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## DESCRIPTION OF THE NORTH JAMAICAN *TIMEA MICRASTER* N. SP. (PORIFERA: DEMOSPONGIAE: HADROMERIDA: TIMEIDAE)

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### ABSTRACT

A new West-Indian species of *Timea* is described and compared with all other Caribbean, Atlantic and Mediterranean members of the genus. *Timea micraster* n.sp. has a surface system of furrows with elevated sides, not known from other congeneric species and has the tiniest asters known in the family. These asters are of unusual shape but comparable to known species of *Timea*. The large aster-category has unique cylindrical processes on top of conical rays.

### INTRODUCTION

The genus *Timea* was erected by Gray, 1867 for type species *Hymedesmia stellata* Bowerbank, 1866. In spite of the availability of *Timea* as genus name, many contemporary authors (cf. Topsent, 1900, 1904; Carter, 1880) still used *Hymedesmia* Bowerbank, 1864 for species now partially assigned to *Timea*. The somewhat surprising neglect of the genus name *Timea* is explained by Vosmaer's (1887: 245) statement: "Das Genus [*Timea*] ist von Gray für *Hymedesmia stellata* Bwk. gemacht. Dieser Schwamm ist aber so ungenügend bekannt, dass es sicher nicht geboten scheint, die neue Gattung aufrecht zu halten." (Own translation: "The genus [*Timea*] is made by Gray for *Hymedesmia stellata* Bwk. But this sponge is known so insufficiently that it is not advisable to keep the new genus.")

Eventually, Topsent (1928) revived Gray's

genus, moved several species originally erected in *Hymedesmia* to *Timea* and introduced a new family Timeidae (: 145) without describing their characters there but, he stated earlier (: 35): "Le genre *Timea* Gray, à mégasclères monactinaux et à euasters, représenterait une famille à part, les Timeidae, car sa structure fort simple l'écarte de celle des Tethyidae." (Own translation: "The genus *Timea* Gray, with monactinal megascleres and euasters, represents a family of its own, the Timeidae, for its very simple structure separated from those of the Tethyidae.")

Topsent's definition of monactinal megascleres was later narrowed down to tylostyles as the only megascleres in Timeidae. (cf. Levi, 1973: 604: "Famille des Timeidae Topsent, 1928: Hadromérides avec tylostyles et euasters." Bergquist, 1978: 165: "Timeidae: Encrusting Hadromerida possessing tylostyles and euasters.") Consequently, species without tylostyles or with-

out euasters had to be removed from *Timea* (see remarks). According to more recent publications (Hartman, 1982; Hooper & Wiedenmayer, 1994) the family Timeidae is characterized, apart from the spiculation of tylostyles and asters, also by the occurrence of an ectosomal cortex of asters, the arrangement of the tylostyles in a single layer of erect spicules or, alternatively, in ascending tracts. The colour is mostly recorded as red. The distribution is confined to tropical and warm-temperate waters from the shallows to 165 m.

The family contains two genera: *Diplastrella* Topsent, 1918, type species *Diplastrella bistellata* (Schmidt, 1862), is separated from *Timea* by two characters: the presence of diplasters and the occurrence of a basal layer of large spherasters with branching rays, which are lacking in *Timea*.

The present paper describes *T. micraster* n.sp., and separates it from known Caribbean, Atlantic and Mediterranean species.

## METHODS

A fragment of the sponge was collected at the North Jamaican coast near Runaway Bay by SCUBA diving and frozen in dry ice. It is stored at the Thetis-Institut für biomolekulare Naturstoffforschung in Hamburg since then. A voucher specimen of the sponge was transferred to ethanol and is kept at the ZMA as holotype. Handmade thin sections and spicule preparations for light microscopy were carried out following procedures already described (e.g. Lehnert & van Soest, 1996). Spicule measurements were made of 25 spicules of each category. SEM investigations were made at the Friedrich-Alexander-University of Erlangen, Institute for Zoology I on a Hitachi S 800 SEM. For SEM samples spicule-ethanol suspension was transferred directly to stubs, as the tiny aster-category tended to drown in any adhesive material used. Samples were then sputtered with gold.

