

# Morphology and Molecular Taxonomic studies of Marine Sponges of Lakshadweep

## Abstract

Knowledge about the sponge fauna from the Lakshadweep is scanty in recent years, but most of these modern taxonomic studies have been focused on. The aim of this study was to contribute to the knowledge of the sponge and its distribution in Lakshadweep. At present, forty-three species of sponges have been recorded from the Arabian Sea from the two surveys.

A total of 45 species of sponges belonging to 9 orders, 12 families and 32 genera from class Demospongiae were recorded. Out of which one new species (*Scalarispongia sp.*) recorded first time in India and four new records such as *Axinella minor*, *Haliclona cymaeformis*, *Callyspongia subarmigera*, *Luffariella sp.* were recorded from Lakshadweep region.

**Keywords:** Arabian sea, Diversity. India, Island. New record.

## Introduction

Lakshadweep islands located between 08°00'N and 12°30'N latitudes and 7.00'E and 74°00'E longitudes at a distance ranging from 200 Kms (111 nautical miles) to 400 Kms (222 nautical miles) from mainland. It is the largest atoll system in the world (Jones 1986). It consists of 12 atolls, 27 islands, 3 reefs and 5 submerged banks and total area of 32 sq.km coastline of 132 m and lagoon area. 10 are inhabited and rest of the islands are uninhabited. Studies on marine resources of this island system includes Corals, fishes, mainly tuna, sharks, food fishes, bait fishes and ornamental fishes. Other than fishes there was numerous diversity in crustaceans like crabs, shrimp and sponges. Sponges are most primitive among multicelled animals that existed for 700- 800 million years. It is worldwide in their distribution, which are mostly marine and very abundant in all seas, ranging from intertidal

**Comment [d1]:** • There is an inconsistency in the number of species reported:

- The first sentence mentions **43 species** recorded from two surveys.
- The following paragraph states **45 species** were found.
- It should be clarified whether the number is 43 or 45 species.

**Comment [d2]:** Abstract should have a clear structure: background, objective, methods, results, and conclusion.

**Comment [d3]:** • The methodology used for the survey or species identification is not mentioned.

- There is no implication or conclusion drawn from the study's findings.

rock to very great depths. Most species encrust hard rocky substrate, but many are embedded in sandy muddy sediments with a root-like structure. It usually dominates cryptofauna in coral reefs.

They constitute an abundant and functionally important component of coral reef systems that perform many important functional roles. Sponges also provide microhabitats for various invertebrate species as well as some fishes enhancing biodiversity and harbors microbial symbionts that can contribute to reef productivity.

So far scientific publications have identified about 9000 poriferans species, of which about 400 are glass sponges about 500 are calcareous and the rest of the species are demosponges. The composition size and shape of spicules are one of the largest determining factors in taxonomic identification of sponges. Demospongiae is the largest and most diverse class of the Porifera. The calcarea and demospongiae are strictly shallow water forms, while the hexactinellida are typically deep-water inhabitants. A total of 275 species of sponges have been identified in India (Thomas, 1998). In the Gulf of Mannar and Palk Bay, a maximum of 219 species of sponges recorded followed by Andaman and Nicobar Islands (95 species), Lakshadweep (91 species) and Gulf of Kachchh (25 species) (Venkataraman and Wafar, 2005b). The distribution of sponges in other area is in the Gulf of Kutch – 25 species; and the Orissa coast – 54 species (Thomas, 1998).

