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Clathrina clara (Calcarea: Clathrinida: Clathrinidae) as foulers on onshore farmed oysters (*Pinctada fucata*)

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A calcareous sponge species was observed as a fouler in the onshore oyster culture tanks at Visakhapatnam Regional Centre of Central Marine Fisheries Research Institute (CMFRI). The sponge was collected and preserved for further studies. The material was deposited in the CMFRI museum. The species was identified as Clathrina clara *(family Clathrinidae, order Clathrinida, subclass Calcinea, class Calcarea). The species is being recorded for the first time from Indian waters.*

Keywords: Clathrinidae, *Clathrina clara*, fouler, oyster, *Pinctada fucata*

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INTRODUCTION

Sponges are among the most ancestral metazoans (Medina *et al.*, 2001) and may hold many clues to our understanding of the evolution of early animal and developmental processes (Martindale, 2005). The 'World Porifera Database' enlists 8132 valid species of sponges (van Soest *et al.*, 2005). Sponges, besides their fundamental role in marine ecological processes, are an important source of secondary metabolites, useful for mankind in the pharmaceutical industry. However, of late, there has been a continuous threat to these sessile organisms due to habitat destruction and indiscriminate fishing activities (Vinod *et al.*, 2007).

A sharp divide is apparent between information known about deep-water sponges and more poorly known, but richer, shallow-water sponges (Barnes & Bell, 2002). Sublittorally, sponges are found mainly on hard rock substrates, but can occur on algae, or even loose on stable sediment bottoms (Picton *et al.*, 2007). Massive or erect sponges are usually easy to spot, whereas encrusting sponges can be more cryptic owing to their small size and/or location (Picton *et al.*, 2007).

A study on the diversity and taxonomy of sponges from different waters is of paramount importance as sponges are known to have both historical and evolutionary significance (Hooper & van Soest, 2002). Many sponge species are notoriously difficult to identify, because morphological characters for comparative morphology are scarce and prone to homoplasies, highly variable or otherwise unsuitable for unambiguous identification and hence have frequently been regarded as widely distributed ('cosmopolitan') (Wörheide *et al.*, 2007).

The class Calcarea (especially the Calcinea) has a reputation of being obscure and taxonomically difficult (Manuel *et al.*, 2002). However, the use of numerical analyses of shape, size and distribution of spicules, and detailed histology have thrown new light on the classification of Calcarea, revealing that the species diversity in calcareous sponges is much higher than was previously expected (Wörheide & Hooper, 1999, 2002; Borojevic & Klautau, 2000; Rapp *et al.*, 2001; Rapp, 2004a, b).

The history of spongology of the Indian Ocean is rather a short one (Thomas, 2000). Thomas (1983) described 481 species of marine sponges while only 451 species have been reported from India by Pattanayak (1999). Sponges of class Demospongia are represented by the maximum number of species forming 88.8% followed by class Hexactinellida which represents 9.1% and the least by class Calcarea having only 2.1% of the total marine sponges from the Indian region (Thomas, 1983). There is a close relationship of the sponge fauna of the Indian Seas with that of the Australian region, Red Sea and the Pacific Ocean (Thomas, 1983). The sponge fauna of the Indian region is known from the papers of Carter (1887), Dendy (1916), Burton (1930, 1959), and Thomas (1968, 1984). Along the east coast of India Dendy (1887) and Ali (1954) described the sponge fauna of Madras while those of Orissa State were investigated by Annandale (1915) and Bapuji *et al.* (1999). Comparatively, poor data are known on the shallow-water marine sponge fauna of peninsular India. Shallow-water marine sponges collected from India were studied by Burton & Rao (1932).

Sponges are well known for their association with other animals and plants (Bowerbank, 1873; Dendy, 1905, 1921; Annandale, 1911, 1914; Devanesan & Chacko, 1941; Rao, 1941; Nayar & Mahadevan, 1965). Sponges are known to occur as foulers and also in association with oysters (Annandale, 1914; Dharmaraj *et al.*, 1987).

The aim of the present paper is to identify and report information about a calcareous sponge found during the routine cleaning operations of onshore oyster *Pinctada fucata* culture tanks.

