Occurrence of black corals (order: Antipatharian) in Andaman and Nicobar Island, India

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A total of 15 species of antipatharians were accounted from the study sites. Maximum number of species was reported in Henry Lawrence Island and minimum in Page t Island, Rowe Island and North Reef Island. The present study yielded seven species (Cupressopathes abies, C. pumila, Tanacetipathes hirta, Antipathes dendrochristos, Cladopathes plumose, Trissopathes tetracrada, Dendrobathypathes boutillieri) and all are first report to India.

[Key words: Hexacoral, Antipatharians, Black corals, Andaman and Nicobar]

Introduction

The Antipatharians are commonly called as black corals or horny corals look like an upright and bushy growth forms and mimic gorgonian octocorals. Most of growth forms inhabit in the shallow tropical deep sea environment, their ecology and distribution are largely unknown 1-10. Black corals are suspension plankton feeders and mostly present in shady or dark habitats, attached over the hard substrate 11-14 and the relationship with abiotic environmental features 15. In Caribbean Sea, black corals reported below the euphotic zone16 and most of the species reported in shallow reef environment along the Indo – Pacific coast17-22.

The taxonomic studies on black corals along the seacoast of Indonesian Archipelago can be found in two detailed monographs23-24 and also reported in the Northern Moluccas25, in Northeast Atlantic26, Bay of Biscay27 and Maldives and Lakshadweep Archipelagos28-29. Shallow water black corals reported from Indo-Malayan region22. A total of eight species belonging two families and seven genera were recorded from Andaman and Nicobar Islands30.

Black corals are very numerous in shallow tropical reef communities and are well documented in deep benthic communities, where the colonies may provide a substrate in habitats with poor complexity. Present study is to assess the community structure of antipatharian and reporting 15 species belonging to 11 genera, four families from Andaman and Nicobar Island.

Material and Methods

Andaman and Nicobar Archipelago have 572 reef islands between Myanmar (North) to Sumatra (South) 6° to 14° North and 92° to 94° East with 2000 km² coral reef cover (Figure 1). The black coral taxonomical study was conducted in different reef islands and samples were collected during June 2013 to July 2016 at a depth range of 5.0 – 40.0 m with the help of SCUBA. The specimens were identified based on the morphological characteristics such as growth form, colour, shape, size, colour of the polyp, diameter of the axis and spines arrangement16. Live colonies photo made by underwater digital camera (Canon G10) and spine arrangement of each species was examined under Leica –DFC 500 stereo microscope. The identified samples were deposited in the National Zoological Collection of ZSI, ANRC, Port Blair. Quantitative data were obtained at each study sites by using the adapted belt transect method and counting all the colonies observed along 5 transects with 2.0 m wide31 (Including 1.0 m on each side of the diver) at depths of 5.0 to 40.0 m.
Results

A total of 15 species of antipatharians belonging to 11 genera and four families was reported from 11 study sites (Figure 1-5, Table 1) and a maximum number (6) of species, was recorded from Henry Lawrence Island in South Andaman followed by Peacock Island (4), Trilbay Island (4), Havelock Island (4), Shark Island (3), Oliver Island (3), Sound Island (3), Landfall Island (2), Paget Island (1), Rowe Island (1), North Reef Island (1). The species Cirrhipathes anguina was common in most of the Islands studied (Table 1). Percentage of cover was maximum (12.5%) in Peacock Island, North Andaman followed by Shark Island (10%), Henry Lawrence Island (10%), North Reef Island (7.5%), Trilbay Island (7.5%), Sound Island (7.5%), Havelock Island (7.5%), Paget Island (6.25%), Landfall Island (6.25%), Oliver Island (5%) and Rowe Island (3.75%) (Figure 6).