## SYSTEMATICS

GENUS *TIMEA* GRAY, 1867

***Timea micraster*** n.sp.

Figs. 1-8

## MATERIAL

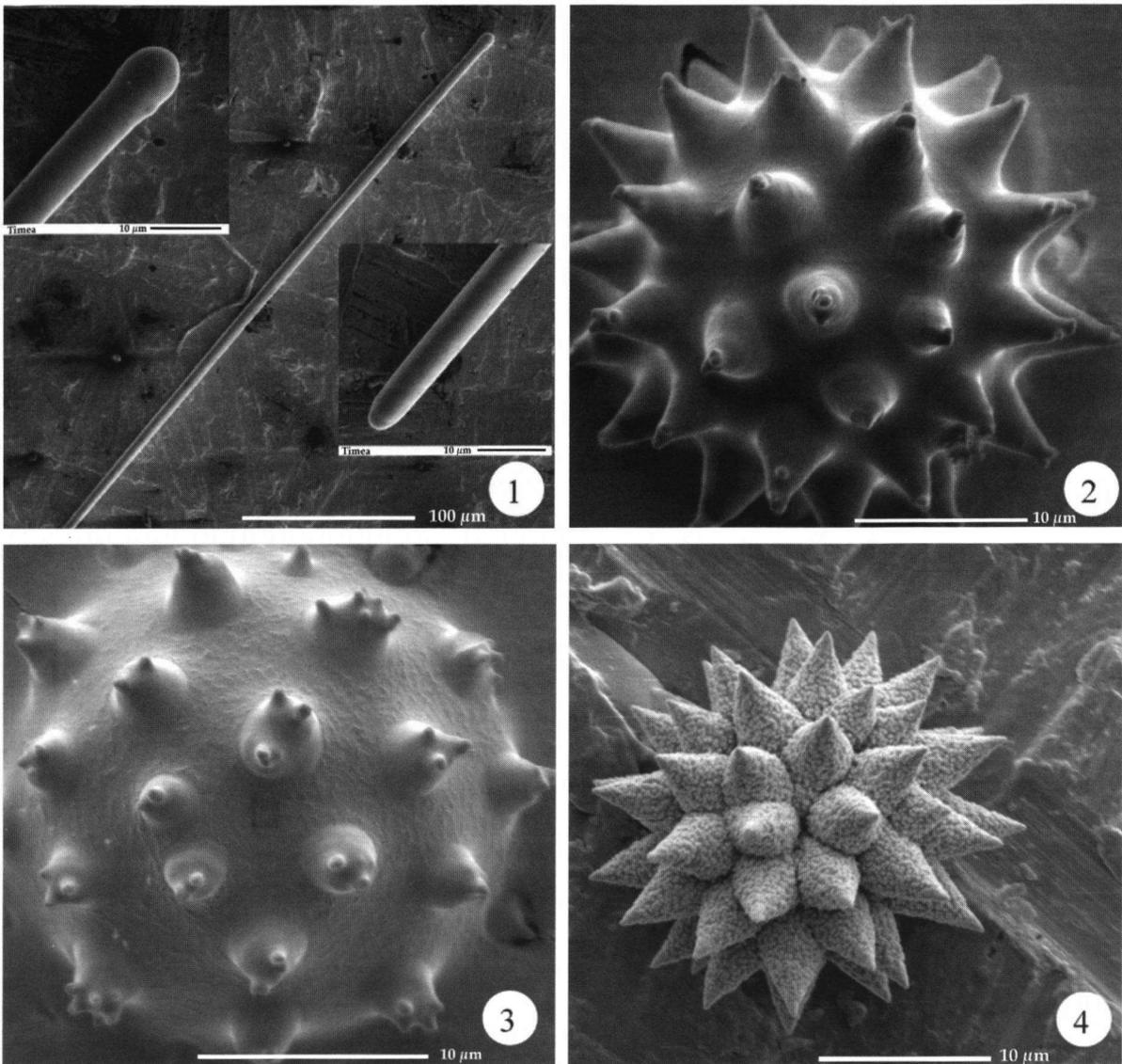
Holotype: ZMA POR 16753, J00/87, Pear Tree Bottom, JAMAICA, 15-IV-2000, undersurface of platy *Agaricia* at the landward side of a reef-tunnel; 20 m depth. Fragment of a larger sponge.