#### **Materials and methods**

Underwater surveys were conducted by SCUBA diving in five different locations (Fig. 1) where patchy coral growths are present in various islands viz., Kavaratti, Agatti, Androth, Kadamath and Kalpeni, Bangaram, Amini & Kadmat were carried out from 15.10.2019 to 8.11.2019 and 14.2.2020 to 25.2.2020 depth ranging from 10 to 30 m. The samples were placed in polythene bags and preserved in 90 % ethanol for identification. Underwater photographs of the reef area and the associated sponge fauna were also taken. The samples were brought to the laboratory in clean polythene bags; one sample per bag. The specimens were photographed immediately after they were brought to the laboratory. The morphological characteristics of each specimen including size, shape, colour, texture, total length, and breadth and oscule diameter were noted. For identification, samples from different portions of the sponge specimen were carefully removed using a fine razor blade and digested separately using concentrated nitric acid for extraction of sclerites. The specimens were identified following the taxonomic keys described by de Laubenfels (1936; 1948).

## Review of Literature

India has a rich history of detailed sponge studies from the Gulf of Mannar, Andaman and Nicobar Islands, and Lakshadweep. The first scientific documentation of sponge fauna of Lakshadweep was made by Gardiner during 1903–1906, followed by Thomas (1979–1986), who particularly materialized the special interest of Dr. Jones in documenting the sponge fauna of Lakshadweep, culminating in several publications (Thomas, 1973; 1979; 1989; 1989). More than 90 sponges were reported from his exploratory surveys at various locations in Lakshadweep. In addition, he reported a total of 41 Demospongiae distributed among 23 families and 32 genera from Minicoy Island, and 18 species of boring sponges from various atolls. After a long research gap, Gopi and Ajith Kumar (2012) reported 21 species from Agatti of which 19 were new records. Prabhakaran *et al.* (2013) reported 22 species from Minicoy Island seagrass meadows followed by Das *et al.* (2019), who reported a new record from Bangaram and Thinnakara island. Few reports during the past years included knowledge about the sponge diversity of Lakshadweep (Venkataraman *et al.*, 2004; George *et al.*, 2020). More recently, studies on secondary metabolites and bacteria associated with the sponges of Lakshadweep were also carried out. Species checklists of type collections were made in ZSI, Kolkata by Pattanayak during 1999–2009. Substantial contributions on the sponge fauna of the west coast were made by Dendy 1916–1922, while Burton (1930; 1937) and Thomas (1979; 1980; 1986; 1989) contributed significantly to the sponges of the east coast. Thomas (1986) published a sponge species inventory from the Gulf of Mannar and Palk Bay, wherein brief taxonomic descriptions of 275 sponges were provided. Out of the 555 sponges reported from India, the World Porifera Database could reflect only a total of 138 species as valid taxa (George *et al.*, 2020). The present study is intended to provide an outline of the sponge species composition of Lakshadweep islands based on literature review and exploratory survey.

**Table 1. Sampling sites**

Point No.	Date	Locality	State	Coordinates (GPS)	Specimens Details
1	18-10-19	Kavaratti	Lakshadweep	Lat. N 10° 32.995' Long. E 72° 37.448'	
2	19-10-19	Kavaratti	Lakshadweep	Lat. N 10° 32.924' Long. E 72° 37.567'	
3	20.10.19	Kavaratti	Lakshadweep	Lat. N 10° 34.021' Long. E 72° 38.112'	
4	22.10.19	Androth	Lakshadweep	Lat. N 10° 49.931' Long. E 73° 41.235'	Marine sponges
5	22-10-19	Androth	Lakshadweep	Lat. N 10° 52.589' Long. E 73° 41.157'	Marine sponges
6	23-10-19	Androth	Lakshadweep	Lat. N 10° 48.462' Long. E 73° 41.906'	Marine sponges
7	23-10-19	Androth	Lakshadweep	Lat. N 10° 49.236' Long. E 73° 40.736'	Marine sponges
8	24-10-19	Androth	Lakshadweep	Lat. N 10° 48.486' Long. E 73° 39.765'	Marine sponges
9	27-10-19	Kalpeni	Lakshadweep	Lat. N 10° 05.551' Long. E 73° 38.673'	Marine sponges
10	27-10-19	Kalpeni	Lakshadweep	Lat. N 10° 05.480' Long. E 73° 37.424'	Marine sponges
11	28-10-19	Kalpeni	Lakshadweep	Lat. N 10° 04.655' Long. E 73° 38.675'	
12	30-10-19	Kavaratti Island Passanger Jetty	Lakshadweep	Lat. N 10° 34.302' Long. E 72° 38.236'	Marine Sponges
13	31-10-19	Light House Jetty	Lakshadweep	Lat. N 10° 33.638' Long. E 72° 38.782'	Marine sponges
14	1.11.19	Shipwreck side	Lakshadweep	Lat. N 10° 32.841' Long. E 72° 37.446'	Marine sponges
15	02.11.19	Kavaratti	Lakshadweep	Lat. N 10° 34.970' Long. E 72° 38.263'	Marine sponges
16	02.11.19	Kavaratti	Lakshadweep	Lat. N 10° 34.849' Long. E 73° 37.901'	Marine sponges
17	04.11.19	Agatti	Lakshadweep	Lat. N 10° 50.240' Long. E 72° 11.295'	Marine sponges
18	04.11.19	Agatti	Lakshadweep	Lat. N 10° 52.403' Long. E 72° 12.563'	Marine sponges
19	05.11.19	Tinnikara Island	Lakshadweep	Lat. N 10° 55.071' Long. E 72° 18.493'	Marine sponges
20	05.11.19	Bangaram island	Lakshadweep	Lat. N 10° 57.966' Long. E 72° 17.233'	Marine sponges

