Italian Journal of Zoology, June 2006; 73(2): 191–194

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A new species of *Cliona* (Demospongiae, Hadromerida) from the Mediterranean Sea

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(Received 6 October 2005; accepted 9 January 2006)

Abstract
A new species of the genus *Cliona* is described: *Cliona spissaspira* sp. n., collected at 1 m depth in a shallow bay of the Ionian coast of Apulia (Southern Italy). The species, erected on the basis of the finding of two small specimens, shows a boring habitus, with an irregular pattern of galleries and spaciously distributed perforating chambers. Its colour varies from orange to light brown. The spiculation consists of short robust tylostyles, together with smooth thick spirasters. The latter vary in length and shape, and constitute the main diagnostic character of the species. The affinity of these species with other Mediterranean Clionaidae is discussed.

Keywords: *Boring sponges, Cliona, new species, Mediterranean Sea*

Introduction

The Ionian sponge fauna remains poorly known in spite of a large number of studies on the taxonomy and distribution of Mediterranean sponges which, however, mainly refer to the western coasts (see Pansini & Longo 2003).

The genus *Cliona*, erected by Grant (1826) for *C. celata*, comprises sponges boring into calcareous substrata (both organogenic and inorganic), displaying three different stages of growth: alpha (excavating, with inhalant and exhalant papillae protruding from the substrate), beta (encrusting) and gamma (massive) (Rosell & Uriz 1997). Mega and microscleres are mainly represented by tylostyles and spirasters, respectively, the latter frequently showing amphiastrose modifications or lacking spines, thus turning into entirely smooth forms. According to Rosell & Uriz (1997), such microscleres are to be considered as sinuous microstrongyles rather than streptasters. On the basis of this assumption the latter authors suggested the edification of the genus *Bernatia* for *B. vermifera* (Hancock, 1867) (=*C. vermifera*).

The genus *Cliona* is distributed worldwide, with more than 100 species described (Rützler 2002a). Pansini & Longo (2003) report 12 species belonging to this genus for the Mediterranean. They agree with Rosell & Uriz (1991, 1997, 2002) who consider *C. copiosa* Sarà, 1959, *C. nigricans* (Schmidt, 1862) and *C. tremitensis* Sarà, 1961 as different growth stages of *C. viridis* (Schmidt, 1862) (the so called "*Cliona viridis* complex"). However, two of these species, *C. copiosa* and *C. nigricans*, are accepted by several authors, who support their existence on the basis of morphological and ecological observations (Rützler 1973; Corriero 1989; Barbieri et al. 1995; Calcinai et al. 1999).

Nine species of *Cliona* (namely *C. topsenti* (Lendenfeld, 1896), *C. vermifera*, *C. celata*, *C. copiosa*, *C. nigricans*, *C. rhodensis* Rützler & Bromley, 1981, *C. parenzani* Corriero & Scalera Liaci, 1997, *C. schmidti* (Ridley, 1881) and *C. viridis*) have been reported for the Ionian Sea (Pulitzer-Finali 1983; Corriero et al. 1984; Corriero 1990; Corriero & Scalera Liaci 1997; Pansini & Longo 2003). The present work describes a new species of *Cliona*, *C. spissaspira*, collected along the Ionian coast of Italy (Porto Cesareo, Apulia). This finding brings to 10 the total number of Ionian species known for the genus.

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ISSN 1125-0003 print/ISSN 1748-5851 online
DOI: 10.1080/11250000600679496

Materials and methods

The investigated specimens were sampled from the hard bottoms of the Strea Basin (Figure 1), near Porto Cesareo (Ionian sea, 40°15′ N, 17°54′ E), at a depth of 1 m.

The collected material was fixed with formaldehyde (4% in seawater) and preserved in ethanol (70%). Transverse sections, perpendicular to the surface, of paraffin-embedded sponges were prepared in order to study the spicular arrangement. Spicule preparations were made by dissolving sponge fragments in boiling nitric acid. Ranges and mean spicule sizes were calculated from 50 measurements for each type of spicule. For SEM micrographs, spicule mounts were covered with gold-palladium and observed under a Philips scanning electron microscope.

