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**A GENERAL ACCOUNT ON COMMUNITY STRUCTURE OF ECHINODERMS IN
NORTH ANDAMAN**

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ABSTRACT

The diversity of echinoderms at 6 different sites of North Andaman was studied during April'09- June'10. A total of 53 species of echinoderms have been reported from study area during the survey. Obtained results shows the maximum species diversity ($H' = 4.12$) in Sound Island with the dominance of *Holothuria atra* and *Culcita noveguinea*. The reef habitats of Sound and North Reef Island harbour maximum occurrence of similar species than other areas of North Andaman. The aim of this paper is to understand the species composition and abundance of echinoderms in North Andaman with ecological response to the habitat.

Key Words: Echinoderms, Diversity, Habitat, Species composition, North Andaman.

INTRODUCTION

The Andaman and Nicobar Islands located in the south east of Bay of Bengal between 6° - 14°N latitude and 91°-94°E longitude have clear and unpolluted waters all around. As the

islands are hilly in nature, the slope of the shelf is steep with limited shallow area and extensive offshore area. The coastal habitats and the offshore benthic zone of Andaman and Nicobar harbour a rich variety of

echinoderms. Andaman and Nicobar Island consists rich diversity of echinoderms with 425 species which is around half that of the entire Indian coast [1]. [2] listed the echinoderms from the Andaman Islands for the first time. Specimens collected by Royal Indian Marine Survey Steamer *INVESTIGATOR* were studied and reported in 10 parts of *Echinoderma of the Indian Museum*. Chief among these are the reports of Crinoidea by [3, 4] Asteroidea by [5-7], Ophiuroidea by [8-11], Echinoidea by [12-14] and Holothuroidea by [15, 16]. [17] reported 12 echinoderms from Ritchie's Archipelago. [18] gave distribution of some holothurians as Andaman and Nicobar islands without clearly monitoring whether the species is from Andamans, Nicobars or from both. [19] reported some new records of echinoderms from Marine National Parks of Andaman and Nicobar Island and in 2001, he updated 44 species from different islands of Ritchie's Archipelago. Previously the diversity of

echinoderms with particular references to coral habitats was not extensively studied. In the present paper the authors describe the diversity and distribution of echinoderm species along the different Islands of North Andaman. A total of 53 species were reported that belongs to 19 families and 30 genera. Among them, the species *Holothuria atra*, *Culcita noveguinea*, *Stichopus chloronatus*, *Echinothrix calamaris* are mostly distributed along the study areas. An attempt has made to describe the percentage of abundance of echinoderms with species distribution and composition of similar species occurred at the different Islands.

Study Area (Figure 1)

North Andaman is located between 12°.53' N and 92° .86' E, constituting about 70 large and small islands. The coastal zone, in addition to the fringing reefs, is endowed with extensive rocky outcrops, sandy beaches and mangrove vegetation. The following islands were surveyed during the present study.

- Aves Island (N 12° 54.917' E 092° 55.954')

- Karlo Island (N 12°56.282' E 092°53.541')
- Sound Island (N 12°56.167' E 092°58.113')
- Rail Island (N 12°59.033' E 092°54.137')
- Interview Island (N 12°59.304' E 092°43.245')
- North Reef Island (N-13°03.793' E-092°42.896')

MATERIALS AND METHODS

Surveys were conducted by SCUBA diving (up to 15m deep) and skin diving during April'2009 to June'2010. Data on the distribution and abundance of echinoderms was done on a transect line, 100 m long and ordinate perpendicularly to the coastal line. In total, six stations were selected and in each area three transects (300m in total) were placed in different depths. PVC framed Quadrate (1m²) was placed along the transect area with an interval of 10m. The collected organisms were placed individually in plastic container with sea water and kept in closed containers to avoid heat, light and exposure that give further stress to the organisms.

Finally the specimens were preserved in 70% alcohol for further studies. The Species diversity index (H'), Jaccard's similarity index (S) were calculated by using the following formula.

$H' = - \sum P_i \log_e P_i$ (P_i-Proportion of the *i*th species in the collection and H' = Diversity of Theoretically infinite population)

$S = (2C/a+b) \times 100$ (C= Number of species common at any two stations, a= Number of species at one station and b= number of species at other station).