#### Second survey

Date	Study sites	Coordinates	Maximum Depth
16.02.20	Kadmat Island	Lat. N 11° 13.457' Long. E 72° 46.725'	Inter-tidal
17.02.20	Kadmat Island	Lat. N 11° 11.142' Long. E 72° 46.013'	40 m
18.02.20	Amini Island	Lat. N 11° 08.634' Long. E 72° 43.676'	35 m
19.02.20	Kiltan Island	Lat. N 11° 28.538' Long. E 72° 59.821'	25 m
20.02.20	Kadmat Island	Lat. N 11° 14.102' Long. E 72° 45.579' 25 m Lat. N 11° 15.204' Long. E 72° 47.495'	25 m 22m
22.02.20	Agatti Island	Lat. N 10° 51.105' Long. E 72° 11.793' Lat. N 10° 49.552' Long. E 72° 10.996'	30 m 28 m

23.02.20	Bangaram Island	Lat. N 10° 55.193' Long. E 72° 16.128' Lat. N 10° 55.332' Long. E 72° 16.881'	28 m 25 m
24.02.20	Bangaram Island	Lat. N 10° 57.904' Long. E 72° 17.513' Lat. N 10° 58.036' Long. E 72° 16.857'	30 m 35 m
25.02.20	Dinnakara Island	Lat. N 10° 57.268' Long. E 72° 20.117'	40m
26.02.20	Agatti Island	Lat. N 10° 52.023' Long. E 72° 11.568' Lat. N 10° 50.048' Long. E 72° 10.860'	Intertidal Intertidal

## Results

A total of 45 species of sponges belonging to 9 orders, 12 families and 32 genera from class Demospongiae were recorded. Out of which one new species (*Scalarispongia*) recorded first time in India and three new records such as *Axinella minor*, *Haliclona cymaeformis*, *Callyspongia subarmigera*, *Luffariella* sp, were recorded from Lakshadweep region List as below

Comment [d4]: italicized

Comment [d5]: italicized

### 1. *Stylissa carteri* (Dendy 1889)

1889. *Acanthella carteri* Dendy. *Annals and Magazine of Natural History*. (6) 3: 73-99, pls III-V.page(s): 93-94.

Material Examined:3exs. Reg.No. Sta: Agatti: Reg.No.S.420,Kadmat; Reg.No. S.339.; Bangaram,Reg.No S.359, Pitty island; Reg.No S.453; Date: 3.11.2019, 20.2.2020, 3.11.2019, 6.2.2022. Coll: Marimuthu & Party.