Taxonomic account

CLIONAIDAE D'Orbigny, 1851

Cliona Grant, 1862

Cliona spissaspira n. sp.

Material examined

MZB POR PC 59, holotype; MZB POR PC 59a, paratype. The material was collected by G. Corriero on 21 May 2001. Holotype, paratype and slide preparations are deposited in the Zoology Museum of the Bari University.

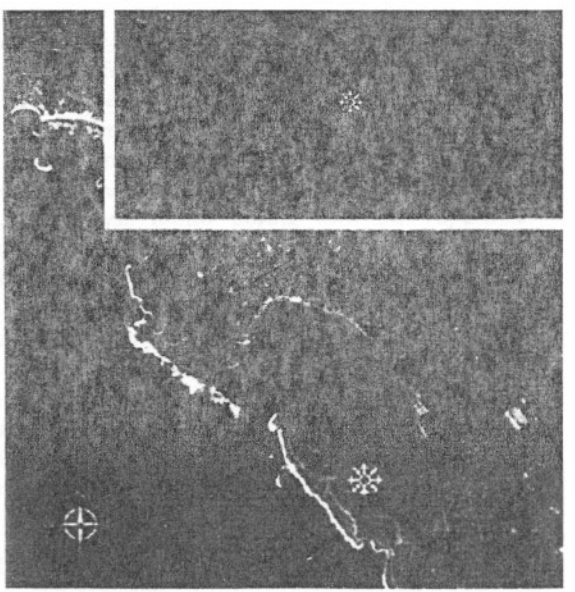

Figure 1. Porto Cesareo, Strea Basin: location of sampling site.

Description

Two small specimens boring in the calcareous rocky platform, whose presence is revealed by protruding papillae covering about 3 and 5 cm^2 of substrate, respectively. Colour: red, orange, brownish in live specimens, brown in ethanol. The cylindrical papillae (0.25–1.5 mm in diameter) show a verrucose surface bearing either grouped ostia or oscula at the top. Consistency: fleshy. An irregular arrangement of galleries and spaciously distributed perforating chambers is recognizable. They are spherical or subspherical and measure from 0.5 to 1.5 mm in diameter.

Skeletal arrangement. The skeleton consists of tylostyles and spirasters, the latter mainly confined to the choanosome around the canals of the aquiferous system. The ectosome is reinforced by vertically arranged tylostyles, whose tips slightly protrude from the sponge surface. In the choanosome, tylostyles lie predominantly tangential to the substrate. Sand particles are always found embedded in the sponge tissue.

Spicules. Robust tylostyles with a well-developed head and a sharp point, gradually tapering from the middle of the shaft. They measure 144–264 µm (227.8 ± 45.3 µm) in length × 4–5.4 µm (4.3 ± 0.4 µm) in width; their heads are 6–8.4 µm (6.9 ± 0.6 µm) in diameter (Figures 2A, C; 3A–D). They may occasionally present a rounded end (Figure 3E).

Smooth spirasters, C-shaped or elongated, with or without undulations; their dimensions are 65–92 µm (77.8 ± 14.1 µm) × 8–12 µm (10.2 ± 2.1 µm) (Figure 3F–M). Shorter and thicker spirasters (about 40 µm long, up to 20 µm thick) can also be found (Figure 2B, C).

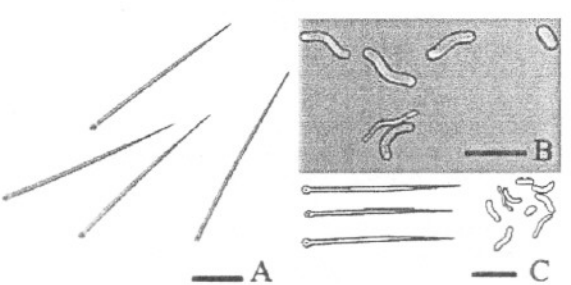

Figure 2. **A, B.** Light micrographs of *Cliona spissaspira* n. sp. **A.** Tylostyles. **B.** Smooth spirasters of different thickness and length. **C.** Drawing of spicules. Scale bars: **A, C.** 50 µm. **B.** 80 µm.