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MATERIALS AND METHODS

A sponge sample was collected from the onshore pearl oyster (*Pinctada fucata*) culture tank of 1-ton capacity at a depth of a metre at Visakhapatnam Regional Centre of Central Marine Fisheries Research Institute (CMFRI). *In situ* information was first recorded, and photographs were taken using a Sony W220 camera. Laboratory studies encompass external morphology and skeletal arrangement. Morphology was noted and the specimen was observed under a stereomicroscope in order to analyse the anastomosis pattern of the cormus, distribution of oscula and the presence or absence of water-collecting tubes. The samples were preserved in ethanol for further study. Skeletals and spicules analysis was done using an Olympus compound microscope 10× and 40× objectives. Sections were prepared in order to analyse the organization of the skeleton and establish the presence or absence of cells with granules. The section was hand-cut using a clean scalpel mounted on a slide and analysed. For the spicule analysis, small pieces of the cormus were transferred to test tubes and dissolved in bleach. After digestion of the soft tissue, the spicules were spread out on microscopic slides and analysed. Measurements (length and width) of 34 spicules of each type were taken using an ocular micrometer. The results are presented in tabular form, featuring length (number, minimum, mean, maximum and SD [σ]) and width (number, mean and SD). Microphotographs of the spicules and sections were taken. Identification was done using the key and guide given by Hooper (2000), Klautau & Valentine (2003) and Picton *et al.* (2007).

SYSTEMATICS

Class CALCAREA Bowerbank, 1864
Subclass CALCINEA Bidder, 1898
Order CLATHRINIDA Hartman, 1958
Family CLATHRINIDAE Minchin, 1900
Genus *Clathrina* Gray, 1867
Clathrina clara Klautau & Valentine, 2003
(Figures 1–2)

Synonym: *Clathrina coriacea* (Montagu, 1818).

ETYMOLOGY

Latin *clarus* (= bright). Describing the bright surface (Klautau & Valentine, 2003).

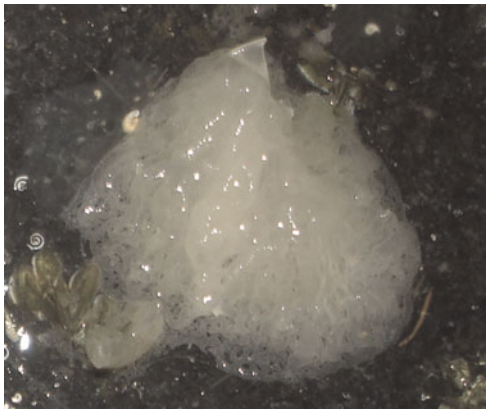

Fig. 1. *Clathrina clara*: specimens found on *Pinctada fucata* shell.

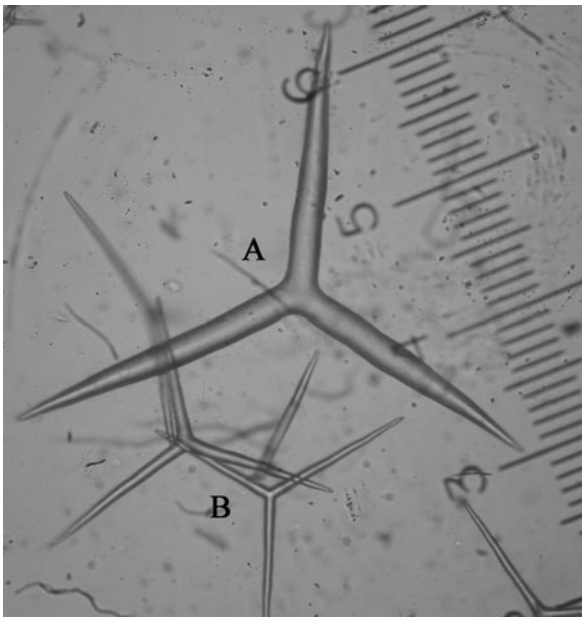

Fig. 2. Light microscopy view of *Clathrina clara* spicules: (A) large triactines; (B) small triactines.

TYPE MATERIAL

Diameter: 18 mm; station: onshore tanks at Visakhapatnam Regional Centre of CMFRI; VSCC1, coll. S. Veena, 12 August 2010.

DESCRIPTION

Colour: live sponge was white and after preservation, light brown.
Consistency: soft and delicate.
Odour: none.
Contraction: no noticeable contraction when the animal was compressed.

DIAGNOSIS

Small, flat but not tubular and has meshes consisting of a network of thin walled tubes which are a compact mass attached directly to the substrate. The surface cormus comprises tightly-knit tubes, several tubes joining to share one common oscule, slightly raised above the surface (Figure 1). There are no erect free branches. Cells with granules were not observed. The skeleton comprises two size-classes of equiangular and equiradiate triactines (Figure 2). Actines are conical and straight, with a sharp tip. The large triactines are located only in the external tubes, delimiting the cormus, while the smaller triactines are found inside the cormus. The measurements are all tabulated (Table 1).