DESCRIPTION. - 3-5 mm thick encrustation, bright orange coloured, still orange in ethanol, approximately 0.06 m<sup>2</sup> in surface area. Consistency hard, not elastic. The smooth surface is rough to the touch and ornamented by, sometimes branched, furrows with elevated sides, up to 1 mm high and 0.3 to at least 1.5 cm long. In life this species reminds of specimens of encrusting *Spirastrella coccinea* with such furrows instead of skinny, star-shaped canals, both species occurring in the same habitat. The hard consistency is due to the usual Timeidae-crust of spherasters. The skeleton consists of a dermal crust of tightly packed asters, 60-220 µm in diameter. In the choanosome there are ascending, polyspicular tracts of tylostyles, points facing out, not protruding into the dermal crust, 70-180 µm in diameter. The sides of the furrows consist of the dermal crust of asters, here and there strengthened by underlying polyspicular tracts. They enclose subdermal cavities up to 350 µm in diameter and touch each other on top of the elevations. This is probably due to contraction of the sponge after collection.

Spicules: tylostyles (Fig. 1), with round tyles, the fusiform spicule broadening within the first third and slowly tapering to an almost invariably blunt end, 325-758 x 7-10 µm; large spherasters (Figs. 2-5), 15-37 µm in diameter with a large centrum and short conical spines. Developmental stages (Figs. 3-4) of these large asters show rough surfaces and conical rays. Fully grown asters have smooth surfaces and may have two to six thin cylindrical processes on top of the rays. The small aster category are very tiny two-, three- or four-lobate asters (Figs. 6-8), 2-3 µm in total diameter.

ETYMOLOGY. - Named after the small category of asters.

REMARKS. - Family and genus assignment: the new species described here shows all family characteristics of the Timeidae: bright orange colour, encrusting growth, presence of a dermal crust of asters, spiculation of tylostyles and asters and