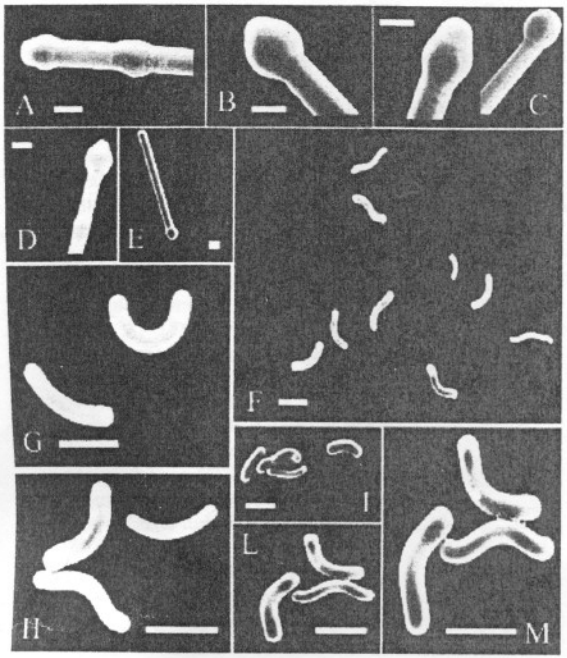

Figure 3. SEM micrographs of *Cliona spissaspira* n. sp. **A–D**. Heads of tylostyles. **E**. Modified tylostyle with rounded end. **F–M**. Smooth spirasters of different thickness. Scale bars: **A–E**. 5 µm. **F–M**. 50 µm.

Ecology

The species inhabits the Strea, a small sheltered basin close to Porto Cesareo, along the Ionian Apulian coast, characterized by high water exchange with the sea and by depths of less than 3 m. The basin is very rich in calcareous substrates consisting of wide platforms and stones of different sizes. This is an elective habitat for sponges, which constitute the main component of the zoobenthos (Mercurio et al. 2001), among which boring sponges show high species richness and abundance (Corriero 1990). *C. spissaspira* was found boring into the superficial portion of the carbonatic platforms (down to 2 cm under the rocky surface), at 1 m of depth. In addition to *C. spissaspira* other boring sponges occur in this habitat: *C. celata*, *C. viridis*, *C. copiosa*, *C. schmidti*, *C. parenzani* and *Pione vastifica* (Hancock 1849). The latter species, which shows oxeas as main spicules, may be confused in the field with *C. spissaspira* due to the similar size and colour of its papillae.

Etymology

The presence of thick spirasters suggested the name of the species.

Conclusive remarks

The main diagnostic character of the species here described consists of the occurrence of thick smooth spirasters with variable shape and undulation reduced to no more than 1 or 2 curves, sometimes completely lacking. Smooth or delicately microspinulated spirasters are frequent in the boring genus *Spiroxya* and *Pione* (Calcinai et al. 2000; Rützler 2002b), but are relatively uncommon among clionid species. Smooth spirasters occur in *C. vermifera*, a species with a wide geographical distribution (Mediterranean Sea, Atlantic and Indo-Pacific Ocean), which shows a spicular pattern very close to *C. spissaspira* (Hancock 1867; Rützler 1974). In particular, in *C. vermifera*, spirasters are constantly smooth and undulated and measure from 16 to 77 µm in length × 1–5 µm in thickness. The megascleres are constituted by tylostyles, longer (133–445 µm) and thicker (3–9 µm) than in *C. spissaspira*. Smooth microscleres also occur in *C. parenzani*, where they coexist with spinulated ones, very similar in shape and size, thus supporting the hypothesis of a common origin of these spicules. This pattern clearly results from the SEM images of the microscleres of *C. parenzani*, showing spinulated and smooth spirasters together with transitional forms with strongly reduced spines (Corriero & Scalera Liaci 1997, figure 4, p. 73). Therefore, in agreement with Rützler (2002), the lack of spines on the microscleres of these sponges may be considered as a minor modification, and does not justify the erection of the separate genus *Bernatia* proposed by Rosell & Uriz (1997).

Acknowledgements

This paper was financially supported by the Italian Ministero dell'Università e della Ricerca Scientifica e Tecnologica funds (ex MURST 60%). All the experiments complied with the current Italian laws. We appreciate the constructive criticism of the reviewers that helped to improve the paper.

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