

*HARMOTHÖE HYALONEMAE* SP. NOV. (POLYCHAETA,  
POLYNOIDAE), AN EXCLUSIVE INHABITANT OF  
DIFFERENT ATLANTO-MEDITERRANEAN SPECIES  
OF *HYALONEMA* (PORIFERA, HEXACTINELLIDA)

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ABSTRACT

A new polynoid species, *Harmothoe hyalonemae*, living as an inquiline inside the atrial cavities of deep-water hexactinellid sponges of the genus *Hyalonema* - viz. *H. thomsoni*, *H. infundibulum*, *H. lusitanicum* and *H. toxeras* - is fully described and illustrated. It is characterized by the notched, bill-shaped tips of neurosetae, smooth cephalic sensory organs and cirri, and smooth margined elytra with a patch of papillae near the reniform indentation. The species shows sexual dimorphism and the morphology of the polychaetes changes slightly when comparing specimens from Mediterranean hosts to those of Atlantic hosts. Some trends of the association between the polychaete and the sponge have been studied on a dense population of Mediterranean *H. thomsoni* (including 171 of the total 176 hexactinellid specimens examined). 88.3% of the sponges were infested by the polychaete, with 52.3% of them harbouring a male and female together. The absence of correlation between sponge size and polychaete size, together with their particular distributions in size-classes (normal unimodal in sponges, and bimodal in polychaetes), suggest that the life-history of the polychaete population is independent of the host, with sponge life being notably longer than inquiline life.

INTRODUCTION

Polynoids are among the most abundant and widely distributed families of Polychaeta, ranging from shallow waters to great depths (Pettibone 1982), and display a high species diversity (Levenstein 1984). Many species of polynoids have commensal habits, living in close associations with a wide range of hosts: corals (Hartmann-Schröder 1985), mussels (Pettibone 1984), malidanids (Pettibone 1983), arenicolids (Estcourt 1967), and especially echinoderms, viz. holothuroids (Wesenberg-Lund 1941, Kirkegaard & Billet 1980), ophiuroids (Millott 1953, Davenport 1953, Hartmann-Schröder 1981), echinoids (Hartmann-Schröder 1981), asteroids (Hartmann-Schröder 1981, 1984, Ruff 1991). However, among these numerous relationships, none have involved polynoids and sponges.

The sponge fauna from areas around the Iberian Peninsula (Uriz & Rosell 1986, 1990, pers. obs.), included some species of the genus *Hyalonema* Gray, 1832.

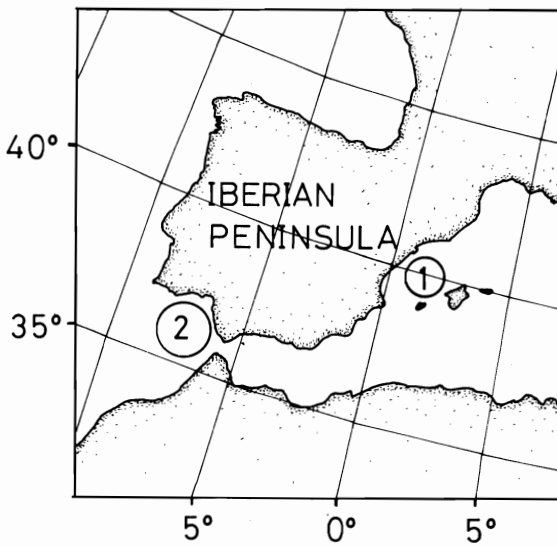


Fig. 1. Location of sampling areas. 1) BATIMAR and BATHOS Surveys: Catalan Sea (NW Mediterranean). 2) BALGIM-84 Survey: Ibero-Moroccan Gulf (NE Atlantic).

*H. thomsoni* (Marshall, 1875), in the Mediterranean and Atlantic regions, and *H. infundibulum* (Topsent, 1896), *H. lusitanicum* Barboza du Bocage, 1864 and *H. toxeras* Thomson, 1877, in the Atlantic region. During these investigations, the first association between sponges and polynoids has been found. In addition, the polynoid specimens belong to a new species of Polychaeta.

The Atlantic specimens have been collected during the BALGIM-84 survey, directed by P. Bouchet, on the R. V. "Cyros" from the PIROCEAN (CNRS). Our special thanks to Dr. M. H. Pettibone, Zoologist Emeritus of the Dept. of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, for her systematic advice and to Dr. M. C. Gambi from the Laboratorio di Ecologia del Benthos, Stazione Zoologica di Napoli, for critically reading the manuscript. We also thank Mr. J. M. Fortuño of the S.E.M. Service of the "Instituto de Ciencias del Mar de Barcelona" (C.S.I.C.), for assistance in the preparation and observation of specimens using scanning electron microscope, and to Mr. D. Byrne for critically correcting the English language.

## MATERIAL AND METHODS

The surveys took place from 1985 to 1988 on the Catalan Sea - BATHOS I to IV and BATIMAR - and in 1984 on the Ibero-Moroccan Gulf - BALGIM-84 - (Table 1, Fig. 1).

A total of 176 sponges has been examined: 172 specimens of *H. thomsoni* (171 from the Mediterranean and 1 from the Atlantic) and 2 specimens of *H. infundibulum*, 1 of *H. lusitanicum* and 1 of *H. toxeras* from the Atlantic. All the specimens were thoroughly dissected under a stereo-microscope (Wild Heerbrugg M-8) in search of the presence, location, and total number of polychaetes per host. Damaged sponges have not been taken into account.