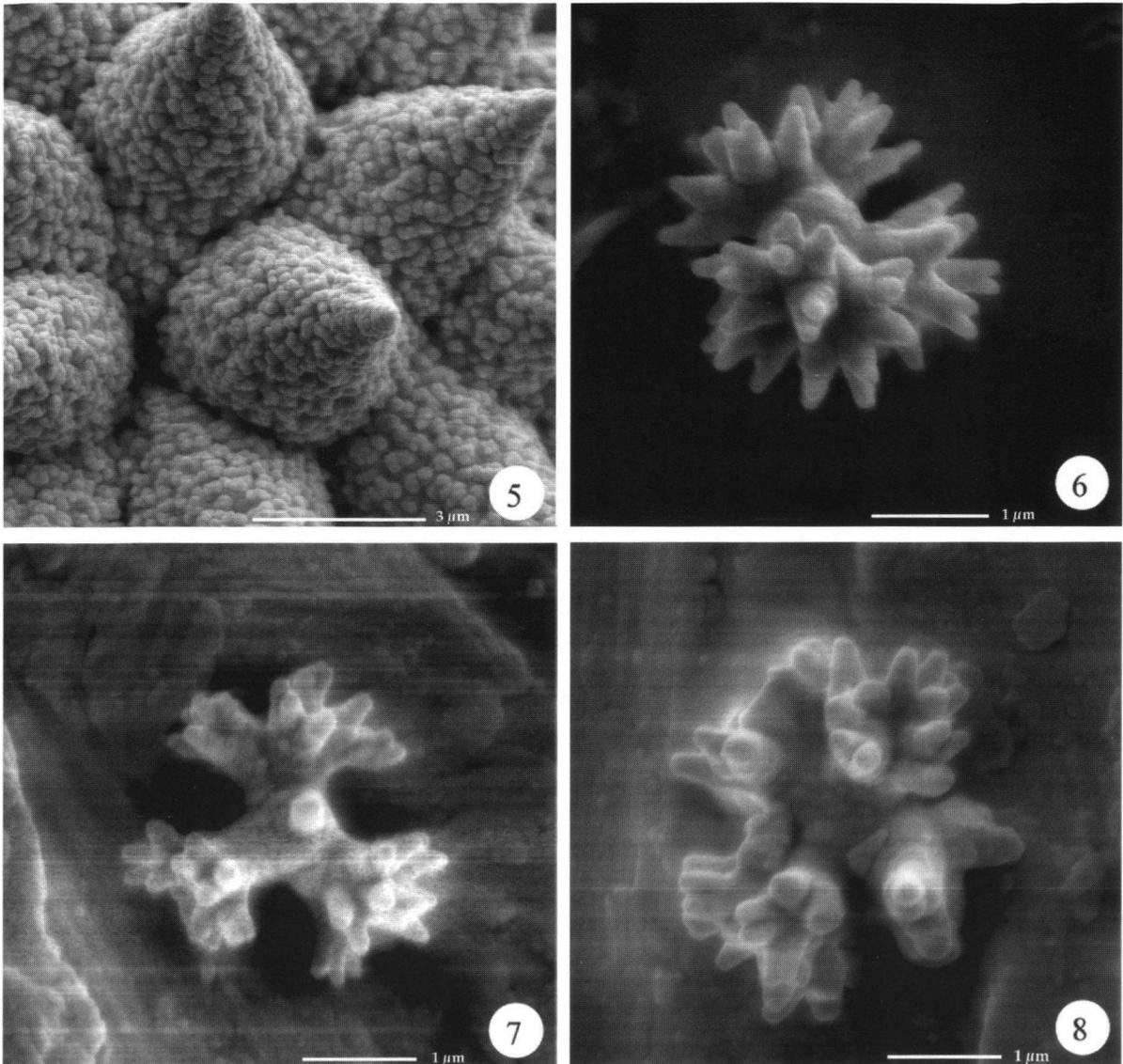
Figs. 1-4. *Timea micraster* n.sp. 1, tylostyle with blunt end. Upper left: tyle. Lower right: blunt tip. 2, fully grown large aster with conical rays and furcate tips. 3, developmental aster with relatively large centrum, more cylindrical rays and furcate tips. 4, developmental aster with conspicuous rough surface, rays not furcate.

arrangement of tylostyles in ascending tracts.

Assignment to *Diplastrella*, as the only alternative to *Timea* within the Timeidae, is excluded because no basal layer of asters is developed and the digitate processes of the rays of the large aster category are regarded different from the branched rays of asters of *Diplastrella*. However, two-lobate specimens of the micrasters could be interpreted as amphi- or diplasters which would be an argument for placing the new species in *Diplastrella* but, as three- and four-lobate specimens of the same spicule-type exist in consider-

able numbers they are regarded as irregular shaped asters as known from other species of *Timea* (cf. *T. tristellata* Topsent, 1900; *T. geministellata* Pulitzer-Finali, 1977).

COMPARISON TO OTHER KNOWN SPECIES OF *TIMEA*. - *Timea stellata* (Bowerbank, 1866), type species of *Timea*, differs in being yellow and in spicule dimensions (Table 1) as well. Schmidt (1870) mentioned a sponge from Florida which is probably a *Timea*. He wrote that it should be placed in the Museum of Cambridge as *Tethya* ?



Figs. 5-8. *Timea micraster* n.sp. 5, detail of rough surface of developmental aster in Fig. 4. 6-8, variability of small aster category.

*innocens* N., but that the specimen available would not be enough for a complete investigation. The description of characters (: 51) is sufficient to recognize the genus *Timea*, as Schmidt describes a spiculation of tylostyles and asters in which the asters form a dermal crust, but he gives no measurements of the spicules and without re-examination of the specimen mentioned, it must be regarded unrecognizable.