Description: Section showing the choanosomal skeleton with plumose tracts running up the sponge. Ectosomal skeleton showing protruding spicule tracts making the surface velvety.

Spicules- Styles are in two forms.A.Short stout gradually sharp pointed styles. b. long slender curved styles. 0.4-0.021mm.

Distribution: India. Continental shelf of southwestern Bay of Bengal (Ansari *et al.*, 2012

Elsewhere: India, Indonesia, Kenya, Madagascar, Mozambique channel

### 2. *Axinella donnani* (Bowerbank, 1873)

1873. *Axinella (Stylissa) donnani* Bowerbank. *Proceedings of the Zoological Society of London*. 1873: 25-32, pls V-VII. 28-29.

Material Examined: 3 exs, S.453. Kalpeni, 29.10.2019

Description: Sponge lamellar. Surface minutely hispid. Colour yellow. Oscules scattered. Axial fibers arranged plumosely. Fibers are cored. Styles. 0.12-0.283x0.002mm, Oxeas: 0.213-0.42mmx 0.002mm.

Distribution: India Gulf of Mannar Thomas, 1986

Elsewhere: East African Coral Coast and South India & Western India.

### 3. *Axinella manus* Dendy, 1905

1905. *Axinella manus*. Dendy. (*Royal Society: London*). (*Supplement 18*). Pp. 57-246, pls I-XVI. 188-189.

Material Examined: 1 ex, S.432, Sta: Agatti, Date: 4.11.2019, Coll: Dr. Marimuthu & Party

Description: Sponge palmately branched with conical tips. Skeleton without axial and extra axial specialization. Spicules are plumosely arranged. Spicules: Styles: 0.2-0.012mm. @. Oxeas: 0.2- 0.012mm

Distribution: India India Gulf of Mannar Thomas, 1986

Elsewhere: India, Maldives, South India, Western India & Sri Lanka.

### 4. *Dragmacidon durissimum* (Dendy 1905)

1905. *Dragmacidon durissima*. Dendy. *Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Mannar. 3 (Supplement 18)*. (*Royal Society: London*). Pp. 57-246, pls I-XVI. 187-188.

Material Examined: 2 exs, S.373, Sta: Kalpeni, Date: 28.10.2019.

Description: Sponge massive, tuberous. Colour orange texture compact. Oscules numerous, compound. Pores minute. Main skeleton composed of plumose columns of megascleres. Spicules: Oxeas: 0.297x0.01mm. Styles: 0.0217x0.01mm.

Distribution: India: Gulf of Mannar Thomas, 1986

Elsewhere: Banda Sea, Gulf of Thailand, Seychelles, South India, Sri Lanka, Southern Red Sea & West Arabian Sea.

### 5. *Phakellia*.sp.

2009. *Phakellia* Alvarez and Hooper. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory*. 25: 17-42. page(s): 29

Material Examined: 1ex.342, Sta: Kadmat, Date: 20.2. 2020.Coll: Marimuthu & Party.

Description: Surface cartilaginous Orange in colour while in alive. Styles straight slightly curved,  $422.51 - 524.93 - 650.41 \times 8.82 - 14.87 - 18.71 \mu\text{m}$

Distribution: India.

Elsewhere: Red Sea.

#### 6. *Tethya robusta*(Bowerbank, 1873)

1873. *Tethya robusta* Bowerbank. Part IV. *Proceedings of the Zoological Society of London*. 1873: 3-25, pls I-IV.pp: 10-11

Material Examined: 1ex, Reg.No.S.338, Sta: Kalpeni, Date: 27.10.2019;Reg.No. S.344, Kadmat, Date: 20.2.2020.

Description:Sponge sphaerical surface tuberculated. Yellowish brown in colour.Consistency fleshy. Oscules slit like.Pores minute. Skeleton in radial pattern Strongylaxeas: 0.217-1.2x0.002mm Sphaerasters: 0.031, Oxyasters: 0.025-0.03mm, Chiasters: 0.012mm.