Table 1. Surveys in which samples containing *Hyalonema* spp. and *Harmothoe hyalonemae* were collected. Latitude (LAT), longitude (LONG), maximum depth in meters (MAX), minimum depth in meters (MIN), sampling month (DATE).

Mediterranean						
Survey	Species	LAT (N)	LONG (E)	MAX	MIN	DATE
BATIMAR	<i>H. thomsoni</i>	40°32.3'	01°46.5'	1580	1450	-
BATHOS-2	<i>H. thomsoni</i>	40°25.4'	01°56.9'	1734	-	-
BATHOS-3	<i>H. thomsoni</i>	40°02.8'-40°50'	01°58.6'-03°44.7'	2256	1430	06-07/88
BATHOS-5	<i>H. thomsoni</i>	39°50.5'-40°45.9'	01°47.2'-02°07.1'	1758	1083	10/88
Atlantic						
Survey	Species	LAT (N)	LONG (W)	MAX	MIN	DATE
BALGIM-84	<i>H. thomsoni</i>	35°03.6'	08°01.8'	2142	1948	05/84
BALGIM-84	<i>H. cf infundibulum</i>	34°04.2'	07°06.9'	1532	1488	06/84
BALGIM-84	<i>H. infundibulum</i>	36°01.8'	08°01.0'	1527	-	06/84
	<i>H. lusitanicum</i>					
	<i>H. toxeras</i>					

Sponge body measurements (width and length without stalk) were made with a scaled rule, while width (as distance between the anterior pair of eyes) and length of the polychaetes were measured projecting their image - magnified through a Wild Heerbrugg M-8 stereo-microscope and a "camera-clara" - on a GENIUS digitizer linked to a computer by the program HiPad2 (designed by Dr. K. Foreman of the Woods Hole Oceanographic Institute and modified by Mr V. M. Hernández). Only undamaged specimens of both sponges and polychaetes have been measured.

Statistical analyses were carried out using the MICROSTAT package (Copyright 1978-85, Ecosoft Inc.).

Normal distributions have been inferred following Battacharia's method using the Compleat ELEFAN, Version 1.11, September 1990 (Copyright International Center for Living Aquatic Resources Management 1988, 1990). Only the BATHOS-2 (Summer) and BATHOS-5 (Autumn) surveys have been taken into account in the analyses, because they had sufficient specimens of both sponges and polychaetes.

Type material of *Harmothoe hyalonemae* has been deposited in the "Museo Nacional de Ciencias Naturales de Madrid", MNCNM (Spain) and with the invertebrate collection of the "Centre d'Estudis Avançats de Blanes", CEAB (Spain).

#### *HARMOTHÖE HYALONEMAE* SP. NOV.

Order Phyllodocida, family Polynoidae Malmgren, 1867, genus *Harmothoe* Kinberg, 1855.

*Type specimens.* HOLOTYPE: MNCNM, No. 16.01/806; PARATYPES:

MNCNM (10 Mediterranean specimens), Nos. 16.01/807 to 811; MNCNM (8 Atlantic specimens), Nos. 16.01/812 to 816; CEAB (293 specimens), Nos. AP/024/001 to 170.

*Type locality.* Catalan Sea, Western Mediterranean (40°25.4'N, 01°56.9'E, 1083-2256 m depth).

*Host.* Porifera: Hexactinellida: *Hyalonema* Gray, 1832: *H. thomsoni* (Marshall, 1875), *H. infundibulum* (Topsent, 1896), *H. toxeras* Thomson, 1877 and *H. lusitanicum* Barboza du Bocage, 1864.

*Site on host.* Atrial system.

*Etymology.* The specific epithet refers to the generic name of the hosts, which are different species of hexactinellid sponges belonging to the genus *Hyalonema*.

*Description.* Body with 15 pairs of elytra, dorsal and ventral surfaces with a longitudinal groove; measures up to 14 mm (females) and 11.5 mm (males) for 34 setigers. Male body less massive and more tapered at the posterior end than the female body. Colour whitish (in alcohol).

Prostomium tending to be quadrate (females) or rounded-hexagonal (males) in dorsal outline, bilobed; with prostomial peaks; with median anterior antenna more than 4 times as long as the lateral antennae; lateral antennae inserted on the prostomium below and to the side of median antenna (ventral insertion); 2 smooth palps, slightly annulated, more than 3 times as long as lateral antennae; 4 rather large, black eyes, an anterior pair on the middle-posterior region of the prostomium, and a posterior pair on the rear margin, both laterally placed, the anterior pair being twice as big as the posterior ones in females and of similar size in males (Fig. 2).

Peristomium with 2 stout setae projecting from the inside of the fused ceratophores of the dorsal and ventral tentacular cirri (tentaculophores) and representing reduced uniramous parapodia; dorsal and ventral tentacular cirri 3 times as long as lateral antennae (Fig. 2a).

Facial tubercle trilobed with median lobe twice as wide as the lateral ones (Fig. 4a). Proboscis with 9 pairs of papillae and two pairs of jaws (Fig. 4b).