*T. parasitica* (Higgin, 1877) differs in having a considerably bigger small aster category. Arndt, 1927 classified *Suberites stelligerus* Carter, 1882 as

member of the genus *Timea*. This species was also reported from the Azores by Topsent (1904) as *Hymedesmia stelligera* (Carter). It has two categories of tylostyles and chiasters with 12-13 μm diameter. The spiculation with two categories of tylostyles, and only one aster category of different size separates it from *T. micraster* n.sp. *T. unistellata* (Topsent, 1892) has smaller tylostyles and only one size category of asters. *T. (?) tristellata* (Topsent, 1892) has only one aster category which is of similar shape as the micrasters in our new species but of completely different dimensions

Table 1. Caribbean, Atlantic and Mediterranean species of Timeidae.

Species	Author/year	Tylostyles ( $\mu\text{m}$ )	Small asters	Large asters	Distribution
<i>Diplastrella bistellata</i>	(Schmidt, 1862) <sup>4</sup>	320-620 x 6.5-14		13-50, diplasters	Mediterranean
<i>Diplastrella ornata</i>	Rützler & Sarà, 1962 <sup>4</sup>	320-800 x 13-26		up to 86, diplasters	Mediterranean
<i>Diplastrella megastellata</i>	Hechtel, 1965	253-841 x 9-26	9-20	29-79, spherasters, branched rays	Caribbean
<i>Timea stellata</i>	(Bowerbank, 1866) <sup>2</sup>	170-1000 x 1-15	13-15, chiasters		NE-Atlantic/Mediterranean
<i>Telthya ? innocens</i> N.	Schmidt, 1870	probably member of <i>Timea</i>	but species unrecognizable		Florida
<i>Timea parasitica</i>	(Higgin, 1877)	508 x 7.26	12.7, tylasters	25.4, spherasters	Caribbean
<i>Timea (?) stelligera</i>	(Carter, 1882) <sup>3</sup>	90-550 x 2-4 and large category to 1700 x 6-12	12-13, chiasters		
<i>Timea unistellata</i>	(Topsent, 1892)	230-280 x 3-4.5		20-25, spherasters	Caribbean, Azores
<i>Timea (?) tristellata</i>	(Topsent, 1892)	230-280 x 3-4.5	17-20, 'spherasters triples'		Mediterranean
<i>Timea halilezi</i>	(Topsent, 1894)	300-750 x 2-10	10-12, spherasters		Mediterranean, Azores
<i>Timea mixta</i>	(Topsent, 1896) <sup>1</sup>	200-1150 x 1.5-12.5	3-5, chiasters	10-17, oxyasters	NE-Atlantic
<i>Timea crassa</i>	(Topsent, 1900) <sup>5</sup>	580-990 x 7-14	7-8, tylasters	12-22, oxyasters- strongylasters	Mediterranean/NE-Atlantic/Caribbean
<i>Timea unistellata</i> var. <i>aspera</i>	(Topsent, 1904)	660-1400 x 5-12		20-25, spherasters	
<i>Timea fasciata</i>	Topsent, 1934	240-750 x 5-10	8-13, strongylasters		NE-Atlantic/Mediterranean
<i>Timea perastra</i>	(De Laubenfels, 1936)	540-1888 x 7-13	12, tylasters		Mediterranean/NE-Atlantic
<i>Timea stelfasciata</i>	Sarà & Siribelli, 1960	125-950 x 3-9	7-21, unsymmetrical		Caribbean
<i>Timea irregularis</i>	Sarà & Siribelli, 1960	320-1100 x 4-10	6-8	two categories: 17-21 & 21-40	Mediterranean/NE-Atlantic
<i>Timea hechteli</i>	(Lirtle, 1963)	211-1015 x 3-12	7-22, chiasters	18-33, spherasters	Mediterranean
<i>Timea stenosciera</i>	Hechtel, 1969	173-252 x 1.7-2.4	4.7-11.8, oxyspherasters	11.8-25.9, spherasters	Caribbean
<i>Timea cumana</i>	Pulitzer-Finali, 1977	210-1600 x 4-20	6-15, strongylasters	16-27, calthrops-like	Mediterranean
<i>Timea geministellata</i>	Pulitzer-Finali, 1977	400-650 x 5-7	9-11, chiasters	15x15, 2-4 branches!	Mediterranean
<i>Timea bifidostellata</i>	Pulitzer-Finali, 1983	230-600 x 4.5-9.5	11-16, spherasters	27-44, spheroxyasters	Mediterranean
<i>Timea simplistellata</i>	Pulitzer-Finali, 1983	1600-2500 x 12-21		15-30, spherasters	Mediterranean
<i>Timea micraster</i> n.sp.		400-700 x 7-10	2-3		Caribbean

