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Discovery of *Alectona wallichii* (Carter, 1874) from the Indian seas as a pest of brown mussel with notes on the zoogeography and substratum preference in *Alectona* spp. (Demospongiae: Alectonidae)

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Original Article

Abstract

Ten species of the genus *Alectona* Carter, which are enlisted world over, form a dreadful group of pests of calcium secreting animals in the marine environment. These species were collected in the past from hard parts of Hexacorals, Octocorals, Hydrocorals and also from molluscan shells. In the present study *A. wallichii* (Carter) identified from the brown mussel (*Perna indica* Kuriakose and Nair) collected from Enayam, south west coast of India, forms the first record of *A. wallichii* from a shell, that too of the south west coast of India. Since the previous records of *A. wallichi* are from calcareous rocks and precious coral, it may be inferred that it has succeeded in migrating and establishing in a molluscan shell obviously in the absence of any precious coral communities in the Indian seas. With the present discovery of a species under the queer genus *Alectona*, the total number of valid Indian boring sponge species comes to 37.

Keywords: *Alectona wallichii, dreadful pest, new record, Enayam, southwest coast, India.*

Introduction

Topsent (1900) included *Gummina wallichii* in the genus *Alectona* emphasizing the difference between the two in spicular geometry and measurements. De Laubenfels (1936) considered them synonyms and designated *A. millari* as the Type. Later Bavestrello *et al*. (1998) showed that these two are distinct species. Species of the genus *Alectona* so far reported from the world oceans and their preference to various biogenic substrata are enlisted in Table 1. The total number of species added to the genus *Alectona* was only four during the first 100 years (1874-1974) while six were reported during the next 36 years (1975-2011). Bavestrello and his associates in 1998 could identify 5 species out of the total 8 species known till date, including 2 new species.

According to Calcinai *et al.* (2008) a survey of the literature on boring sponges infesting the precious coral from Mediterranean sea and the Pacific Ocean indicated that species of the family Alectonidae are quite specifically associated to these kind of substrata and their world distribution, in fact, practically or totally overlap that of their coral hosts. While examining the reports and subsequent records of *Alectona* spp. it becomes clear that Indo Pacific area is richer in species than the Atlantic and Mediterranean areas with a few species having overlapping distribution. Out of 10 known species, 7 are distributed in the Indo-Pacific area (Table 1).

Rutzler and Reiger (1973) reported that the boring activity of *Alectona* spp. tends to empty the substrata while common species of *Cliona* produce discrete boring chambers separated

Table 1. Global distribution of *Alectona* spp. and their preference to calcareous substrata

Sl. No	Species	Distribution	Substratum preferred
1	*Alectona millari* Carter, 1879	North Atlantic, Mediterranean	Calcareous rock, red corals
2	*A. wallichii* Carter, 1874	Cape of Good Hope, Japan Sea, Mediterranean, Seychelles	Calcareous rock, red corals and shells*
3	*A. verticillata* Johnson,1899	North Atlantic, Japan Seas	Precious coral
4	*A. primitiva* Topsent, 1932	Australia, Madagascar	Shell and precious coral
5	*A. jamiacensis* Pang 1979	Jamaica	Porites, Acropora (Stony coral)
6	*A. triradiata* Levi and Levi, 1983	New Caledonia, Japan Seas	Calcareous conglomerate, precious coral
7	*A. sorrentini* Bavestrello *et al.*, 1998	Japan seas	Precious coral
8	*A. microspiculata* Bavestrello *et al.*, 1998	Japan seas	Hydrocoral
9	*A. mesatlantica* Vacelet, 1999	Mid Atlantic Ridge	Calcareous rock
10	*A . sarai* Calcinai, *et al.* 2008	Japan seas	Precious coral
11	*Alectona* sp. Bavestrello *et al.*, 1998(1)	Japan seas	Coral fragment

* First record from shell (1)-Known to genus-level only

from one another by narrow canals. Boring sponges of the genus *Thoosa* and *Alectona* (Bavestrello *et al.,* 1998) were common in the Eocene/Miocene coral reefs while in the recent reefs species of the genus *Cliona* dominate. According to the above workers the deep precious coral communities of the Western Pacific, may be interpreted as refuge habitats of these ancient boring species. The above conclusion may very well explain the distribution of *Alectona* spp. in areas where precious coral communities are distributed in the recent oceans.

Extensive investigations were made in the recent past in the Indian seas for boring sponges in general (Thomas, 1986) and specifically for coral borers (Thomas, 1972; 1988) and molluscan borers (Thomas, 1981) but no species of *Alectona* or even an isolated spicule of *Alectona* spp. could be detected from the spicule preparations for boring sponges. The present discovery of *Alectona wallichii* from Enayam may hence be considered as a new infiltration of this species to Indian seas bridging a long gap in its distribution in the Indo Pacific as it was known previously from Cape of Good Hope, Seychelles and the Pacific Ocean.

