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FIRST RECORD OF BLACK CORAL ASSOCIATED SEA ANEMONE (*NEMANTHUS ANNAMENSIS* CARLGREN 1943; FAMILY NEMANTHIDAE) FROM INDIA

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INTRODUCTION

Information on Actiniarian sea anemone in Andaman & Nicobar Archipelago were limited to the works of Parulekar (1967, 1968, 1969a, b, 1971 & 1990), until two recent works of Madhu and Madhu (2007) and Raghunathan *et al*. (2014) which reported 20 species from this locality. Of which, five species are new records to India and one species is new distributional record to Andaman and Nicobar Islands.

One specimen belonging to Nemanthidae, is for the first time observed in Indian waters from the Andaman Sea. The family Nemanthidae is monogeneric with the genus *Nemanthus* containing three species described so far, viz. *N. nitidus* (Wassilieff, 1908), *N. californicus* Carlgren, 1940 and *N. annamensis* Carlgren, 1943 (Fautin, 2008; Excoffon *et al.*, 2009). The specimen reported here is identified as *Nemanthus annamensis* and observed to be associated with a black coral. In an earlier observation this species was attached on to the carapace of the crab *Lauridromia intermedia* (Laurie, 1906) (Lavaleye & den Hartog, 1995). The morphology of the specimen obtained is described in this paper.

Interspecific relationships between Actiniarian sea anemones and other macrobenthos, such as sponges, amphipod crustaceans, pycnogonids, nematodes and cirratulid polychaetes (Excoffon *et al*., 1999; Sanamyan *et al*., 2012) and closer associations, such as mutualism (symbiosis) with dinoflagellate protists as well as the commensalism with clownfishes, hermit crabs and shrimps (Gohar, 1934 & 1948; Fautin and Allen, 1992; Fautin *et al*., 1995 and Elliott *et al*., 1999; Bach & Herrnkind, 1980) and parasitism with pycnogonids, bernacles and black corals (Mercier & Hamel, 1994; Yusa & Yamato, 1999; Ocana *et al*., 2004; Excoffon *et al.,* 2009) were reported.

The present paper provides morphological description, ecological and geographical distribution of the newly recorded sea anemone associated with black coral.

MATERIAL AND METHODS

The individual of sea anemone was collected by hand picking from the subtidal region of North Andaman Coast by SCUBA diving at 15m depth during 2014 (Fig. 1A). Collected specimen was relaxed by the addition of magnesium chloride crystals with seawater in the field (Fig. 1B) and later fixed in 10% phosphate buffered formalin (PBF) and was then preserved in 70% ethyl alcohol (Haussermann, 2004).

Key words: Sea anemone, new record, black coral, Andaman and Nicobar Island, India

The external characters of specimens was critically observed in *in situ* and also examined under a stereozoom microscope. The family level taxonomic character was identified by observing the peculiarity of tentacular structures, the arrangement of tentacles in sea anemones and special colour pattern of column. The specimen was identified to the species level according to Lavaleye & den Hartog (1995), Fautin *et al*. (2007) and Excoffon *et al.* (2009).

The cnidocysts are derived from various parts of *N. annamensis* Carlgren, 1943 such as tentacles, column, actinopharynx, acontoid and pedal disc (Carlgren, 1943; Fautin *et al*., 2007; Excoffon *et al*., 2009). The identification of the Cnidocysts was based on the keys of Mariscal (1974); England (1987, 1991, 1992); Fautin *et al.* (2007); Excoffon *et al.* (2009).

RESULTS

TAXONOMIC PART

Phylum CNIDARIA Verrill, 1865

Class ANTHOZOA Ehrenberg, 1884

Subclass HEXACORALLIA Haeckel, 1896

Order ACTINIARIA Hertwig, 1882

Suborder NYNANTHEAE Carlgren, 1899

Infraorder THENARIA Carlgren, 1899

Superfamily ACONTIARIA Stephenson, 1935

Family NEMANTHIDAE Carlgren, 1940

Genus ***Nemanthus*** Carlgren, 1940

Nemanthus annamensis Carlgren, 1943

MATERIAL EXAMINED

One specimen collected from the sub tidal and deposited in repository of Zoological Survey of India, Port Blair, (Fig.1C).

