



SEAGRASS ASSOCIATED MARINE SPONGES IN PALK BAY

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INTRODUCTION

Seagrass, though one of the predominant and specialized group of marine flora, are poorly known in India, compared to other similar ecosystems such as mangroves. It occurs in all the coastal areas of the world except the Polar Regions because of ice scouring. It represents one of the highly productive coastal ecosystems of the world and protects the shorelines against erosion in the middle and lower intertidal and subtidal zones. India is home to more than fifteen species of seagrasses found in different coastal areas of Eastern, Southern and Western parts of India. Most of the species are found in healthy numbers along the Southeast Coast (which is the Gulf of Mannar and the Palk Bay), of Tamil Nadu, and the sporadic islands of Lakshadweep and Andaman & Nicobar.

Most of the earlier seagrass studies in the Palk Bay have focused only on their quantitative, taxonomic and structural components, Hence the present study was carried out to collect distribution, diversity of seagrasses in the Palk Bay area between Mandapam and Thondi that are colonized by seagrasses support rich and diverse fauna like Corals, sea anemones, molluscs, sea cucumbers, small macroalgae and epiphytic organisms such as sponges, bryozoans, foraminiferans, other taxa like star fishes and sea urchins. It serves as feeding and nursery habitat for endangered species like dugong and turtles and also many commercial and recreationally important fishes. Fishing pressure has resulted in overexploitation of marine resources, especially

the benthic assemblages. Sponges, being sedentary, are easily landed as a by catch discard in most of the bottom targeting fishing gears.

So far about 11,000 species have been formally described of which 8553 are valid species of sponges world over. In India marine sponges constitute 451 species. Out of which the Gulf of Mannar and Palk Bay consists of 313 species belonging to 137 genera and 12 orders of demospongiae and 5 species of class Hexactinellida and 1 species of class calcarea were recorded. (Pattanayak, 2001). Fossil sponges are among the oldest known animal fossils, dating from the late precambrian. Since then sponges have been conspicuous members of many fossil communities and the number of described fossil communities and the number of described fossil genera exceeds 900. (www.ucmp.berkeley.edu/porifera). Over exploitation for commercial purposes have resulted in the depletion of the sponge fauna with a few species being included under Schedule 1.

The history of sponge study of the Indian Ocean starts from 1765 onwards. A perusal of literature reveals that 451 species of marine sponges are known to occur in India (Pattanayak, 1999) through the works of Sollas (1884), Dendy (1887-1989), Annandale (1914-1915), Burton (1930) and Ali (1954-56). An exhaustive survey of the marine sponges with special reference to the Gulf of Mannar and Palk Bay has been studied during the years 1964-67 by Thomas (1968-2006). Coral boring sponges of the Gulf of Mannar and Palk Bay were studied by Thomas (1969). The

fauna of West coast of India is partly worked out when compared to that of the east coast.

Sponges have played a critical role in shaping the basic form of the Phanerozoic biosphere. Archaeocyaths and perhaps even some *Calcarea* formed the first major biological reef systems in the middle Tommotian. Sponges seemed to have played an important role in most reef systems thereafter, and have been critical in maintaining reef systems during certain times of biological crisis (Vishnevskaya *et al.*, 2002 - Late Devonian).

MATERIAL AND METHOD

Palk Bay is located on the northern side of Mandapam (Long. 79° 09' E and Lat. 09° 16' N) a coastal town on the southeast coast of India on a small peninsular extension of the main land leading to Rameswaram (Long. 79° 09' E and Lat. 09° 17' N).

Materials for the present study were collected from 23.7.11 to 29.7.11 2011 in the seagrass area of Olaikuda, Dhanushhkodi, Chinnapalam in Gulf of Mannar and Devipattinam, Thondi, Mallipattinam. During low tide samples were handpicked from the inter-tidal region and samples were also collected from bottom set gill nets used in crab fishery. The samples of sponges thus collected were preserved in 70% Ethyl Alcohol. Clearing of the hand sections were done in carbol- xylol and mounted in glycerine. Spicules were boiled in nitric acid and mounted were done in the euparal.



Map showing the study area

Sponge distribution; During the survey on seagrass associated sponge resources of Palk Bay, 9 species under seven genera and six families are recorded in these areas. Out of 7 genera *Axinella*, *Sigmatocia* and *Haliclona* were found to be dominant in the Thondi area. Higher sponge species diversity was found in Pamban area and the lower diversity in Mallipattinam area.