Distribution: India:Gulf of Mannar and Palk Bay Thomas, 1986..

Elsewhere: South india, Sri Lanka, South eastern Brazil, South Caribbean. Western & Northern Madagascar & Fiji Islands

Remarks:These samples fit with *T.robusta* Thomas, 1986 from Gulf of Mannar in external morphology, skeleton structure, and spicule shape and size.

#### 7. *Stelletta clavosa* Ridley, 1884

1884. *Myriaster clavosa* Ridley. (*British Museum (Natural History): London*). 366-482, pls 39-43; 582-630, pls 53-54. page(s): 474-476.

Material Examined: 1ex, S.352, Sta: Kalpeni, Date: 27.10.2019.

Description: Sponge spherical in shape.ht grey in colour. Consistency hard.surface hispid due to the presence of spicules. Spicules: Dichotriaenes: 0.074mm, Protriaenes: 0.02mm, Anatriaenes: 0.1mm, Asters: 0.012mm

Distribution: India:. Andaman & Nicobar islands, Pattanayak, 2006.

Elsewhere: Andaman & Nicobar Islands, Banda Sea, Malacca Strait, South India, Sri Lanka& North great Barrier reef.



**8. *Agelas dispar* Duchassaing & Michelotti, 1864**

1883. *Agelas clavaeformis* Carter. *Natuurkundige verhandelingen van de Hollandsche maatschappij der wetenschappen te Haarlem*. 21(2): 1-124, pls I-XXV.

page(s): 76-77; pl XV fig 1

Material Examined: 1 ex. Reg.No.334; Androth; 362, Androth: Date: 22.10.2019

Description: Sponge globular with cavernous interior. Dark brown in colour. Consistency fibrous and resilient. Skeleton with spined acanthostyles. Acanthostyles: 0.13- 0.001mm

Distribution: India: Gulf of Mannar, Thomas, 1986.

Elsewhere: Maldives, Marshall islands, South India, Sri Lanka Madagascar & Seychelles

**9. *Agelas mauritiana* (Carter, 1883)**

1883. *Ectyon mauritiana* Carter. *Annals and Magazine of Natural History*. (5) 12 (71): 308-329, pls XI-XIV. page(s): 310-311; pl XII fig 3a-b.

Material examined: 2 exs. Reg.No.S.401. Kavaratti, 2.11.2019.

Description: Sponge tubular with cavernous interior. Colour dark brown. Consistency fibrous and resilient. skeleton reticulated with acanthostyles. Acanthostyles 0.134x 0.012mm.

Distribution: India, Gulf of Mannar Thomas, 1986

Elsewhere: Red Sea to West pacific.

**10. *Cliona orientalis* Thiele, 1900**

1900 *Anthosigmella orientalis* Thiele. *Frankfurt*. 25: 19-80.

Material Examined: 3 exs, Reg.No.S.335, Sta: Kalpeni;. Date: 28.10.2019

Description: This species common on corals. Oscules scattered. Surface minutely hispid.

Tylostyles: 0.127- 0.0012mm.

Distribution: India: Andaman & Nicobar islands, Pattanayak, 2006 & Gulf of Mannar Thomas, 1986

Elsewhere: South India Sri Lanka Southern Red Sea

Remarks: This species was recorded from Gulf of Mannar by Thomas.

**11. *Clathria (Thalysias) procera* (Ridley, 1884)**

1884. *Clathria (Thalysias) procera* Ridley. (*British Museum (Natural History): London*). 366-482, pls 39-43; 582-630, pls 53-54. page(s): 451-452.

Material Examined: 3 exs, S.504, Sta: Pitty Island, Date: 6.2.2022.

Description: Sponge a clathrous mass. Textre compressible. Surface uneven, Oscules scattered, slit like. Skeleton is an irreugular reticulation of fibres cored by subtylostyles. Subtylostyles; 0.21-0.331X0.005.