SYSTEMATIC POSITION

Phylum: Cnidaria Hatschek, 1888
Class: Anthozoa
Sub-Class: Hexacorallia
Order: Antipatharia
Family: Myriopathidae Opresko, 2001
Genus: Antipathella Brook, 1889

1. Antipathella subpinnata (Ellis and Solander, 1786) (Fig 2 A, B)

<table>
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<tr>
<th>S.No</th>
<th>Name of Species</th>
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(1 – Paget Island, 2 – Rowe Island, 3 – Landfall Island, 4 – Shark Island, 5 – Peacock Island, 6 – North reef Island, 7 – Trilbay Island, 8 – Oliver Island, 9 – Sound Island, 10 – Henry Lawrence, 11 – Havelock Island)

3. *Cupressopathes gracilis* (Thomson and Simpson, 1905) (Fig 2 E, F)
1860 *Antipathes gracilis* Gray

Material Examined: ZSI/ANRC: 14303 (Shark Island – North Andaman, Lat. 13°12.064 N Long. 92°45.255 E) the dry preserved sample 28 cm height, 11 cm breadth, 12 m depth; ZSI/ANRC: 5606 (Pongibalu at Port Blair Lat. 11°30.956 N; Long. 92°39.201 E)

Description: see Thomson and Simpson, 1905. Living colonies orange or yellowish brown colour and branched colonies, height 1.5 m and 60.0 cm wide, inter node of branches 4.29 to 5.26 mm, spines small, smooth, mostly 0.1 – 0.15 mm in size, polyps are very small tentacles.

Distribution: Gulf of Mexico, Indian Ocean, New Zealand, North Atlantic Ocean, Bermuda, India: Andaman and Nicobar.

4. *Cupressopathes pumila* (Brook, 1889) (Fig 2 G, H)
1889 *Antipathes pumila* Brook, 1889

Material Examined: ZSI/ANRC: 14657 (Peacock Island – North Andaman, Lat. 13°33.951 N; Long. 93°03.153 E), size of the sample 22.0 cm height, 8.0 cm breadth, dry preserved, 15.0 m depth.

Description: see Brook, 1889. The colony differs from *C. abies, C. gracilis*, 40.0 – 60.0 cm height in live, the branches arise from the main axis, polyps are white.
colour, primary pinnules developing into side branches. The size of the colony is smaller than other species, interpolyyp space 0.2 mm or less, tentacles up to 0.7 mm.


Genus: *Myriopathes*

5. *Myriopathes antrocrada* (Opresko, 1999) (Fig 3 A, B)

1999 *Antipathes antrocrada* Opresko

Material Examined: ZSI/ANRC 14297, Henry Lawrence, South Andaman Island, (Lat.12°05.000 N; Long. 93°06.312 E), the preserved sample 45.0 cm tall and 30.0 cm wide, 25.0 m depth; ZSI/ANRC 14659 Peacock Island, North Andaman, Lat. 13°33.951 N; Long. 93°03.153 E, 32.0 cm height and 18.0 cm width, 15.0 m depth; ZSI/ANRC 5610 (Havelock Island, Lat. 12°03.334 N; Long. 92°57.716 E).

Description: see Opresko. Live colonies more than 1.0 meter height, reddish brown colour, the basal stem diameter 3.3 mm, large branches up to 9.0 cm long, spines conical and horn shaped, 0.14 mm to 0.18 mm size, polyps slightly elongated in the transverse axis, tentacles knob like and 0.15 mm long.

Distribution: Indonesia, Australia, India: Andaman and Nicobar Islands

Genus: *Plumapathes*

6. *Plumapathes pennacea* (Pallas, 1766) (Fig 3 C, D)

1766 *Antipathes pennacea* Pallas

Material Examined: ZSI/ANRC 14296, Henry Lawrence, South Andaman Island, (Lat.12°05.000 N; Long. 93°06.312 E), 14cm height, 11.0 cm width dry preserved sample, 15.0 m depth; ZSI/ANRC 13029, Trilbay Island, North Andaman, (Lat. 13°24.675 N; Long. 93°04.245 E), 18.0 cm long and 12.0 cm breadth sample, 18.0 m depth; ZSI/ANRC 14646, Oliver Island (Lat. 13°00.038 N; Long. 92°59.216 E), the sample 22.0 cm height and dried sample, 22.0 m depth;

Description: see Pallas. Live colonies more than 1.0 meter in size, uneven sparsely branched, main axis brown in colour and polyps are white colour in underwater, average size of axis diameter is 3.0 mm, spines are smooth, conical, 0.12 – 0.3 mm, polyps 0.22 – 0.51 mm long and 10-16 polyps in per centimeter, tentacles 0.12 – 0.36 mm long, mouth usually Sagittally elongated.