RESULTS

List of Sponge species of Palk Bay identified during the study period
Phylum PORIFERA
Class DEMOSPONGIAE
Order HADROMERIDA
Family SPIRASTRELLIDAE

1. *Spirastrella inconstans* (Dendy)
Family CLIONIDAE
2. *Cliona celata* Grant
Order HALICHONDRIDA
Family AXINELLIDAE
3. *Axinella flabelliformis* Hentschel
4. *Axinella durissima* (Dendy)
Order HAPLOSCLERIDA
Family CALLYSPONGIDAE
5. *Callyspongia diffusa* (Ridley)
Family NYPHATIDAE
6. *Gelliodes fibrosa* (Dendy)
Family Chalinidae
7. *Sigmatocia fibulata* (Schmidt)
8. *Haliclona implexa* (Schmidt)
9. *Haliclona exigua* (Kirkpatrick)

1. *Spirastrella inconstans* (Dendy)
1902. *Spirastrella inconstans* Sollas, p.216, pl.14, fig.3
Spirastrella inconstans Thomas, 1985, p. 305, pl.v, fig. 23.

Material examined: 1 exs, sta: Olaikuda and Thondi, 24.7.11. Reg. No. S-49. Coll. Dr.V. Deepak Samuel and Party. Sponges were found among *Cymodocea serrulata*, *Halophila ovalis*, *Syringodium isoetifolium*

Distribution: In India, Gulf of Mannar, Palk Bay and Andamans.

2. *Cliona celata* Grant

1972, *Cliona celata* Thomas, p.344, pl.1, figs.5A (synonymy)

Material examined: 2 exs, sta: Devipattinam, Olaikuda, and Pamban. 26.7.11. Reg.No. S-206. Coll. Dr.V.Deepak Samuel and Party. Sponges were found among *Halophila ovalis* in the intertidal area

Distribution : In India, Gulf of Mannar, Palk Bay and Andamans.

3. *Axinella flabelliformis* Hentschel

Material examined : 2 exs, sta: Devipattinam, Thondi, Olaikuda and Pamban 24.7.11. Reg.No.S-204. Coll. Dr.V. Deepak and Party. Sponges were found among seagrass meadows like *Syringodium isoetifolium*

Distribution: In India, Gulf of Mannar, Palk Bay and Andamans.

4. *Axinella durissima* (Dendy)

1905, *Thrinacophora durissima* Dendy, p.187, pl.12, fig.5

Material Examined : 1 exs, sta Thondi, Devipattinam and Olaikuda), 24.7.11. Reg. No. S-203. Coll. Dr.V. Deepak and Party. Sponges were found among seagrass meadows *Cymodocea serrulata*.

Distribution : Widely distributed in the Indian Ocean.

5. *Callyspongia diffusa* (Ridley)

1884, *Cladochalina diffusa* Ridley, p. 672, pi. 41, fig. D.

1934, *Callyspongia diffusa* Burton, p. 541, fig. 6 Thomas 1968, Ph.D. Thesis.

Material Examined : 2 exs, sta: Mallipattinam, Thondi, Devipattinam, Olaikuda, Chinnapalam and Pamban), 27.7.11. Reg.No. S-202. Coll. Dr.V. Deepak and Party. Sponges were found in the roots of *Syringodium isoetifolium*.

Distribution: Indian Ocean.

6. *Gelliodes fibrosa* (Dendy)

1905, *Gelliodes petrosioides var. fibrosa* Dendy, p.139.

Material examined : 1 ex, sta: Mallipattinam, Thondi, Devipattinam, Olaikuda, Chinnapalam and Pamban), 28.7.11. Reg.No. S-203.

Dr.V.Deepak Samuel & Party. Sponges were found among *Cymodocea serrulata*.

Distribution : In India, Gulf of Mannar, Palk Bay, Andamans.

7. *Sigmatocia fibulata* (Schmidt)

1880, *Renicra fibulifera* Carter, p. 48.

1884, *Gellius fibulatus* Ridley, p. 424.

1973, *Sigmatocia fibulata* Thomas, p. 21, pi. 1, fig. 9

Material Examined: 2 exs, sta: Olaikuda), 25.7.11. Reg.No. S-199. Coll. Dr.V. Deepak Samuel & Party. Sponges were found among *Halophila ovalis*.

Distribution: Atlantic Ocean, Mediterranean Sea, Indian Ocean, Australian region.

8. *Haliclona implexa* (Schmidt, 1868) (figs. 6, 7)

1868, *Reniera implexa* Schmidt, 27; Ridley & Dendy, 1887: 15, pi. 14; Topsent, 1904:244;

1978, Griessinger, 1971: 133, figs 5c, 6d, 6k; Pulitzer-Finali, 72.