<sup>1</sup> Measurements from Wiedenmayer, 1977

<sup>2</sup> Measurements from Topsent, 1900 as *Hymedesmia stellata*

<sup>3</sup> Measurements from Topsent, 1904, as *Hymedesmia stelligera*

<sup>4</sup> Measurements from Pulitzer-Finali, 1977

<sup>5</sup> Measurements from Pulitzer-Finali, 1983

(Table 1). In 1918 Topsent moved this species (: 552) to *Spirastrella*, so that its genus assignment seems to be doubtful at the moment. *Timea hallezi* (Topsent, 1894) has only one aster category in size between the two categories of *T. micraster* n. sp.

*Timea mixta* Topsent, 1896 is according to Wiedenmayer 1977 (: 170): "ochre tending towards orange" in life, while the dry specimen was reported as beige. The new species is bright orange in life and in ethanol. Tylostyles of *T. micraster* n.sp. have a narrower size range. The most striking differences between the two species are the large spherasters of *T. micraster* n.sp. which are twice the diameter of *T. mixta*'s asters and the two- to four-lobate asters are half the size of *T. mixta*'s small chasters.

*Timea crassa* (Topsent, 1900) has larger tylostyles, the small aster category is described as tylasters and considerably larger than the small asters, while the large aster category of *T. crassa* is smaller than in *T. micraster* n.sp.

*Timea unistellata* var. *aspera* (Topsent, 1904) has only one aster category and tylostyles of twice the length as in the newly described species.

*Timea fasciata* Topsent, 1934 has only one aster category of strongylasters which do not correspond, neither in size nor in shape, to one of the categories in *T. micraster* n.sp.

*Halicometes perastra* De Laubenfels, 1936 was transferred to *Timea* by Hechtel (1969) and has much longer tylostyles and one category of asters of different shape and size as any of the asters present in our new species. Furthermore, *Timea* (?) *perastra* (De Laubenfels, 1936) is recorded as cylindrical and thus violates the definition of Timeidae as encrusting sponges (cf. Levi, 1973; Bergquist, 1978), and so affiliation to the family is questionable.

*T. stellifasciata* Sará & Siribelli, 1960 has only one category of unsymmetrical asters of a relatively wide size range.

*T. irregularis* Sará & Siribelli, 1960 has longer tylostyles and is reported to possess three categories of asters.

*Halicometes stellata* Little, 1963 was transferred to *Timea* by Hechtel (1969: 31). Hechtel recognized that *T. stellata* (Little, 1963) has two categories of asters and is therefore obviously not conspecific with *T. stellata* (Bowerbank, 1866)

which has only one. Accordingly this species needs a new name. As Hechtel (1969: 32) recognized that it is not conspecific with *T. stellata* it is suggested to name it *T. hechteli*.

*Timea cumana* Pulitzer-Finali, 1977 has longer tylostyles, calthrope-like large asters and strongylasters as small category which are larger than those in *T. micraster* n.sp.

*T. geministellata* Pulitzer-Finali, 1977 has large asters with two to four branches and a small category of chasters of larger size.

*Timea bifidostellata* Pulitzer-Finali, 1983 has only one category of spherasters.

*T. simplistellata* Pulitzer-Finali, 1983 has extremely larger tylostyles and only one category of considerably large asters.

Species removed from *Timea*: *Hymedesmia chondrilloides*, Topsent, 1904, moved to *Timea* by Topsent, 1928 and *Timea stellata* var. *stylifera* Arndt, 1927 do not belong to Timeidae as both species have a spiculation of styles and asters. *Columnitis squamata* Schmidt, 1870 was transferred to *Timea* by De Laubenfels 1932 but was recently adopted as a valid genus of Tethyidae (Sarà & Bavestrello, 1996). *Cometella stellata* Schmidt, 1870, type species of *Halicometes* Topsent, 1898 is reported to possess anisostrongyles and two types of asters and belongs to Tethyidae (Sarà, 1994).