Table 1. Spicule measurements of *Clathrina clara* Klautau & Valentine, 2003.

	Length (μm)					Width (μm)		
	No.	Min.	Mean	σ	Max.	No.	Mean	σ
Small triactines	34	110.0	175.0	33.2	240.0	34	10.0	2.9
Large triactines	34	300.0	330.0	21.3	360.0	34	18.0	2.1

No., number; Min., minimum; σ, standard deviation; Max., maximum.

HABITAT

The species was observed as a fouler on the oyster (*Pinctada fucata*) in onshore culture tanks.

REMARKS

Symbiotic association between this sponge and the oyster was noted since there was no external or internal damage observed on the oyster.

DISCUSSION

The genus *Clathrina* is defined almost exclusively by negative characters (Borojevic & Boury-Esnault, 1987). Moreover, its skeleton is also simple, comprising only a few spicule types: diactine, triactine and/or tetractine. The genus *Clathrina* is represented by more than 40 described species in all seas (Klautau & Valentine, 2003). The classification is difficult due to the existence of only a few, easily recognizable morphological criteria that can be used as descriptors, especially in species whose skeleton is composed only of triactines (Borojevic & Boury-Esnault, 1987).

The use of statistical analyses of shape, size and distribution of spicules has thrown new light on the classification of the group, and previous numbers of species in any given geographical area are expected to be underestimated (Thomas, 1996; Wörheide & Hooper, 1999; Borojevic & Klautau, 2000; Klautau & Borojevic, 2001; Rapp *et al.*, 2001; Klautau & Valentine, 2003; Rapp, 2004b).

The present species identification was done by studying the type of spicules and pattern of spicule arrangement. The large size of the triactines that remain on the surface of the tubes in *Clathrina clara* is enough to differentiate it from the other clathrinas (Klautau & Valentine, 2003). The next feature is the tip of the actines which is sharp in *Clathrina clara* similar to that noted by Klautau & Valentine (2003) whereas for the other species (blunt in *C. ceylonensis*, conical in *C. coriacea* and cylindrical in *C. clathrus*) as noted by Hooper (2000), Klautau & Valentine (2003) and Picton *et al.*, (2007). Hence these species were all ruled out. However, the species *Clathrina primordialis* is similar to *C. clara* since both have the tip of actines sharp and also two size-classes of triactines (Klautau & Valentine, 2003). But it is easy to differentiate the two species by the anastomosis of the tubes (tight in *Clathrina clara* and loose in *C. primordialis*), and by the size of the spicules (Klautau & Valentine, 2003). As recorded by Klautau & Valentine (2003) the length and thickness of the two size-classes of triactines of *Clathrina primordialis* are 91.9/9.6; 86.6/11.3 μm, while in *C. clara* recorded in the present study are 175.0/10.0; 330.0/18.0 μm. Hence this species was confirmed as *Clathrina clara*. A note to be made here is that the size of the spicules of *Clathrina clara* differed when compared with the descriptions given by Klautau & Valentine (2003) where they noted these as 84.5/9.8 μm; 164.5/21.8 μm. This difference may be due to the ambient environmental conditions. There are reports of putative environmental influences on spicule size in Demospongiae (Chondrilla) (Solé-Cava *et al.*, 1991; Klautau *et al.*, 1999) and in *H.* (*Cyliconema*) *apertum apertum* (Tabachnick & Menshenina, 2002).

Sponges constitute a major group among 12 different taxa of marine animals and plants which can cause considerable damage to the calcium carbonate secreting animals such as molluscs, corals, barnacles, etc. (Thomas, 2000). Annandale (1911) discussed in detail the association of some sponges with molluscs of the family Vermetidae from the Bay of Bengal and in a later publication (Annandale, 1914) he dealt with similar association with oysters and mussels from the Madras Harbour. Dharmaraj *et al.* (1987) also studied the fouling and association with oysters. In the present study, no damage caused by the sponge to the oyster *Pinctada fucata* was noted during observation for a period of 4 months (August to December) and only symbiotic association was seen between the animals.

The number of calcareous species from the Indian Region, as now understood, comprises a total of ten widespread species (Thomas, 1983). Family Clathrinidae has henceforth not been described from Indian waters except *Clathrina coriacea* from Andaman waters (Pattanayak, 2006). *Clathrina clara* has been identified from the reefs at Christmas Island, Indian Ocean by Klautau & Valentine (2003). The shallow-water sponges from this area have not been recorded and this study reports the identification of the present sample to the species level. This article reports *Clathrina clara* as a new species identified not only from this area but also adds this species as a new record to the taxonomic list for India.

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