RESULTS AND DISCUSSION

A total of 53 species of echinoderms belonging to 30 genera and 19 families were reported from the six stations surveyed (**Table 1**). A determination of the taxonomic grouping revealed a high percentage (37.74%) of Holothuroidea (**Figure 1**). The value for other groups such as Asteroidea, Echinoidea, Ophiuroidea and Crinoidea were 18.87%, 16.98%, 13.21%, and 13.46% (**Figure 2**). Among the six study areas Sound (H. -4.12),

Interview (H. -3.92) and North Reef (H. -3.92) comprises higher index of species diversity than other areas (**Table 2**). Karlo Island represents 14 species which comprises maximum species evenness (J- 0.95) among all the study sites. The species *Holothuria atra*, *Culcita novaeguniae*, *Diadema savignyi*, *Fromia monilis*, *Comanthina schlegeli*, *Echinothrix calamaris* are most commonly distributed along the different islands of North Andaman (**Figure 3**). The present paper also represents percentage of occurrence of similar species between two islands by determining the Jaccard's similarity index. Sounds-Interview (50%) and Sounds -North Reef Island (52.3%) contributes maximum occurrence of similar species in comparison of other islands (**Table 3**).

The coast of North Andaman is fringed with coral reefs abounding in biodiversity. The coastline also provides other varied habitats such as rocks, sand, mud, mangroves etc.

Echinoderms inhabit in both hard and soft substrata and a variety of suitable habitats are provided by the coral reef ecosystem. The echinoderms associated with coral reefs are mostly facultative and taking advantage of the facilities available in the reef habitats [20]. Among five classes reported during the present investigation crinoids and Ophiuroids show the lowest diversity compared to other classes.

Among the crinoids, *Comanthus sp* are commonly found at different islands of North Andaman. They are most common at dead branches and bases of corals. The crinoids species *Comanthus parvicirrus* and *Comanthina schlegeli* shows higher percentage of abundance in comparison to other species of Crinoidea class. During daytime this species are cryptic but at night they move vertically to feed on the floating microorganisms filtered by pinnules of the spread out arms. The class asteroidea showed 10 species belongs the family Ophidiasteridae

represents 5 species followed by Asterinidae (1), Acanthasteridae (1), Luidiidae (1), Astropectinidae (1), and Oreasteridae (1). Asteroid species *Culcita novaguineae* and holothuroids species *Holothuria atra* are the most dominant species which lie exposed in open places mostly on hard substrata. Asteroids like *Luidia* and *Astropecten* inhabit patches of soft substratum among the coral colonies or in their neighborhood [20]. The class Holothuroidea has the maximum representation of species (20) among all echinoderm classes (Table 1). The genus *Holothuria* are commonly found at all the study areas. The Holothurians inhabit the protected places of hard substrata provided by the coral reefs. They are substrate feeders ingesting sediments rich in organic matter either from substrate or by borrowing. In the marine ecosystem holothurians are counterparts of earthworms of terrestrial ecosystem. By ingesting organic matter of the substrate and trapping the suspended particles

they help in reducing organic load of the environment and silt settlement on the polyps. Among the sea urchin, *Diadema savignyi* and *Echinothrix calamaris* are mostly abundant in the study areas. The class Echinoidea comprises of 9 species among all echinoderms studied in this paper. Sea urchins are commonly found in Sound, Interview and North Reef Islands. Echinoids are mainly herbivores feeding on a variety of algae and occasionally omnivores feeding on encrusting organisms along with their vegetative diet. The class ophiuroidea has the lowest percentage of species composition (13.21%) in North Andaman Islands. The genus *Ophiocoma* is commonly found at different island but percentage of abundance is very low at all islands (Table 2). *Ophiothrix* sp and *Macrophiothrix* sp are found in reef habitats taking shelter in the crevices of dead bases. The other common species belongs to Ophiocomidae family is found on

undersurface and in crevices during low tide periods.

Sound Island in North Andaman region shows maximum diversity of 23 species among all areas. This region has a diverse coral reef ecosystem with sand, rocks and mangroves. The maximum occurrence of similar species

in Sound and North Reef Island (52.8%) revealed that the reef habitats of these two areas are also quite similar to harbour echinoderm diversity (**Figure 3**). Recent studies showed that echinoderm diversity in North Andaman is conspicuous by their size, abundance and role in the ecosystem.