DISTRIBUTION. - As one of the species (*Timea mixta* Topsent, 1896) is reported from the Caribbean and the Mediterranean we decided to compare *T. micraster* n.sp. with all species from the Atlantic-Mediterranean area. However, *Timea* is a widely distributed genus and numerous records exist from other seas (cf. Carter, 1880; Hentschel, 1909; Hooper, 1986).

#### KEY TO ATLANTIC AND MEDITERRANEAN SPECIES OF *TIMEA*

1. Asters in:
  - a. One size-category ..... 2
  - b. Two size-categories ..... 9
  - c. Three size-categories ..... *T. irregularis*
2. Asters are:
  - a. Strongylasters ..... 3
  - b. Spherasters ..... 4
  - c. Tylasters ..... *T. perastra*
  - d. Asymmetrical ..... 8

3. Strongylasters only:
  - a. Tylostyles 170-1000  $\mu\text{m}$  long, strongylasters over 12  $\mu\text{m}$  in diameter ..... *T. stellata*
  - b. Tylostyles 90-1700  $\mu\text{m}$  long, probably in two size-categories, asters over 12  $\mu\text{m}$  in diameter ... *T. stelligera*
  - c. Tylostyles 240-750  $\mu\text{m}$  long, asters around 8  $\mu\text{m}$  in diameter ..... *T. fasciata*
4. Spherasters only:
  - a. Spheroxyasters, very long, 1.5-2.5 mm, tylostyles ..... *T. simplistellata*
  - b. Tylostyles shorter, below 1.5 mm ..... 5
5.
  - a. Spherasters 20-25  $\mu\text{m}$  in diameter ..... 6
  - b. Spherasters 10-16  $\mu\text{m}$  in diameter ..... 7
6.
  - a. Tylostyles 660-400  $\mu\text{m}$  ..... *T. unistellata* var. *aspera*
  - b. Tylostyles 230-280  $\mu\text{m}$  ..... *T. unistellata*
7.
  - a. Spherasters 10-12  $\mu\text{m}$  in diameter, NE-Atlantic distribution ..... *T. hallexi*
  - b. Spherasters 11-16  $\mu\text{m}$  in diameter, Mediterranean distribution ..... *T. bifidostellata*
8. Asymmetrical asters:
  - a. Tylostyles of a narrow size range, 230-280  $\mu\text{m}$  long, 'spherasters triples' ..... *T. tristellata*
  - b. Tylostyles of a wide size range, 125-950  $\mu\text{m}$  ..... *T. stellifasciata*
9. Two size-categories of asters:
  - a. Small category tylasters ..... 10
  - b. Small category spherasters ..... *T. stenoclara*
  - c. Small category strongylasters ..... 11
  - d. Small category irregular, 2-3  $\mu\text{m}$  in diameter, surface of ridges with furrows ..... *T. micraster* n.sp.
10. Small category tylasters:
  - a. Tylasters up to 12.7  $\mu\text{m}$  in diameter, Caribbean distribution ..... *T. parasitica*
  - b. Tylasters 7-8  $\mu\text{m}$  in diameter, Mediterranean distribution ..... *T. crassa*
11. Small category strongylasters:
  - a. Large aster category calthrope-like ..... *T. cumana*
  - b. Strongylasters 3-5  $\mu\text{m}$  in diameter, large category oxyasters ..... *T. mixta*
  - c. Strongylasters above 5  $\mu\text{m}$  in diameter ..... 12
12.
  - a. Strongylasters up to 22  $\mu\text{m}$  in diameter, large category spherasters, 18-33  $\mu\text{m}$  in diameter ..... *T. hechteli*
  - b. Strongylasters 9-11  $\mu\text{m}$  in diameter, large category irregular with 2-4 branches, 15 x 15  $\mu\text{m}$  ..... *T. geministellata*

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