Registration No. - **ZSI/ANRC -13006;** Date of Registration- 27. II. 2015; Collector's name – R. Raghuraman; Date of collection: 18. VIII. 2014; Locality- Trilby Island; Co-ordinates-Lat: 13°24.577´N; Long: 93°04.226´E.

DESCRIPTION

Pedal disc diameter is up to 20.910mm; Oral disc diameter is up to 12.102mm (Fig. 1C). The column is 8.245mm in height in live condition while 7.143 mm in height in preserved specimens. Usually, tentacles are not larger than pedal disc diameter and up to 1.250 mm long in preserved specimen (Fig. 1C) and in relaxed condition; length of tentacle is up to 3.545mm (Fig. 1B). The column is smooth, very low and spreading at distal region. Dark patches are present throughout the column, giving the specimen a leopard-spotted appearance in live condition (Fig.1A). In preserved specimen, the dark patches are disappeared and irregular vertical lines are visible (Fig. 1C). Mouth is central, having no lips with two distinct siphonoglyphs. The pedal disc is well developed and wider than oral disc. Two individuals closely live together that the edges of their pedal disc arrange each other intimately to form grouped sea anemone. Limbus is well developed and having marginal line at its border of limbus.

The tentacles are variable in size; hexamerously arranged up to 4-5 cycles (6+6+12+12+29); about 65 in number. The inner tentacles are longer than outer ones. In preserved or stressed condition, the tentacles are short and stubby (Fig. 1C). The sea anemone is causing death to black coral polyps (Cirrhipathes *sp.*) where the pedal disc is firmly wrapped around (Fig. 1A). A small bud and tiny sea anemone is appeared at the basal disc of specimen (Fig. 1D).

Colouration: The specimen is very easy to identify with its characteristic colour. The color of column is dark brown in irregular manner in live condition (Fig. 1A) and also in preserved condition; it is cream in colour. The colour of tentacles is also cream in colour both in live and preserved conditions (Fig. 1C). The colour of limbus is dark chocolate in color (Fig. 1A).

Spirocysts, microbasic p-mastigophores, basitrichs are derived from various organs of *N. annamensis* Carlgren, 1943 (Table 1) and all nematocysts are illustrated in Figure 1.