Parapodia all biramous (Fig. 3a, b) except for the peristomium. Elytra overlap and completely cover the body, occurring on the 2nd, 4th and 5th setigers, on alternate segments to the 23rd and then on the 26th, 29th and 32nd followed by 2 successive segments with dorsal cirri, that is without elytra but covered by the last pair of elytra. The first pair of elytra are round, the remainder reniform (Fig. 3c), their margins are smooth and their surfaces with small conical tubercles (Fig. 3d, e) in a patch near the reniform indentation and with brown irregular patches of different intensity of colour (Fig. 3c). On all segments without elytra, the dorsal tubercles are in line with and as prominent as elytophores. A dorsal cirrus

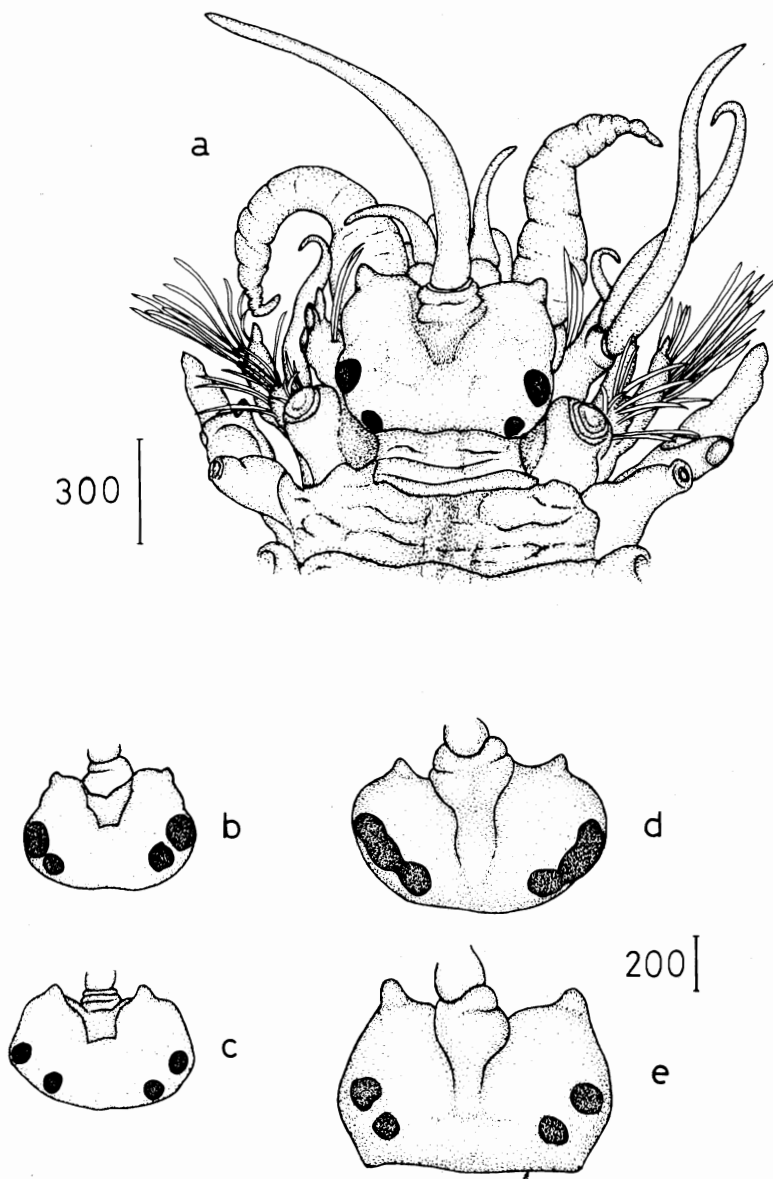


Fig. 2. *Harmothoe hyalonemae*. a) Dorsal view of the anterior end of a male body (without elytra). Schematic shape of the prostomium; specimens found inside a Mediterranean *Hyalonema thomsoni*: b) female and c) male; specimens found inside an Atlantic *Hyalonema lusitanicum*: d) female and e) male. Scale bars in  $\mu\text{m}$ .

projects from a cirrophore, placed above and posterior to the notopodial setae, extending twice as far as neuropodial setae (Fig. 3b).