Material and methods

Brown mussel (*Perna indica* Kuriakose and Nair) form extensive beds along the south west coast of India from Vizhinjam to Kanyakumari (Cape Comorin). A survey of the boring sponge infesting the mussels was undertaken during 1998-2000. Specimens were collected from six main landing centers viz. Vizhinjam, Mulloor, Enayam, Colachal, Kadiyapatnam and Kanyakumari (Fig. 1).

Both bored and unbored mussel shells were measured to estimate the rate of incidence, size frequency distribution, species composition of boring sponges, damage caused to the shell and also to study the pathological manifestations, tissue level changes-chemical or otherwise- in the mantle and adductor muscles akin to sponge boring etc.

Sponge spicules were prepared by boiling sponge infested shell bits in nitric acid (Old, 1941) and sketches were prepared using Camera Lucida (Sunil kumar, 2002).

Results

Definition: Boring sponge possessing diactinal or polyactinal spicules ornamented by conical or mushroom shaped tubercles; different kinds of amphiasters occur together with oxeas.

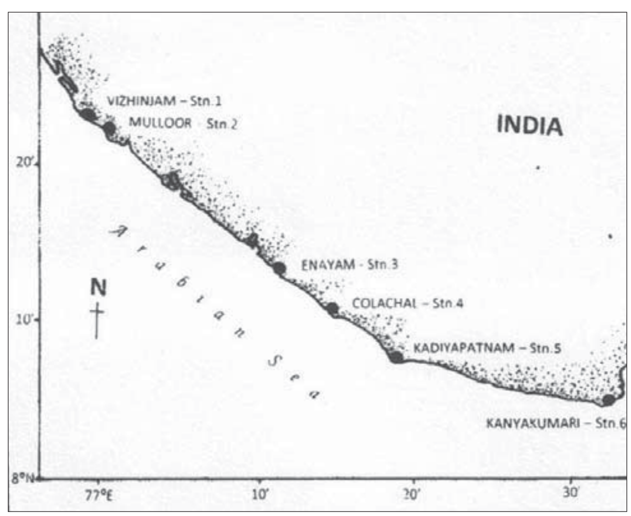

Fig. 1. Map of the south west coast of India showing the six primary data collection centres marked Stn. 1-6

Alectona wallichii (Carter) (Fig.2, a-f)

Synonymy

Alectona wallichii Bavestrello *et al.*, 1998 p.63 fig. 3 A-G

Material: Two infested shells of brown mussel collected from Enayam (Lat. 08° 12'8'' N and Long. 77° 10'8'' E) on 18-12-1998, at a depth of 5-8 m.

Description: In both shells only the umbo part was infested, the number of papillar openings was four in one shell and two in the other indicating that the sponge was in the early stage of development in both shells. Thickness of shell, at umbo part, 1.5-2 mm.

Papillae: The specimens, after collection, were kept in fresh sea water and examined in the laboratory after two hours. The papillae were seen flush with the surface of shell and the papillar openings on the shell varied in diameter from 0.5 to 1 mm.

Colour: Papillae were pale brown when examined. Since the shells were totally used in extracting spicules details regarding the structure of chambers formed inside, etching pattern etc. could not be studied in detail. Examination of spicules revealed that they are not from a sponge so far recorded from the Indian seas. Hence only spicular details are furnished here.

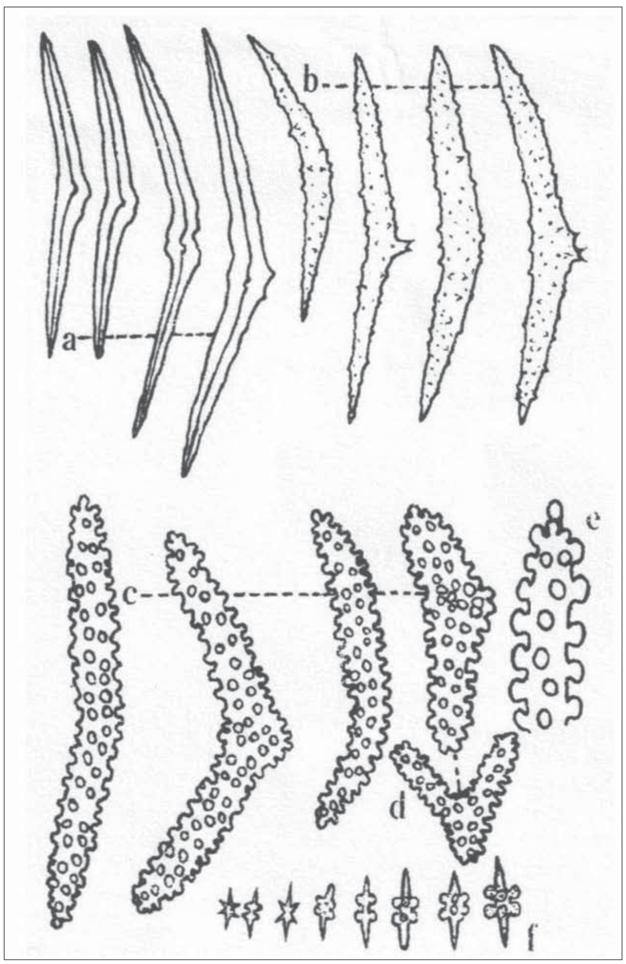

Fig. 2. a-f. Characteristics of spicules of *Alectona wallichii* (Carter, 1874)

Spicules

1. Diacts (smooth) (Fig. 2 a). Smooth and oxea like with a 'kink' at the centre in some, arms asymmetrical and may be wavy in outline; axial canal prominent in some; size, 0.126-0.26×0.016 mm maximum.