Isochelas: 0.015mm

Distribution: South India Gulf of Mannar (Thomas, 1886) & Sri Lanka.

Elsewhere: Hawaii, India, Natal, Seychelles, South India and Sri Lanka, Southe Red Sea, Torres Strait Northern Great Barrier Reef, Western India

#### 12. *Callyspongia fistularis* (Topsent, 1892)

1892. *Sclerochalina fistularis* Topsent. *Mémoires de la Société Zoologique de France*. 5: 21-29, pl. page(s): 25-26

Material Examined: 3 exs. S.463. Sta: Androth, Date 22.10.2019.

Description: Sponge surface spinous or tuberculated. Oscules terminal. Skeleton composed of multispicular fibres, primaries & connectives.

Oxeas: 0.06-0.07mm

Distribution: South India (Gulf of Mannar) by Thomas, 1986 & Sri Lanka

Elsewhere: Marshall islands, Red Sea

#### 13. *Callyspongia (Cladochalina) diffusa* (Ridley, 1884)

1884. *Cladochalina diffusa* Ridley *Annals and Magazine of Natural History*. (5) 14(81): 183-187. page(s): 183-184.

Material Examined: 1 ex, 341; Bangaram, 23.2.2020.

Description: Sponge flabellate. Oscules scattered. Pore min ute. Surface reticulated and hispid. Main fiberes are coarse.

Oxeas: 0.031x 0.001mm.

Distribution: South India (Gulf of Mannar) by Thomas, 1986 & Srilanka.

Elsewhere: Great Barrier reef, East African Coast, Eastern India, Hawaii, India, Maldives, New Zealand, Singapore, Archipelago

#### 14. *Callyspongia (Cladochalina) fibrosa* (Ridley & Dendy, 1886)

1886. *Dasychalina fibrosa* Ridley & Dendy. *Annals and Magazine of Natural History*. 18: 325-351, 470-493. page(s): 330.

Material Examined: 2 exs. Reg. No. S.502. Sta: Pitty island; Date 7.2.2022

Description: Sponge composed of finger shaped branches. Surface with strong conules. Oscules distributed terminal. Dermal skeleton reticulate meshes triangular. Primaries of 0.12mm and connectives 0.03mm in diameter. Oxeas: slightly curved tips pointed. ).056-0.11 x 0.002mm.

Distribution: South India (Gulf of Mannar) by Thomas, 1986 & Sri Lanka

Elsewhere: Brazil, Great Barrier Reef, Eastern Philippines, Malacca strait, Northern Bay of Bengal, Seychelles, Vietnam & Western Arabian Sea.

Remarks

**15. *Haliclona (Gellius) cymaeformis* (Esper, 1806)**

1806. *Spongia cymaeformis* Esper. Zweyter Theil. (Raspe: Nürnberg): 25-48, pls LXV-LXX page(s): 43, plate LXIX figs 1-2.

Material Examined: 2 exs. Reg. No. S.399. Kavaratti, 2.10.2019

Description: Sponge irregular cluster of tubes in different diameter. Colour pale yellow when dry. Texture hard. Oscules in linear series. Pores minute. Surface minutely hispid.

Skeleton composed of triangular meshes. Spicule: Oxeas: .102-0.142 x 0.002mm.

Distribution: India.

Elsewhere: Madagascar, Singapore and Indian Ocean.

Remarks:

**16. *Haliclona (Haliclona) oculata* (Linnaeus, 1759)**

1759. *Axinella oculata* Linnaeus. *Hagae*. pp. 451. available online at <https://doi.org/10.5962/bhl.title.6595>. pp: 390-391

Material Examined: 3 exs, S.438. Sta: Kavaratti island, Date: 19.10.2019.

Description: Sponge consist of several tubes. Texture soft and compressible. Surface hispid oscules terminal. Skeleton consist of cored fibres and connectives. Spicules: Oxeas: 0.047-0.12 x 0.002mm.