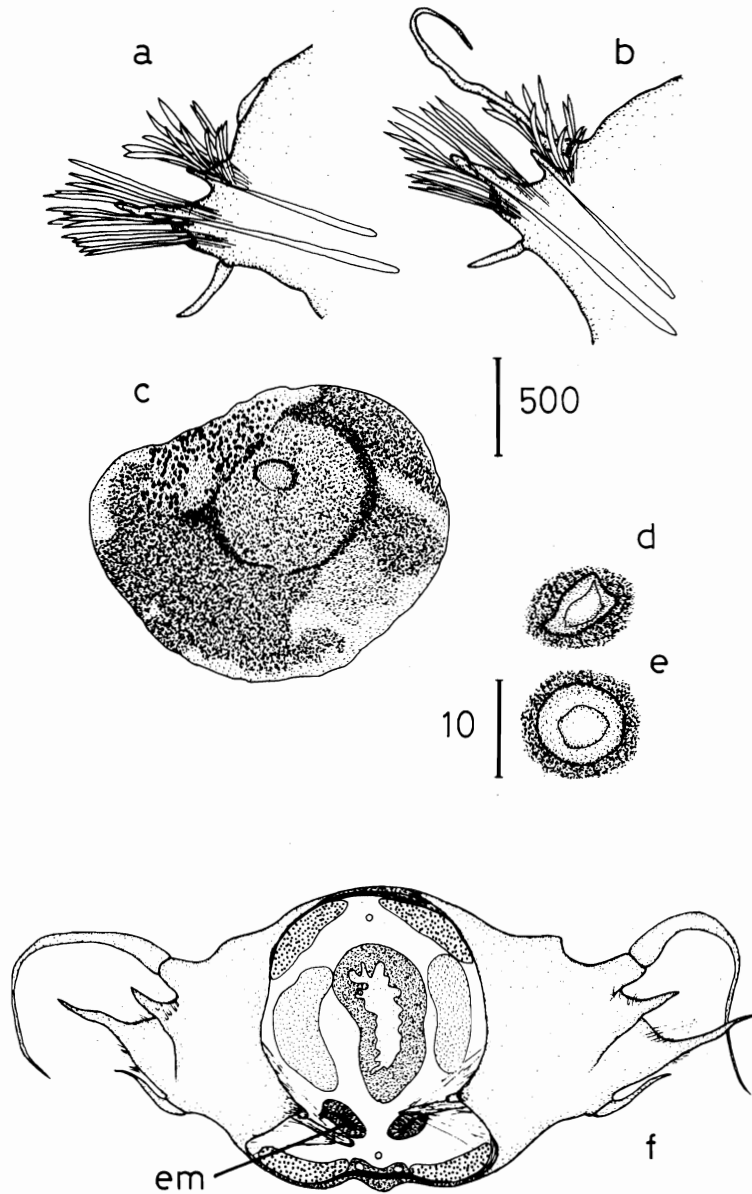


Fig. 3. *Harmothoe hyalonemae*. Parapodia: a) with elyptrophore; b) with dorsal cirrus. Elytra: c) entire view; papillae on d) lateral and e) upper views (Scale bars in  $\mu\text{m}$ ). f) Schema of a transverse section of the body of an Atlantic female, showing the location of the egg-masses.

Ventral cirri of the 2nd setiger long, in short cirrophores, extending just beyond the neurosetae (Fig. 2a); ventral cirri from the 3rd setiger to the end of the

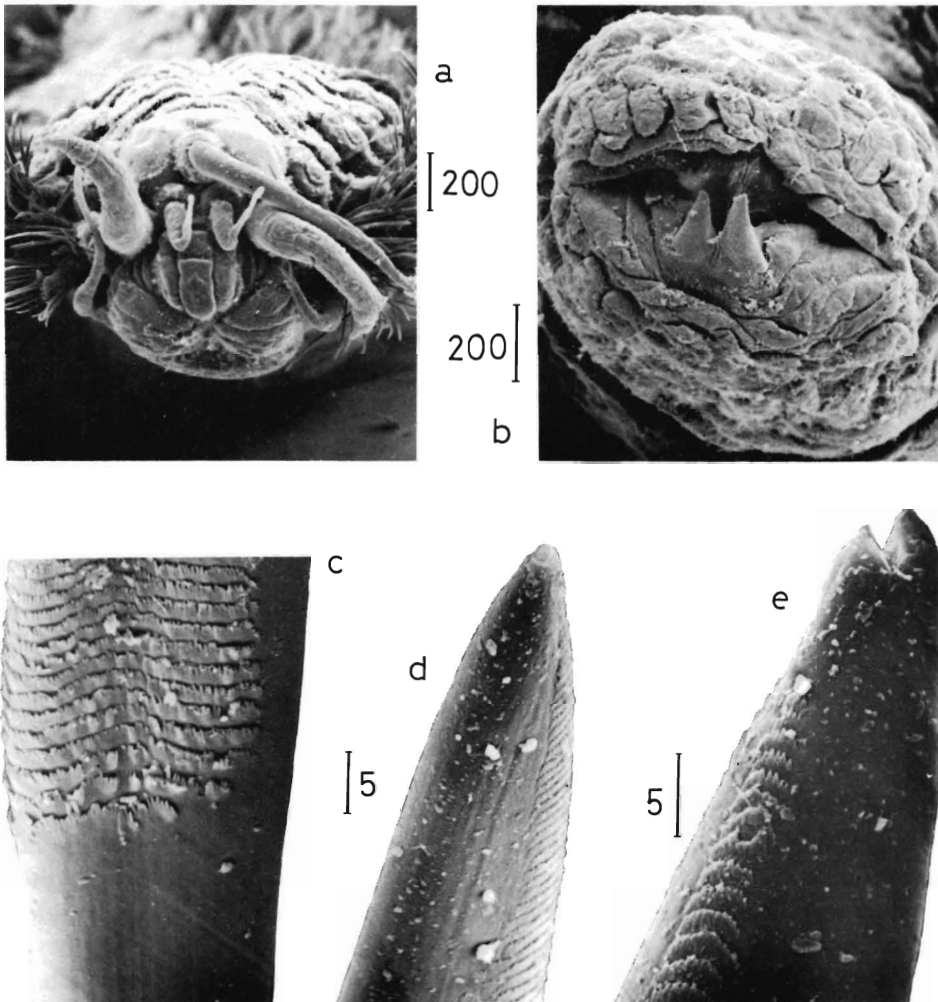


Fig. 4. *Harmothoe hyalonemae*. S.E.M. photographs. a) Frontal view of the anterior end of the body. b) Detail of the extended pharynx. c) Detail of the fringe-shaped rows of spines of a seta. d) Detail of the tip of a notoseta. e) Detail of the tip of a neuroseta. Scale bars in  $\mu\text{m}$ .

body smaller, in short cirrophores, extending just up to the tip of neuropodia (Fig. 3a, b).

Notopodia project as short narrow cuffs with up to 15 setae, and a ventral acicular ligule (Figs 2a, 3a, b); neuropodia project as sleeves with 15-20 setae and an anterior acicular ligule extending distally into long digitiform process (beyond the tip of the neuroaciculum) (Figs 2a, 3a, b). Both notopodial and neuropodial acicula of similar shape with long acuminate tips (Fig. 5a), the first being slightly shorter than the second (Fig. 3a, b).