1956, *Haliclona coriacea* Burton, 123 (Not: *Siphonochalina coriacea* Schmidt, 1868).

Material examined: 1 ex, sta: Thondi and Olaikuda), 24.7.11. Reg. No. S-49. Dr. V. Deepak & Party. Sponges were found in the roots of *Cymodocea serrulata* *Halophila ovalis*.

Distribution : In India, Gulf of Mannar, Palk Bay and Andamans.

9. *Haliclona exigua* (Kirkpatrick)

1937, *Haliclona exigua* Burton, p.17 (Synonymy)

Material examined : 1 ex, sta: Thondi and Olaikuda), 24.7.11. Reg.No. S-49. Dr.V.Deepak & Party. Sponges were found among *Cymodocea serrulata*.

Distribution : In India, Gulf of Mannar, Palk Bay and Andamans.

Sea Grass Associated Sponges

Seagrasses are attached with filter feeding animals like bryozoans, sponges, and hydroids as well as the eggs of ascidians and molluscs. These plants and animals provide food for small fish that live in the seagrass. However, it is important to care for all organisms that live in seagrass

habitats because as they are part of the food web that produces the fish. As humans have encroached on the marine environment, there have been some dramatic effects on coastal ecosystems. Many human activities threaten or destroy seagrass habitats. They are an essential part of the marine environment. The following species are associated in the seagrass are *Hercina fusca*, *Dysidea fragilis*, *Spirastrella inconstans* and *Callyspongia diffusa* like branching sponges are fairly common at the bottom. The vegetation is composed of *Cymodocea sp*, *Halophila ovalis* and *Cymodocea serrulata*. Boring sponges was the major group among the marine organisms causing considerable destruction to the reef system. There are 20 species of boring sponges now known from the Gulf of Mannar and Palk Bay falling into 9 genera. The most conspicuous genus is *Cliona* both in number of species and in distribution (Thomas, 1969).



Seagrasses washed ashore in Palk Bay - shows the presence of dense meadows and increase in fishery activities

It is known fact that there has been steady decline in the sea-grass population around the world. It is estimated that around 30,000 kilometers of sea grass has been lost in last ten years. The accelerated damage is due to man - mechanical destruction of the habitat and over-fishing. The bigger threat to seagrass is not from the environment but from the humans. Coastal activities such as ports, harbours, construction, garbage dumps, urban pollution, industrial dumps, terrestrial erosion, coastal development, breakwaters, fish farming, aquaculture,

eutrophication, siltation, dredging, anchoring, are taking heavy toll on the fragile plants. Seagrass habitat is critical for a number of threatened species, including sirenians (dugong and manatee), sea turtles and sea horses, all widely perceived to have high cultural, aesthetic or intrinsic values.

Threats to seagrass associated sponges in Palk Bay

Natural factors like storms, cyclones and flood are the primary cause for mass degradation of sponge habitat in these seagrass ecosystem.

Sedimentation : Sedimentation due to river run off and pressure during Sethu Samudram excavation has caused the seagrass beds and its sponge associates in stress finally leading to mortality. (Ishrath, 2008). The seaweed and sea grass ecosystem between Rameshwaram and Kanyakumari have either been uprooted or submerged, 'dislocating many associated organisms and changing the species composition'. A huge population of sponges has been affected and animals such as crabs, lobsters and stomatopods displaced from their coral homes. [Ramesh, 2005].

Predation : Predation by spongivorous fishes clearly limits the distribution and abundance of sponge species. Most importantly fish predators have a major impact on the distribution & abundance of sponges on Caribbean reefs because fish predatory activities restrict some sponge species to stable. Fish predation on Caribbean sponges comes from an exhaustive study of fish gut contents conducted by Randall & Hartman (1968).

Anthropogenic Impacts : The main threat to seagrass ecosystem in these regions include usage of trawlers and other destructive practices leading to the up- rooting of seagrass with their sponge associates causing further stress.

SUMMARY

In the Palk Bay a total of 16 specimens as belonging to 9 species of sponges as seven genera and six families were recorded from the Seagrass

beds. Genus *Spirastrella* was dominant and seems to be an integral part of sea grass ecosystems. Fishing pressure through bottom set gill nets and trawling were identified as major threats to sponges and other associated organisms in the seagrass communities.

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PLATE



Fig.1 : *Spirastrella inconstans*



Fig.2 : *Cliona celata*



Fig.3 : *Axinella flabelliformis*



Fig.4 : *Axinella durissima*



Fig.5 : *Callyspongia diffusa*



Fig.6 : *Gelliodes fibrosa*



Fig.7 : *Sigmadocia fibulata*



Fig.8 : *Haliclona exigua*