schama *et al.*, 2005).

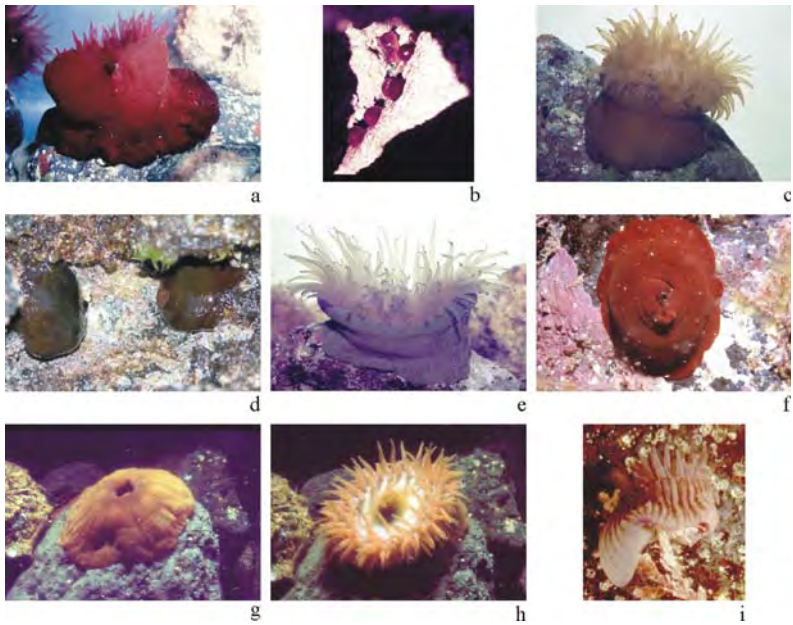

Figure. 7.- Actinia species colour plates: a) *A. schmidti* from Fuerteventura, September 1982 (A. Brito leg.); b) *A. schmidti* from Morrojable (Fuerteventura), April 1981 (A. Brito leg.); c) *A. schmidti* from Las Galletas (Tenerife), February 1980 (A. Brito leg.); d) *A. schmidti* from Orzola (Lanzarote), February 2005 (A. Brito leg.); e) *A. nigropunctata* from Las Galletas, Tenerife, March 1980 (A. Brito leg.); f) *A. nigropunctata* from Jacomar (Fuerteventura), August 2002 (O. Ocaña leg.); g & h) *A. nigropunctata* from Mesa del Mar (Tenerife), January 1994 (O. Ocaña leg.); i) *A. virgata* from Seixal (Madeira), September 1991 (O. Ocaña leg.).

Table VI. Comparison of taxonomic characteristics of main *Actinia* taxa.

	Actinia cari	*A. striata*	*Actinia schmidti*	*Actinia sali*	*Actinia equina equina*	*Actinia equina atlantica*	*Actinia fragacea*	*Actinia tenebrosa*	*Actinia nigropunctata*	*Actinia virgata*
Coloration	Greenish-brown with brown and blue concentric stripes	Redish, greenish or brownish with red vertical stripes	Mainly red but also can be brown and green	Red	Red, brown, green and even orange.	Red, brown, greenish	Red with green spots	Red colour rarely brownish	Red, green; blue, pink; grey. With black spots.	Redish with black stripes
P-mastigophores B1A at Filaments	Absent	Absent	Present	Present	Absent	Absent	Absent	Present	Absent	Absent
Homotrichs Size	(40-65) x (3-4.5)	(40-60) x (3-4.5)	(42-70) x (3.5-5)	(42-62) x (3,5-5)	(50-72) x (3-4.4)	?	(40-70) x (2.5-4)	(42-60) x (2.5-4)	(44-56) x (3.3-4.4)	(40-50) x (3.3-4.4)
Homotrichs wide means	≤4	≥4	≥4	≥4	<4	?	<4	<4	<4	<4
Reproduction pathways	Oviparous	Viviparous	Viviparous Oviparous	Viviparous	Viviparous	Viviparous Oviparous	Oviparous	Viviparous	Oviparous	Viviparous
Presence of cinclides-like	Absent	Present	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Habitat	Infralittoral	Infralittoral	Supralittoral and Mesolittoral	Supralittoral and Mesolittoral	Supralittoral and Mesolittoral	Mesolittoral	Mesolittoral to Infralittoral	Supralittoral and Mesolittoral	Mesolittoral and Infralittoral	Mesolittoral and Infralittoral
Distribution	Mediterranean sea	Mediterranean sea	Mediterranean, Macaronesia, Portugal and Cantabric	Cape Verde Islands	England, North France, Scandinavian	Azores and Biscaya Gulf	From England to Sahara coast. Absent from Mediterranean and Macaronesia	New Zealand region and South Australia	Canary Islands and Madeira	Madeira

ACKNOWLEDGEMENTS

Part of the material studied in this paper was mainly collected thanks to the CANCAP project (1976-1986), BENTHOS project (1980-1985) and FARMAMAR expedition (1990). We would like to extend our gratitude to all the colleagues from Zoology and Marine Sciences departments who made available some material of this genus in the Canary Islands and Madeira. Also many thanks are due to Dr. Biscoito, Director of Museu Municipal of Funchal for his valuable advice and friendly collaboration. We wish to thank Professor Dr. P.Wirtz for providing us with some valuable material from Cape Verde and Azores. Finally, an especial acknowledgement to Dr. Juan José Bacallado Aránega for his relevant contribution to the study of the Macaronesian fauna. Histological sections were partly prepared by Mr T.J.G.M. van Oyen, and Mr M. Slierings send to us important material and collection numbers, both staff from NNM. Special gratitude is due to Leen van Ofwegen for his valuable advice and editing of the manuscript. We are grateful to Francisca Serrais who kindly edited our manuscript. Valuable images were provided by Dr. Jorge Nuñez from La Laguna University.

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Fecha de recepción: 21 junio 2005 Fecha de aceptación: 17 noviembre 2005