Notopodial setae are stout, long and short, with fringe-shaped rows of very

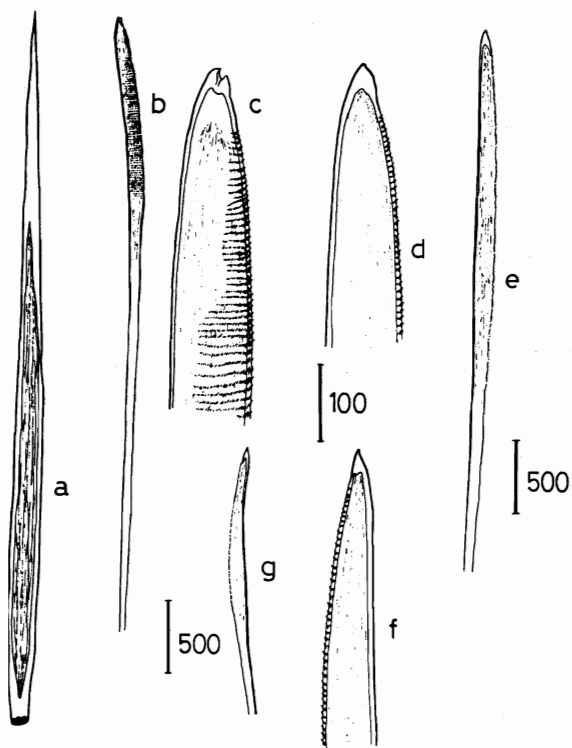


Fig. 5. *Harmothoe hyalonemae*. a) Entire view of notoaciculum. Bidentate neuroseta: b) entire view; c) detail of the tip. Unidentate neuroseta: d) detail of the tip; e) entire view. Notoseta: g) detail of the tip; f) entire view.

Scale bars in  $\mu\text{m}$ .

short spines (Fig. 4c) extending almost to the pointed tips (Figs 4d, 5g, f). Neuropodial setae are longer and thinner than notopodial, they are slightly swollen distally, with rows of spines (same shape as notopodial setae spines) towards their notched, bill-shaped tips (Figs 4e, 5b, c). A few in a lower position may be unidentate (Fig. 5d, e).

Nephridial papillae small, visible on some setigers only, on the ventral body wall near the posterior end of parapodia. Females with two small egg-masses visible internally at the basis of the area around the acicula, near the ventral body wall (Fig. 3f refers to an Atlantic specimen found in *Hyalonema lusitanicum*). Sperm not seen.

Pygium with dorsal anus and 2 anal cirri as long as the dorsal cirri.

**Remarks.** The above description refers to the Mediterranean specimens. Atlantic specimens were bigger than the Mediterranean ones (Table 2A) with body shape, sensory organs, and cirri stouter in Atlantic specimens. They also had a thicker epidermal covering, especially on the prostomium where the eyes seemed to be more deeply set.

The eyes of some Atlantic females were so large that the anterior and the posterior eyes sometimes became laterally fused (Fig. 2d).

Table 2. A) Size of the specimens of *Harmothoe hyalonemae* and *Hyalonema* species. Number of Mediterranean specimens between brackets. Sizes of Atlantic specimens based, respectively, on the only specimen found. B) Width-ratio between body (measured as distance between the anterior pair of eyes) and elytra of female polychaetes found in the different *Hyalonema* species. Measurements in mm.

A							
Species of sponge		<i>Hyalonema</i> spp.		<i>H. hyalonemae</i>			
		Length	Width	Female		Male	
		Length	Width	Length	Width	Length	Width
Mediterranean specimens							
<i>H. thomsoni</i>	Mean	56(117)	19(117)	9.9(48)	0.49(81)	8.5(48)	0.48(72)
	SD	10	6	1.7	0.07	1.6	0.07
Atlantic specimens							
<i>H. thomsoni</i>		80	30	13.5	0.55	13.3	0.55
<i>H. cf infundibulum</i>		120	55	15.6	0.61	15.1	0.66
<i>H. infundibulum</i>		-	-	-	-	13.3	0.54
<i>H. lusitanicum</i>		70	60	-	0.73	21.1	0.70
<i>H. toxeras</i>		135	70	18.9	1.01	-	-

B			
Species	Elytra	Body	Ratio
<i>H. thomsoni</i> (Medit.)	1.39	0.49	2.83
<i>H. thomsoni</i> (Atlan.)	1.36	0.55	2.46
<i>H. cf infundibulum</i>	1.33	0.61	2.20
<i>H. lusitanicum</i>	1.45	0.73	1.99
<i>H. toxeras</i>	1.36	1.01	1.35

The elytra were almost identical in the specimens arising from different species of *Hyalonema*, but certain differences in the number and position of the papillae have been detected (Fig. 6). However, the elytra are relatively smaller in Atlantic specimens (Table 2B). Non-significant morphological differences have been observed between the shape of the setae of the Atlantic polychaetes (Fig. 6) and those of the Mediterranean ones.

Females bearing egg-masses inside the body have been found throughout the Mediterranean and Atlantic sampling stations and months, but no cocoons or egg-brooding structures have been observed outside.

No recognizable structures were found in the gut contents examined under a stereo-microscope.