Distribution: India: (Gulf of Mannar) by Thomas, 1986

Elsewhere: Kara Sea, North Atlantic Ocean, White Sea & Belgium.

**17. *Gelliodes pumila* (Lendenfeld, 1887)**

1887. *Adocia pumila* Lendenfeld. *Zoologische Jahrbücher, Jena*. 2: 723-828, pls XVIII-XXVII. page(s): 806.

Material Examined: 2 exs, S.346; Sta: Agatti, Date: 4.11.2019.

Description: Sponge tubular. Conules at the tip. Short oxeas with less frequent sigmas pointed by arrows. Skeleton reticulated with oxeas in isodityal pattern. Oxeas: 0.10-0.22x 0.001mm.

Distribution: India: (Gulf of Mannar) by Thomas, 1986

Elsewhere: Red Sea.

**18. *Halichondria (Halichondria) panicea* (Pallas, 1766)**

1766. *Alcyonium panicum* Pallas. *Fransiscum Varrentrapp, Hagae*. pp. 451., available online at <https://doi.org/10.5962/bhl.title.6595>. page(s): 388

Material Examined: 1ex, S.462, Sta: Androth, Date: 24.10.2019.

Description: Sponge is tubular cushion shaped. Skeleton composed of halichondroid pattern. Microscleres absent.

Oxeas: 0.66x0.021mm.

Distribution: India (Gulf of Mannar) by Thomas, 1986

Elsewhere: Adriatic Sea, Baltic Sea, Black Sea, North Atlantic Ocean, North Sea, Western Mediterranean, White Sea, Belgium

**19. *Plakinastrella schulzi* Dendy, 1905**

1905. *Penares schulze* Dendy. *Zeitschrift für wissenschaftliche Zoologie*. 34(2): 407-451. page(s): 13.

Material Examined: 1ex, Reg.No.S.380, Sta: Kalpeni: Date: 27.10.2019.

Description: The specimen is petaloid branches. Pores are scattered. Skeleton contains numerous short shafted triaenes. Spicules- Short shafted triaenes are pointed. Diameter- 0.4mm thick.

Distribution: India (Gulf of Mannar) by Thomas, 1986

Elsewhere: Adriatic Sea, Aegean Sea, Celtic Seas, Great Barrier Reef, Eastern Brazil, Eastern Caribbean, Eastern Philippines, Maldives, New Caledonia, North Atlantic Ocean, Red Sea, Madagascar, Belgium

**20. *Cliona celata* Grant, 1826**

1826. *Halichondria celata* Grant. *Edinburgh New Philosophical Journal*. 1: 78-81., available online at <https://www.biodiversitylibrary.org/page/2471191>, page(s): 81

Material Examined: 1ex, Reg. No.S.481, Sta: Kalpeni, Date 28.10.2019.

Description: This is boring sponge. Massive and cushion shaped. Pores scattered. Spicules: Tylostyles: 0.150-0.33x0.002mm.

Distribution: India (Gulf of Mannar) by Thomas, 1986

Elsewhere: Argentina, Namibia, North Atlantic Ocea, Red Sea, Belgium Canada & Netherlands

**21. *Dysidea granulosa* Bergquist, 1962**

1814. *Dysidea granulosa* Montagu. The Palau Archipelago. *Pacific Science*. 19 (2): 123-204. page(s): 144

Material examined: 3exs, Reg.No. 352, Sta: Agatti, Date: 4.11.2019.

Description: Section showing conulose surface that is heavily charged with sand. - Choanosomal skeletal fibres forming a regular reticulating that is heavily cored by debris and sand

Distribution: India (Gulf of Mannar) by Thomas, 1986

Elsewhere: Adriatic Sea, Aegean Sea, Bermuda, Black Sea, Carribean Sea, Eastern brazil, Chatham Island, Japan Sea, New Zealand, North Atlantic Ocean, North Sea.