Distribution: Gulf of Mexico, Bermuda, West Central Atlantic, West Indies, Brazil, India: Andaman and Nicobar

Family: *Antipathidae* Ehrenberg, 1834


Genus: *Tanacetipathes*

7. *Tanacetipathes hirta* (Gray, 1857) (Fig 3 E, F)

1857 *Antipate hirta* Gray, 1857

Material Examined: ZSI/ANRC 14645, Oliver Island (Lat. 13°00.038 N; Long. 92°59.216 E), the sample 22.0 cm height and dried sample, 22.0 m depth.

Description: Gray, live colony more than 1.0 meter in size, uneven sparsely branched, main axis brown in colour and polyps are white colour in underwater, average size of axis diameter is 3.0 mm, spines are smooth, conical, 0.12 – 0.3 mm, polyps 0.22 – 0.51 mm long and 10-16 polyps in per centimeter, tentacles 0.12 – 0.36 mm long, mouth usually Sagittally elongated.

Distribution: Indo-Pacific, Caribbean Sea, Gulf of Mexico, New Zealand, South Atlantic Ocean, India: Andaman and Nicobar.
Genus: *Antipathes* Pallas, 1766

8. *Antipathes dendrochristos* Opresko, 2005 (Fig 3 G, H)
   Material Examined: ZSI/ANRC: 14656, Sound Island, North Andaman (Lat. 12°56.263 N; Long. 92°57.049 E), 18.0 cm height and 9.0 cm width sample, dried preserve sample, 8.0 m depth.
   Description: see Opresko\(^\text{39}\). Live colony bushy with multibranched, more than 60.0 cm height, axis reddish brown in colour, polyp white colour, spines small, conical, smooth, 0.07 – 0.09 mm in size, polyps 1.0 – 1.4 mm in transverse diameter, short, blunt tentacles.
   Distribution: North Pacific Ocean, United States, India: Andaman and Nicobar.

9. *Antipathes elegans* (Thomson and Simpson, 1905) (Fig 4 A, B)
   1905 *Antipathella elegans* Thomson and Simpson
   Material Examined: ZSI/ANRC: 14294, Henry Lawrence, South Andaman (Lat. 12°05.000 N; Long. 93°06.312 E), 42.0 cm height, dried preserve sample, 15.0 m depth; ZSI/ANRC 5613 (Kamota Island Lat. 08°02.183 N; Long. 93°32.573 E)
   Description: see Thomson and Simpson,\(^\text{35}\). Living colonies are orange colour, more than 1.5 m height and 1.0 m breadth, multi branched, bushy colonies reaching a size of 1.0 m or more and branches free, spines are small, conical, smooth, mostly 0.08 – 0.1 mm in size, polyps 1.0 - 1.4 mm in transverse diameter with short tentacles.
   Distribution: Indian Ocean, India: Andaman and Nicobar Islands.

Genus: *Cirrhipathes* de Blainville, 1830

10. *Cirrhipathes anguina* (Dana, 1846) (Fig 4 C, D, Fig. 5 H)
1846 *Antipathes anguina* Dana
   Material Examined: ZSI/ANRC: 14293, Henry Lawrence (Lat. 12°05.000 N; Long. 93°06.312 E), 52.0 cm length sample, 15.0 m depth; ZSI/ANRC 14299, Rowe Island (Lat. 13°14.913 N; Long. 92°50.419 E), 34.0 cm long sample; ZSI/ANRC 14300, North reef Island (Lat. 13°05.785 N; Long. 92°43.355 E), 15.0 cm height sample, 12.0 m depth; ZSI/ANRC 14301, Shark Island (Lat. 13°12.064 N; Long. 92°45.255 E), 25.0 cm height sample; ZSI/ANRC 14304, Paget Island (Lat. 13°25.805 N; Long. 92°50.728 E), 12.0 cm height sample; ZSI/ANRC 13031, Peacock Island, North Andaman (Lat. 13°33.951 N; Long. 93°03.153 E), 1m long sample; ZSI/ANRC 5607, Havelock Island (Lat. 12°03.334 N; Long. 92°57.716 E).
   Description: see Kumar, \textit{et al.},\(^\text{30}\). Live colonies unbranched and greenish brown colour, 60.0 – 100.0 cm in height, average axis size 3.9 mm, average spine size 0.09 mm, polyps pale brown or white colour, transverse diameter about 1.0 – 2.0 mm arranged in multiple irregular rows, sagittal tentacles about 2.0 – 3.0 mm, lateral tentacles 1.05 – 1.4 mm and oral cone about 0.5 – 0.7 mm in size.