*Discussion.* Among the high number of *Harmothoe* species (120 following Fauchald 1977), *H. hyalonemae* sp. nov. only resembles *H. joubini* Fauvel, 1913 (on the basis of the description and figures in Fauvel 1914). Both species have peristomial peaks, and bear smooth sensory cephalic organs and cirri, together with smooth

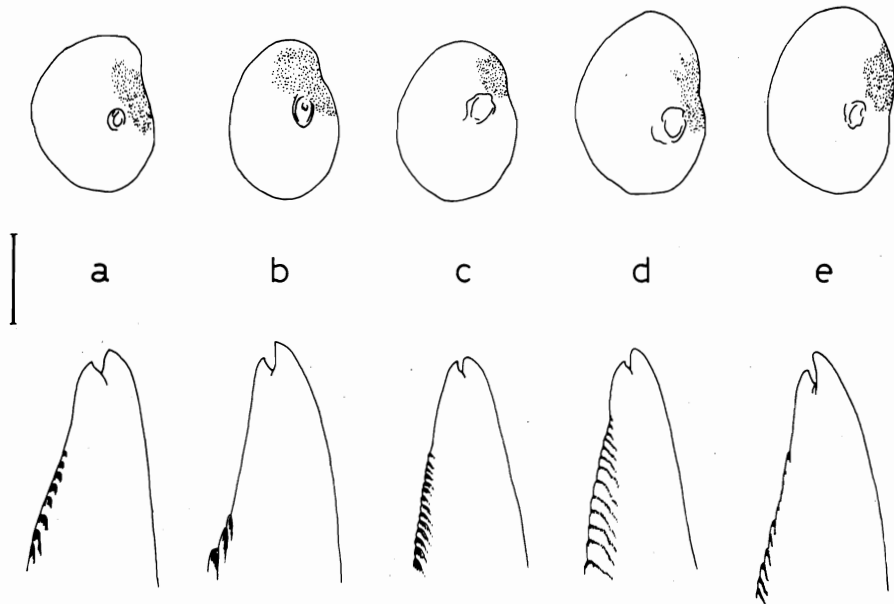


Fig. 6. *Harmothoe hyalonemae*. Elytra (scale bar 1 mm) and setae (scale bar 10  $\mu$ m) of the specimens found in the different *Hyalonema* species: a) *H. thomsoni* (Mediterranean); b) *H. thomsoni* (Atlantic); c) *H. cf infundibulum* (Atlantic); d) *H. lusitanicum* (Atlantic); e) *H. toxeras* (Atlantic).

elytra and with a patch of few papillae near the reniform indentation. However, *H. hyalonemae* and *H. joubini* can be distinguished by a great number of morphological features (M. H. Pettibone, pers. comm.) and, although *H. hyalonemae* and *H. joubini* display similar bathymetric distribution (1083-2256 m and 1473 m depth, respectively), their life-histories are markedly distinct, the former is an inquiline while the latter is free-living. In addition, no sexual dimorphism has been mentioned in *H. joubini* (Fauvel 1914).

We conclude, therefore, that the set of both morphological and ecological characteristics of the studied specimens justify the erection of a new species of the genus *Harmothoe*, namely *Harmothoe hyalonemae*. The morphological differences between Mediterranean and Atlantic specimens are considered an expression of the geographical variability of this new species.

#### ASSOCIATION CHARACTERISTICS

All the Atlantic species of *Hyalonema* examined were infested by the polychaete. A pair, male and female was found in the specimens of *H. thomsoni*, *H. cf infundibulum* and *H. toxeras*. Nevertheless, because of the low number of Atlantic specimens collected, the infestation rates only apply to the Mediterranean population of *H. thomsoni* (Table 3).

Table 3. Number of sponges (total and infested), number of polychaete pairs, and number of polychaetes located in different parts of the sponge (detailed in Fig. 9) from each survey.

Mediterranean <i>H. thomsoni</i>	Sponges		Polychaete Pairs	Polychaete location		
	Total	Infested		Medium	Upper	Lower
BATIMAR	1	1	0	1	0	0
BATHOS-2	25	25	19	25	6	14
BATHOS-3	100	89	46	44	43	47
BATHOS-5	45	36	14	-	-	-
Total	171	151	79	70	49	61

Atlantic specimens						
<i>H. thomsoni</i>	1	1	1	1	1	0
<i>H. cf infundibulum</i>	1	1	1	0	0	2
<i>H. infundibulum</i>	1	1	0	1	0	0
<i>H. lusitanicum</i>	1	1	0	0	1	0
<i>H. toxeras</i>	1	1	1	1	0	1
Total	5	5	3	3	2	3

The percentage of infested Mediterranean *H. thomsoni* was 88.3 (Table 3). Among the infested sponges, 52.3% harboured a pair of polychaetes, always male and female (Table 3). When a single polychaete was found, females were more frequent (62.2%) than males. When the polynoids lived in pairs, females were significantly longer than males (65.2%,  $p \leq 0.04$ ). No polychaetes were found outside the sponges when the fauna of the catches was examined.

Differences in the polychaete location were not significant when considering the number of specimens inhabiting the upper (27.2%), medium (38.9%) and lower parts (33.9%) of the sponge exhalant system (Table 3, Fig. 7).

Differences in width and length among host sponges from different surveys were not significant. Their length frequencies fitted similar unimodal normal distributions in Summer as well as in Autumn (Fig. 8A), suggesting that their life extends more than a year and, probably, for several years.

On the other hand, length frequencies of the polychaete population differed from Summer to Autumn in females as well as in males. The existence of different cohorts can be inferred from the presence of a bimodal normal distribution in Summer (females) and in Autumn (males) (Fig. 8B, C).

No significant correlation was found between sponge and polychaete sizes of the Mediterranean populations. Moreover, it is necessary to point out that the most conspicuous morphological difference between the Mediterranean and the Atlantic sponges and polychaetes was that the Mediterranean were smaller (Table 2A). Both sponges and polychaetes reflect the more favourable trophic conditions of the Atlantic bathyal bottoms (Pérès 1985).