Table1- Distribution of Echinoderms in North Andaman

S. No	Echinoderm Species	Aves Island	Sound Island	Rail Island	Karlo Island	Intervie w Island	North Reef Island
	Class- Holothuroidea						
1	<i>Actinopyga mauritiana</i> (Quoy & Gaimard, 1833)	*			*	*	
2	<i>Actinopyga miliaris</i> (Quoy & Gaimard, 1833)		*			*	
3	<i>Actinopyga echinites</i> (Jaeger, 1833)				*		
4	<i>Holothuria atra</i> (Jaeger, 1833)	*	*	*		*	*
5	<i>Holothuria fuscocinerea</i> (Jaeger, 1833)			*			*
6	<i>Holothuria scabra</i> (Jaeger, 1833)	*				*	
7	<i>Holothuria pyxis</i> (Selenka, 1867)	*	*				
8	<i>Bohadschia marmorata</i> (Jaeger, 1833)		*		*		
9	<i>Holothuria hilla</i> (Lesson, 1830)	*		*		*	
10	<i>Holothuria leucospilota</i> (Brandt, 1835)						*
11	<i>Holothuria impatiens</i> (Forskal, 1775)		*		*		
12	<i>Holothuria cinerescens</i> (Brandt, 1835)				*	*	
13	<i>Holothuria edulis</i> (Lesson,1830)		*			*	*
15	<i>Synapta maculata</i> (Chamisso 1821)				*		
16	<i>Stichopus vastus</i> (Sluiter, 1887)			*			*
17	<i>Stichopus vareigatus</i> (Semper, 1868)				*		
18	<i>Stichopus horrens</i> (Selenka, 1867)		*				*
19	<i>Stichopus chloranatus</i> (Brandt,1835)	*		*	*		
20	<i>Thelenota ananas</i> (Jaeger, 1833)			*			*
	Class- Asteroidea						

21	<i>Linckia guildingi</i> (Gray, 1840)	*				*	
22	<i>Linckia laevigata</i> (Linnaeus, 1758)		*			*	*
23	<i>Fromia indica</i> (Perrier, 1869)			*			
24	<i>Fromia monilis</i> (Perrier, 1869)			*	*		*
25	<i>Asterina sarsini</i> (de Loriol, 1897)	*			*		
26	<i>Achanthaster planci</i> (Linnaeus, 1758)		*			*	
27	<i>Luidia integra</i> (Koehler, 1910)			*			
28	<i>Astropecten monacanthus</i> (Sladen, 1883)	*				*	
29	<i>Ophidiaster armatus</i> (Koehler, 1910)		*				
	Class- Echinoidea						
30	<i>Heterocentrotus trigonarius</i> (Lamarck, 1816)		*				*
31	<i>Echinometra mathei</i> (de Blainville, 1825)	*			*		
32	<i>Diadema setosum</i> (Leske, 1778)	*	*				
33	<i>Diadema savignyi</i> (Michelin, 1845)		*			*	*
34	<i>Echinothrix calamaris</i> (Pallas, 1774)		*			*	*
35	<i>Echinothrix didema</i> (Linnaeus, 1758)	*		*			
36	<i>Mespilia globulus</i> (Linnaeus, 1758)				*	*	
37	<i>Stomopneustes variolaris</i> (Lamarck, 1816)		*				*
38	<i>Marettia planulata</i> (Lamarck, 1914)					*	
39	<i>Culcita novaguineae</i> (Muller & Troschel, 1842)	*	*			*	*
	Class- Ophiuroidea						
40	<i>Ophiosammus yoldii</i> (Quelch, 1885)	*			*		
41	<i>Ophiocoma erinaceus</i> (Muller & Troschel, 1842)	*	*				*
42	<i>Ophiocoma dentata</i> (Muller & Troschel, 1842)		*			*	
43	<i>Ophiocoma brevipes</i> (Peters, 1851)					*	*
44	<i>Ophiothrix proteus</i> (Koehler, 1905)			*			
45	<i>Macrophiothrix propinqua</i> (Lyman, 1861)		*			*	
46	<i>Macrophiothrix aspidota</i> (Muller & Troschel, 1842)			*			
	Class- Crinoidea						
47	<i>Comanthina nobilis</i> (P.H.Carpenter, 1884)	*	*				*
48	<i>Comanthus parvicirrus</i> (Muller, 1841)		*		*		
49	<i>Comanthina schlegeli</i> (P.H.Carpenter, 1881)			*	*		*
50	<i>Amphimetra molleri</i>		*			*	
51	<i>Oxycomanthus benneti</i> (Muller, 1841)						*
52	<i>Himerometra robustipinna</i> (P.H.Carpenter, 1912)	*				*	
53	<i>Heterometra crenulata</i> (P.H.Carpenter, 1882)		*				