11. *Cirrhipathes contorta* van Pesch, 1910 (Fig 4 E – F, Fig. 5 G)
   1910 *Cirripate (Eucirripathes) contorta* Van Pesch
   1910 *Cirripate contorta* van Pech, 1910
   Material Examined: ZSI/ANRC: 14302 (Shark Island), 32.0 cm height sample; ZSI/ANRC 5608 (Page Island, 13°25.805 N; Long. 92°50.728 E), 12.0 cm height sample; ZSI/ANRC 13031, Peacock Island, North Andaman

\textbf{Figure 4.} — A & B - *Antipathes elegans*, C & D - *Cirrhipathes anguina*, E & F - *Cirrhipathes contorta*, G & H - *Stichopathes solorensis*
(Pongibalu Lat. 11°30.956 N; Long. 92°39.201E), ZSI/ANRC 14647 (Havelock Island, South Andaman), 34.0 cm height sample dried preserve samples.

Description: Kumar, et al., 30. Live colonies unbranched and white colour, 150.0 cm in height, average size 6.88 mm, spines 0.19 mm, polyps white colour and arranged in multiple irregular rows, sagittal tentacles about 1.3 – 2.15 mm, lateral tentacles 1.0 – 1.45 mm and oral cone about 0.4 – 0.6 mm in size.


Genus: Stichopathes Brook, 1889
12. Stichopathes solorensis van Pesch, 1914 (Fig 4 G, H)

Material Examined: ZSI/ANRC: 5609 (Kamota Island Lat. 08°02.183N; Long. 93°32.573E), ZSI/ANRC 14648 (Havelock Island, South Andaman), 21.0 cm height dried preserve sample.

Description: see van Pesch, 24. Colonies unbranched and greenish grey colour, 1.8 m in height in live, axis size 8.24 mm, spiral curving is irregular, spiral’s height 9.0 - 57.0 cm, spines 0.13 mm in size, polyps pale orange in colour and arranged in multiple irregular rows, tentacles about 1.3 – 2.15 mm, and oral cone about 0.5 – 0.6 mm in size.


Family: Cladopathidae Kinoshita, 1910
Genus: Cladopathec Brook, 1889
13. Cladopathec plumose Brook, 1889(Fig 5 A, B)

Material Examined: ZSI/ANRC 13027 (Trilbay Island, North Andaman, Lat. 13°24.675 N; Long. 93°04.245 E), 28.0 cm long and 6.0 cm breadth, dried sample.

Description: see Brook, 23. Live colony axis brown colour and polyps are white in colour, shrub like, stem and branches pinnulate and subpinnulate, 0.5 – 1.0 cm long pinnules, 16 pinnules per centimeter, 0.3 mm diameter pinnules, spines simple, smooth, acute, 0.06 – 0.08 mm in size, polyps 3.0 – 4.0 mm in transverse with three polyps per centimeters.


Genus: Trissopathes Opresko, 2003
14. Trissopathes tetracrada Opresko, 2003 (Fig 5 C, D)

Material Examined: ZSI/ANRC 13028 (Trilbay Island, North Andaman, Lat. 13°24.675 N; Long. 93°04.245 E), 15.0 cm height and 8 cm width sample.