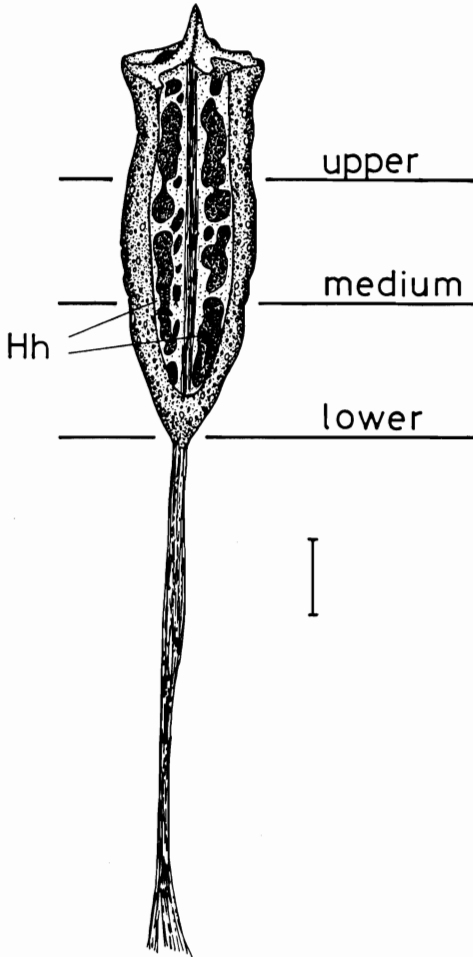


Fig. 7. Atrial system of a Mediterranean *Hyalonema thomsoni* showing the location of *Harmothoe hyalonemae* inside and the three parts in which the sponges have been subdivided. Scale bar 1 cm.

## DISCUSSION

In most of the known associations between sponges and other invertebrates, non-specific relationships were established (Peattie & Hoare, 1981, Alós et al. 1982, Wendt et al. 1985). Sponges appear to be a fairly stable and well-defined microhabitat with many hiding places which encourage the local concentration of fauna, including polychaetes. Moreover, the high densities of certain invertebrate species in sponges suggest that they may serve either as a source of food or as a refuge from predation (Wendt et al. 1985). Mutualistic associations have also been described (Vance 1978, Pitcher & Butler 1987, Feifarek 1987), but none regarding polychaetes.

The genus *Hyalonema* includes a great number of characteristic stalked species (Ijima 1927, Lévi 1964), all living on bathyal and abyssal muddy bottoms. They

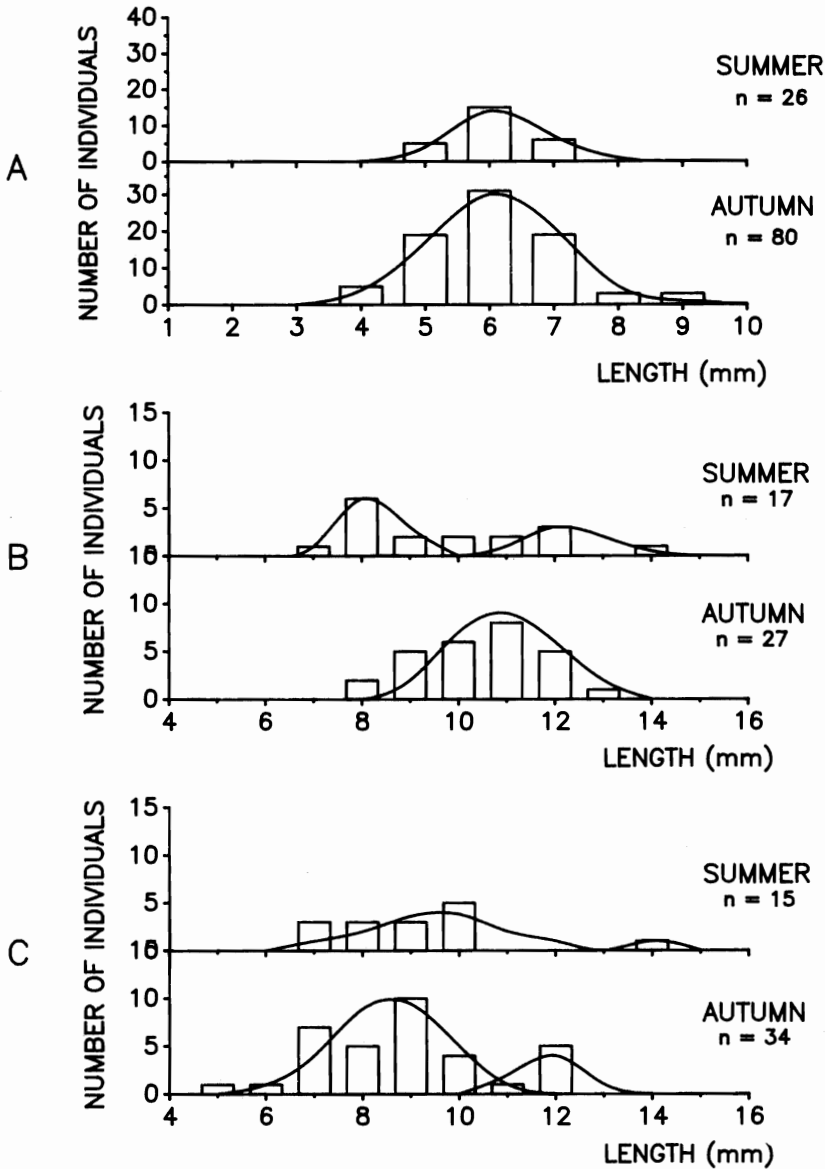


Fig. 8. Size classes of the Mediterranean specimens. A) *Hyalonema thomsoni*. *Harmothoe hyalonemae*. B) Females; C) Males. Scale bar 1 cm.

have a voluminous atrial system consisting of a number of main longitudinal cavities connected to each other and to labyrinthine series of exhalant canals (Fig. 7). Moreover, *H. lusitanicum* and *H. toxeras* bear a sieve covering the terminal orifices of the atrial cavity. In the Mediterranean population of *H. thomsoni*, the exhalant orifices range from 1 mm to 8 mm.