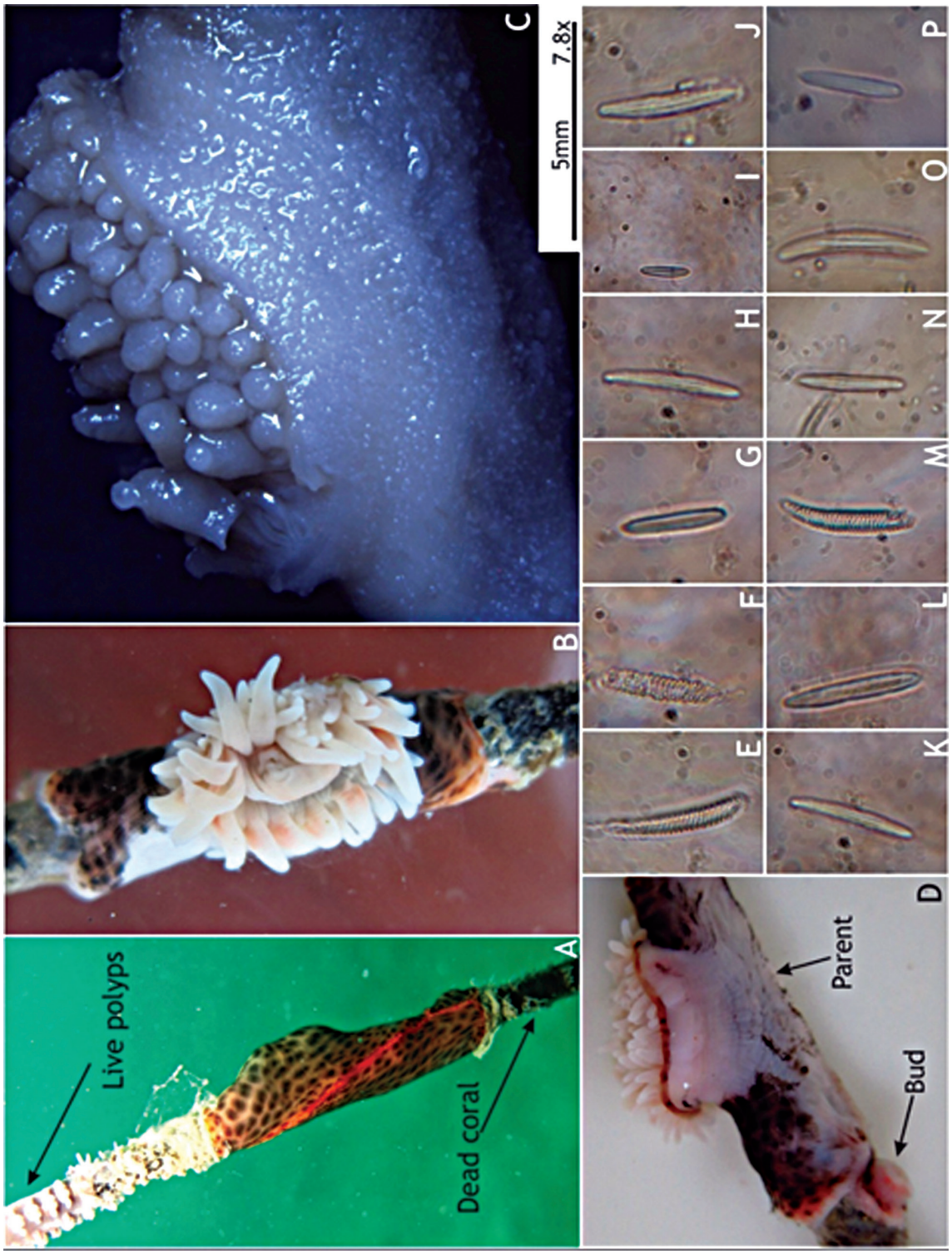

Fig. 1. A. External morphology of *N. annamensis* Carlgren 1943 in situ sheltering in *Cirrhipathes* sp.; B. Oral disc and relaxed tentacles of *N. annamensis* Carlgren 1943; C. External morphology in laboratory condition; D. Asexual reproduction (small or tiny bud is appeared near to pedal disc); E. Spirocyst (G) from tentacle; F. Spirocyst (R) from tentacle; G. Basitrich from tentacle; H. Large basitrich from column; I. Small basitrich from column; J. Microbasic p- mastigophore from column; K. Basitrich from actinopharynx; L. Microbasic p- mastigophore from actinopharynx; M. Spirocyst from actinopharynx; N. Basitrich from acontioids; O. Microbasic p- mastigophore from acontioids; P. Basitrich from pedal disc

The morphometric measurement of nematocysts in different body organs are given in Table 1.