Table 2- Diversity Index of Species at Different Islands of North Andaman

Study area	Diversity Index		
	H	J	D
Aves Island	-3.65	0.89	0.9
Sound Island	-4.12	0.9	0.92
Rail Island	-2.96	0.86	0.83
Karlo Island	-3.61	0.95	0.91
Interview Island	-3.92	0.89	0.91
North Reef Island	-3.92	0.92	0.92

Table 3: Similarity Index of Species at Different Study Areas.

Similarity Index (S)	Aves Island	Rail Island	Karlo Island	Interview Island	North reef Island
Sound Island	30.8	5.88	5.40	50.0	52.3
Aves Island		28.5	32.3	42.1	22.2
Rail Island			24.0	12.5	33.3
Karlo Island				11.4	12.1
Interview Island					17.5

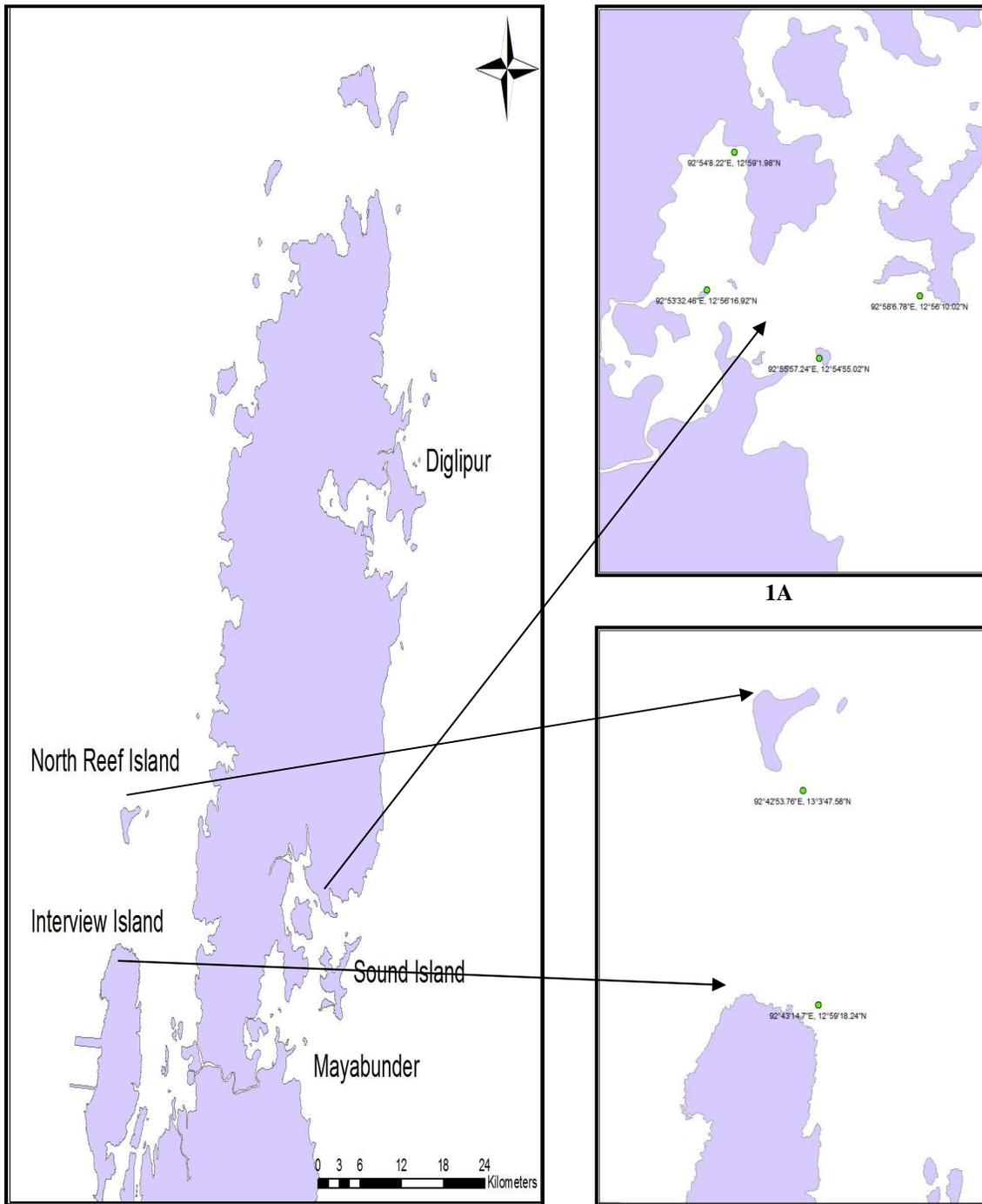


Figure 1: Study area

1B

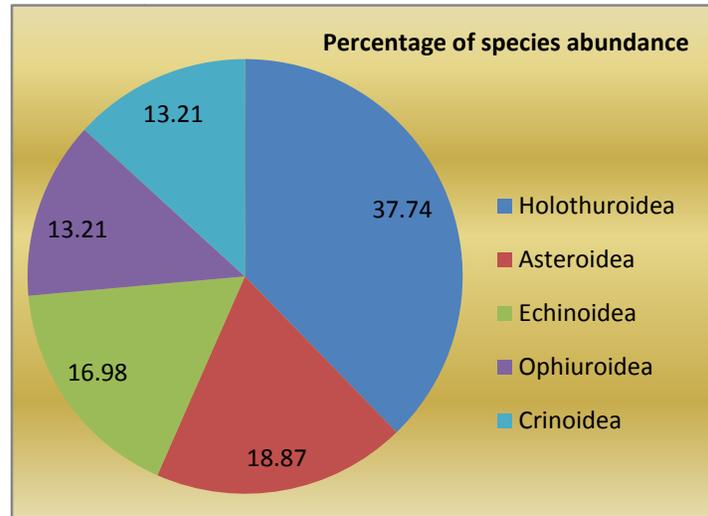


Figure 2: Percentage Abundance of Echinoderm Classes.

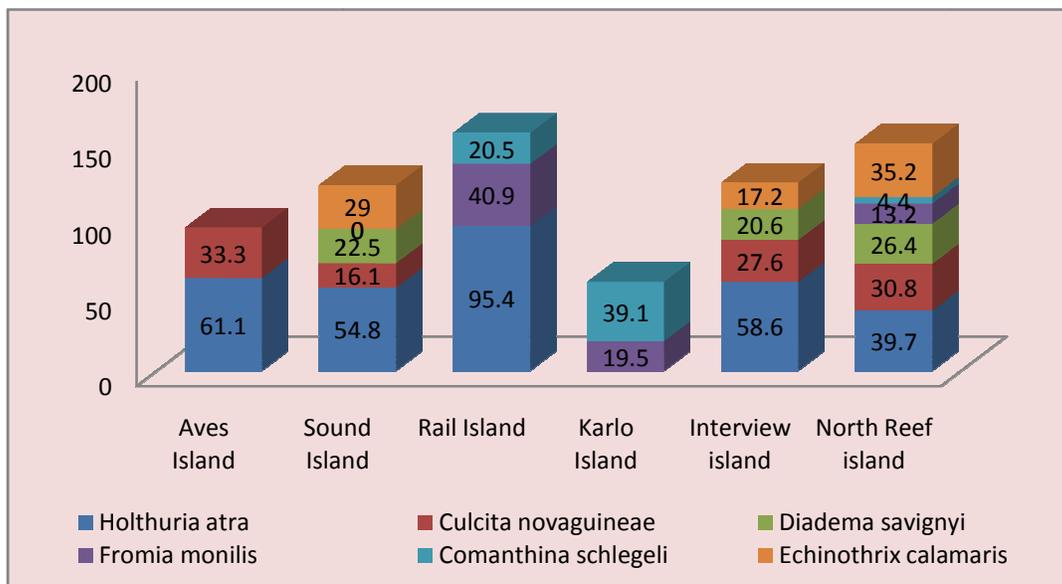


Figure 3: Percentage Abundance of Dominant Species at Different Islands of North Andaman

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