Data must be mentioned in order to establish the nature of the association between *H. hyalonemae* and the *Hyalonema* species. No polychaetes were found outside hosts, nor inside other hexactinellid species examined – exhibiting a wide atrial cavity suitable to lodge vagil fauna (i.e. *Pheronema grayii*) – from the same Atlantic stations. The percentage of infested sponges was notably high, harbouring a maximum of a pair of polychaetes per host sponge, and there was a total absence of other invertebrate species inside all the sponges examined. This association implies a specific relationship in which a sole species is able to colonize some taxonomically close host species. This behaviour is frequently displayed in specific associations involving sponges: i.e. the Cirripedia *Acasta spongites* and some horny sponges (Vacelet 1959); the Octocorallia *Parazoanthus axinellae* and different species of *Axinella* (Uriz 1983); the Scyphozoa *Nausitoë punctata* and horny sponges (Uriz et al. in press). These relationships can be defined either as parasitism or mutualism (bidirectional associations). In contrast, the association between *H. hyalonemae* and the *Hyalonema* species seems to be unidirectional and obligatory, as it occurs in other associations involving polynoids (Davenport 1953, Pettibone 1984).

There may be benefits for a predatory polynoid – like *Harmothoe* (Fauchald & Jumars 1979) – indicating inquilinism. The polychaete gains a suitable habitat easy to defend since its territory is clearly defined by the physical barrier marked by the sponge walls. The association also increases polychaete survival by protection against predation. Furthermore, it is certainly more economic for a predator in bathyal muddy benthos to remain hidden waiting for prey, rather than start hunting and so exposing itself to predation. Such a sit-and-wait predatorial behaviour has been found for other species of *Harmothoe* (Daly 1973 in Fauchald & Jumars 1979). Since biomass is concentrated in patches in bathyal benthos (Sokolova 1972), and sponges provide hiding places attracting vagile fauna, an increase of prey availability could be assumed.

The sponges harbouring the polychaetes do not show any visible morphological alteration compared with non-infested specimens. Consequently, no costs for the sponges are expected from this association nor are benefits for the infested sponges evident. However, certain benefits may derive from the association with an aggressive inquiline, like a polynoid (Dimock 1974). Defence against possible host-predators by biting them (Dimock & Dimock 1969) as far as the maintenance of the host free of foreign fauna could represent advantages (Wagner et al. 1979) which would mean steps from a unidirectional towards a mutualistic relationship (Wagner et al. 1979).

The infestation process would probably be mediated by chemical attraction as is frequent in commensal polynoids (Davenport 1953). Pawlik (1983) suggested that chemical cues emitted by potential host sponges could be detected by chemosensitive larvae of a predatory polychaete (Syllidae) whereas Davenport (1953) demonstrated that commensal populations of some *Harmothoe* species

showed strong, positive responses to their respective host (other polychaetes and echinoderms). Moreover, sex-specific recognition has previously been reported for the polychaete *Neanthes caudata* (Reish 1957).

When a polychaete is attracted (chemically?) towards a *Hyalonema*, the sponge could be devoid of any other polychaete and the colonization would be accomplished. If the sponge already harboured a *Harmothoe*, and the sex of the incoming polychaete was different to that of the first inhabitant then, it would be allowed access to the sponge and a pair would be established. If, on the contrary, the sex of both polychaetes involved is the same, the inquiline inhabitant of the sponge could probably attack the incoming polychaete. A further possibility would occur if the incoming polychaete already found a pair inside the sponge. In that case, it would always be attacked – by the member of the pair exhibiting its own sex. These last two hypotheses suggest that this aggressive behaviour could evolve into cannibalism and could play a role in the *H. hyalonemae* food availability. Cannibalistic behaviour has previously been mentioned in polynoids (Dimock 1974) and, especially, in deep-water polychaetes (Simon 1965 in Fauchald & Jumars 1979).

The absence of correlation between sponge size and inquiline size, suggests that the life-history of the polychaete population is independent of the host, with the sponge life longer than the polychaete life. That implies that the same sponge could host different polychaete generations. Dynamics of the polychaete population would display an internal control, depending on and balanced by the host population – as in the *Arctonoe vittata* (Grube) – *Acmaea pallida* (Gould) association (Britayev 1991). The only way to increase the polychaete population is through the availability of new hosts as the more sponges that reach an adequate size or become devoid of the polynoids (by death or relocation), the more new pairs of polychaetes will be established.

Attraction (chemically mediated?) towards the sponge would ensure recruitment on a suitable habitat. This implies low mortality rates after colonization. In the same way, losses in the population biomass would be avoided either by preventing larval dispersion (outside of the sponge patch) or by the established population feeding on the recruiters which try to colonize occupied hosts. This behavioural pattern provides a feed-back that increases the patchiness, favouring the possible concentration of a chemical stimulus to larval settlement in and around these relatively isolated bathyal patches.

The unimodal normal distribution of sponge size frequencies implies a stable population, reflecting the characteristics of bathyal habitats. Environmental stability and constant biotic pressure may permit specific associations (Schemske 1980). Both characteristics may act in this way also in deep bottoms.

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