ORGAN	Nematocyst Type	Length of Nematocyst in µm	Mean in µm	Width of Nematocyst in µm	Mean in µm	N	Frequency
Telentacle	Spirocysts(G) (Fig. 1E)	12.8 - 29.12	18.5	1.82 - 4.55	3.8	40	A
	Spirocysts(R) (Fig. 1F)	10.4 -18.2	14.35	3.64 -5.46	3.5	5	S
	Large Basitrich (Fig. 1G)	9.35 - 18.90	14.7	1.74- 5.3	3.6	25	C
Column	Large Basitrich (Fig. 1H)	12.74- 30.6	26.5	2.0- 6.0	4.2	30	A
	Small Basitrich (Fig. 1I)	5.9- 8.34	7.1	1.1-3.9	2.5	2	R
	MPM (Fig. 1J)	20.6 - 28.2	22.9	2.73- 5.46	3.5	10	R
Actinopharynx	Basitrich (Fig. 1K)	10.92- 25.8	24.7	1.82 – 6	4.2	20	A
	MPM (Fig. 1L)	11.5 - 24.8	20.7	2.8- 5.2	4.2	25	C
	Spirocyst (Fig. 1M)	8.5 - 29.9	19.8	2.7- 4.9	3.8	8	R
Acontioids	Basitrich (Fig. 1N)	11.7- 18.4	15.2	2.5-3.6	3.0	4	R
	MPM (Fig. 1O)	15.8- 20.9	18.3	3.4- 4.9	4.15	2	R
Pedal Disc	Basitrich, (Fig. 1P)	11.7- 20.9	14.4	2.1- 4.5	3.1	10	C

N = Number of nematocyst measured; Frequency indicated by A= abundant C= common, R= rare, S= Sporadic

MPM= Microbasic *p*-mastigophora

Spirocyst (G) = gracile spirocyst

Spirocyst (R) = robust spirocyst

Distribution: ***India***: Andaman and Nicobar Islands-Trilby Island (13°24.577´N; 93°04.226´E), North Andaman. *Elsewhere*: Bay of Nhatrang, South Annam, Vietnam; Ream, Cambodia; the coast of Kenya; Seychelles and Maldives Islands; Indonesia and Phillipines.

REMARKS

On collation of data from earlier literature (Parulekar, 1990; Madhu & Madhu, 2007 and Raghunathan *et al*., 2014), it is noted that, Indian sea anemone fauna comprised of 54 species under 40 genera and 20 families. In the present study, the family Nemanthidae Carlgren, 1940 is reported as first distributional record to Indian waters. Nemanthidae is monogeneric family and the genus *Nemanthus* was described by Carlgren (1940).

Currently, three species under the genus *Nemanthus* have been described *viz. N. nitidus* (Wassilieff, 1908) from Sagami Bay and Bonin Islands, Japan (Excoffon *et al*., 2009), *N. californicus* Carlgren, 1940 from California, Sea of Cortez, Pacific coast of Costa Rica (Excoffon *et al*., 2009) and *N. annamensis* Carlgren, 1943 from Gulf of Tonkin, Kenya, Galpagos, Maldives, Indonesia and Philippines (Lavaleye & den Hartog, 1995; Gosliner *et al*., 1996). Among these three species, *N. annamensis* and *N. californicus* are widely distributed species.

When Carlgren described *N. anamensis* in 1943, he reported the species level taxonomic character by observing the special thread like structures of acontioids and colour pattern of the coloumn which are also observed in the present examination. Concerning the cnidae, there is higher spirocysts and basitrichs abundance found in the actinopharynx as well as in tentacles which are in agreement with the data given by Lavaleye & den Hartog (1995) and Excoffon *et al*. (2009). The size ranges of most of cnidocysts mentioned in this study are same with the data from Lavaleye & den Hartog, 1995 and also the presence of two modes of basitrich in the column.

Members of this genus are associated with gorgonians, branches of *Anthipathes* sp. and *A. pannamensis* (Kerstitch, 1989; Exscoffon *et al*., 2009). Earlier, the species *N. annamensis* was

described on the carapace of the crab *Lauridromia intermedia* (Laurie, 1906) by Lavaleye & den Hartog (1995). The present *in situ* observations are found as asexual reproduction (small bud attached with pedal disc) and inter specific relationship (parasitism) with black corals Cirrhipathes *sp*.

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