Description: see Opresko, 21. Live colonies bushy, overlapping branches, axis and branches are pinnulate and subpinnulate, 0.5 – 1.0 cm long and 0.15 - 0.2 mm in diameter, four per centimeter, spines 0.08 - 0.10 mm height, three to four spines per millimeter, polyps are transversely elongated, 2.0 – 3.0 mm in diameter.

Distribution: New Zealand, South Australia, Tasmania, Eastern Atlantic off cape Verde, India: Andaman and Nicobar.

Family: Schizopathidae Brook, 1889
Genus: Dendrobathypathes Opresko, 2002
15. Dendrobathypathes isocrada Opresko, 2002 (Fig 5 E, F)

Material Examined: ZSI/ANRC 14658 (Peacock Island, North Andaman, Lat. 13°33.951 N; Long. 93°03.153 E), 8.0 cm height and width, dried preserve sample.

Description: see Opresko, 20. Live colonies white in colour, net branched, stem not distinct or slightly

Figure 5. A & B — Cladopathec plumose, C & D - Trissopathes tetracrada, E & F - Dendrobathypathes isocrada, G - live polyp of Cirrhipathec contorta, H - Live polyp of Cirrhipathec anguina
thicker than other branches, pinnules overlapping and adhering, spines simple, conical, compressed, 0.03 – 0.1 mm in size, polyps 2.5 – 4.0 mm in transverse diameter, two to three polyps per centimeter.

Distribution: Australia, New Zealand, India: Andaman and Nicobar.

Discussion
The Andaman and Nicobar Islands are rich and a variety of marine fauna and flora including endangered, schedule faunas. Two Marine National Parks, namely Mahatma Gandhi Marine National Park and Rani Jhansi Marine National Park; 96 wildlife sanctuaries have been established for protecting these ecosystems. Among them seven study sites coming under the Wildlife sanctuaries (Pagat Island, Shark Island, North reef Island, 7 – Trilbay Island, 8 – Oliver Island, 9 – Sound Island, 10 – Henry Lawrence, 11 – Havelock Island)

Antipatharian are found in a wide range of habitats from the shallow to deeper water and commonly found in the reef areas of different depth. Distribution of black corals were based on light attenuation, substratum inclination, suspended food, flow regimes, wave exposure and water current. Very few antipatharians were reported from Andaman and Nicobar as well as in Indian reef regions. Present study reported the occurrence of antipatharians coral species along with their percentage cover in Andaman and Nicobar Islands.

A total 15 species belongs 3 families and 11 genera were reported from 11 study sites, of which seven species (Cupressopathes abies, C. pumila, Tanacetipathes hirta, Antipathes dendrochristos, Cladopathes plumose, Trissopathes tetracrada, Dendrobathypathes isocrada) are new distribution report to the Indian coast and remaining eight species (Antipathella subpinnata, Cupressopathes gracilis, Myriopathes antrocrada, Plumapathes pennacea, Antipathes elegans, Cirrhipathes anguina, C. contorta, Stichopathes solorensois) were identified and reported by Kumar et al.,30. The abundance of antipatharians cover is in the following order: Peacock Island > Shark Island > Henry Lawrence Island > North Reef Island > Trilbay Island > Sound Island > Havelock Island > Paget Island > Landfall Island > Oliver Island > Rowe Island.

The antipatharians are reported from Pearl Oyster bed of Gulf of Mannar35 and associated shrimp from Andaman and Nicobar Islands40. Extensive surveys are required to inventerise the antipatharians fauna to enhance the database of Andaman and Nicobar as well as India. The antipatharians occur on the steep slope and on inclined and shaded calcareous substrates. More studies are needed to signify their ecological role as a key parameter towards the understanding of the reef environment.

Conclusion
Antipatharian black corals are distributed worldwide at ocean depths varying from shallow to 360 m and they create critical habitat for invertebrates, fishes, including commensal species that are dependent upon black coral for their survival. The present study reported 15 species of antipatharians in shallow reef regions in Andaman and Nicobar Islands, of which, seven species are reported first time in Andaman and Nicobar as well as in India. The community structure of antipatharian was evaluated using standard ecological parameters. The widespread studies on antipatharian may signify their ecological role as a key parameter towards the understanding of the reef environment.

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References