2. Diacts (spiny/robust) (Fig. 2 b, c) entirely or partly spined, or tuberculated throughout; tubercles round or mushroom-shaped and often supported with a stalk; magnified and given in Fig. 2 e. Some such spicules may have an additional arm at the centre which may be short and stumpy (Fig. 2 d); size 0.23-0.35 x 0.04 mm maximum, including tubercles; tubercles may measure up to 0.008 mm in diameter.

In the specimen of Bavestrello *et al.* (1998) collected from Pacific, tubercles of this spicule were arranged in longitudinal rows, but such arrangement is not seen in the present spicules as also in two specimens (Nos. SAL 117 and SAL 59) identified as *A. millari* by Pulitzer-Finali (1983, Figs. 29 a and c) from the Mediterranean.

3. Amphiasters (Fig. 2 f). Shaft fusiform with two verticiles of microspined outgrowths at the centre, usually 4 outgrowths in each verticile, but rarely more numbers may be present, rest of the shaft devoid of any such outgrowths, shaft fusiform in only 2 % of the spicules examined, otherwise conical. Spines prominent at tips of shaft and verticiles, other parts microspined or smooth; size, 0.016-0.042 mm when measured tip to tip of shaft.

Examination of the developmental stages in this category indicates that the smaller forms need not be taken as a separate category of amphiasters.

Distribution

Previously known from Agulhas Shoals, Cape of Good Hope; Seychelles and Western Pacific. Pulitzer-Finali (1983) reported it from the Mediterranean Sea. It is now recorded from Enayam, south west coast of India (Arabian Sea)

Discussion

Oxeote and tuberculate diacts seen in the present specimens are much smaller as compared to those recorded by previous workers. Bavestrello *et al*. (1998) recorded 0.631 x 0.038 mm (both maximum) for oxeote diacts and 0.713 x 0.093 mm (both maximum) for tuberculated diacts, and coming to Pulitzer Finali (1983) specimens Nos. SAL 117 and SAL 59, which were recorded as *A. millari*, the tuberculated diacts measured up to 0.46 x 0.054 mm (both maximum). Similarly the range in size of amphiasters is well emphasized by previous workers, but the geometry of which is not well elucidated in most of them. The smallest size recorded was 0.020 mm (Bavestrello *et al.* 1998), 0.010 mm (Pulitzer-Finali, 1983) and 0.016 mm in the present specimens.

The above findings indicate that the size of spicules, in this species, is a highly variable factor though the basic geometry remains constant in all specimens examined by previous/ present workers.

Out of 997 bored shells of mussel examined during the entire period, only two shells collected from Enayam were found infected by *A. wallichii* and from this it may be concluded that it is not posing any threat to mussel fishery at present. It's very low percentage of incidence and the total absence from other centres clearly indicate that it is a new migrant to Indian seas. When once established in a new environment, overcrowded with mussels, it might spread to other centres and also to other species of mollusc/corals. It is stated by Carter (1879) that boring activity of *Alectona* tends to empty the substratum totally and described *A. millari* as the most destructive type ever met with.

The estimated total number of boring sponge species in the Indian seas is 37 including the latest infiltrant-*Alectona wallichii*. This number as compared with that in any other part of the world oceans is too high, and hence it might be concluded that calcium carbonate producing animals of the Indian seas are under severe threat of any large scale devastation by any one or more species distributed in our seas. A long term monitoring on the spreading pattern of *A. wallichii* in the Indian seas will have to be undertaken at this juncture. This will help not only in predicting the destructive phase of the species well in advance, but also in tracing its impact on other conventional boring species of this area. Studies made in the past (Thomas *et al.,* 1983; 1993) showed that the infiltration of *Cliona margaritifera* Dendy and *Cliona lobata* Hancock into the molluscan culture raft at Vizhinjam, around 1980, and their subsequent migration from tended stocks to natural stocks created a lot of short and long term fluctuations in the abundance, population structure, succession pattern etc. of almost all the conventional boring sponge species occurring in the respective beds.

While assessing the numerical representation of boring sponge species along the various centres covered during the present study, the maximum number of 9 could be recorded from Enayam and the genus-wise breakup of species may be given as follows: 1). *Cliona* spp.- 5, 2). *Thoosa* spp.- 2 3). *Aka* sp.- 1 and 4) *Alectona* sp. 1. In all the other centers only species of *Cliona* could be detected. Enayam, hence has quite unique position along the south west coast of India as it harbours 4 genera of boring sponges and may be reckoned as a major centre of boring sponge distribution/recruitment.

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