**22. *Fasciospongia cavernosa* (Schmidt, 1862)**

1862. *Cacospongia cavernosa* Schmidt. Leipzig: i-viii, 1-88, pls 1-7. page(s): 28

Material Examined: 4 exs, Reg.No.S.416. Sta: Androth, 22.10.2019.

Description: Sponge thickly fistular. Oscules scattered. Texture hard and incompressible. Surface conulose. Primary fibres 0.12mm thick and cored. connectives are 0.012mm thick.

Distribution: South India, (Gulf of Mannar) by Thomas, 1986 & Sri Lanka

Elsewhere: Adriatic Sea, Aegean Sea, North Atlantic Ocean, Red Sea,

Remarks:

**23. *Leucetta chagosensis* Dendy, 1913**

1931. *Leucetta expansa* Row and Hozawa. *Science Reports of the Tôhoku Imperial University*. (4) 6(1): 727-809, pls XIX-XXI. page(s): 749-751

Material Examined: 2exs. Reg.No.355, Sta, Kadmat, Date: 20.02.2020

Description: The skeleton is composed mainly of small triactines, which are present everywhere, while colossal triactines are present only on the cortex and very rare small tetractines can be found only in the atrium.

Large triactines with conical equiradiate actines measuring  $427.27 - 516.47 - 635.63 \times 32.48 - 42.38 - 50.01 \mu\text{m}$ . Small, extremely rare equiangular actines measuring  $34.17 - 44.75 - 56.03 \times 5.79 - 5.45 - 7.06 \mu\text{m}$ .

Distribution: India: Lakshadweep (Anita mary, 2020)

Elsewhere: Banda, Great Barrier Reef, Phillipnes, Fiji Isl;and, Indonesia, Maldives, New Caledonia, Saudi Arabia Papua new guinea, Madagascar, Northern Red Sea, Japan (Okinawa), Indonesia, Australia (Queensland and Fremantle), New Caledonia and French Polynesia (Dendy, 1913; Wörheide & Hooper, 1999; 2008; Borojevic & Klautau, 2000).

**24. *Hyattella* sp**

1766. *Spongia sinuosa* Pallas. Fransiscum Varrentrapp, Hagae., available online at <https://www.biodiversitylibrary.org/page/6019361>. pp. 451, page(s): 394;

Material Examined: 1 ex. Reg.No.S. S.456., Androth, 4.11.2019.

Description: Choanosomal skeleton with anastomosed fibers. Primary fibers are thic and secondary fibers are very thinner.

Distribution: India Lakshadweep

Elsewhere: Banda Sea, Seychelles, Sri Lanka.

**25. *Spongia* ( *Spongia*) *ceylonensis* ( Dendy, 1905)**

1905. *Euspongia officinalis* var *ceylonensis* Dendy. (Royal Society: London). Pp. 57-246, pls I-XVI. page(s): 211-213

Material Examined: 6exs. Reg.No.S. 7262, Kadmat, 20.02.2020

Description: Sponge sub-globular bearing oscules. Surface minutely conulose. Colour yellow when dry. Main fibers running vertically towards surface. It is connected with secondaries.

Distribution: India

Elsewhere: Central New Zealand

**26. *Dragmacidon* *agariciforme* (Dendy, 1905)**

1905. *Axinella agariciformis* Dendy. (*Royal Society: London*). Pp. 57-246, pls I-XVI. page(s): 186-187 .

Material Examined: 1ex.S.358. Sta: Bangaram. Date 6.11.2019.

Description: Section showing the choanosomal skeleton with thick plurispicular columns running parallel to each other approaching the surface to form the characteristic conules. The primary tracts contain single spicules protruding making the surface velvety

Distribution: India, South India, Lakshadweep (Anita Mary, 2020) Srilanka

Elsewhere: Delagoa, Maldives, Western Arabian Sea, Western India

Remarks: This species was recorded in Lakshadweep (Anita mary), 2020.

**27. *Hyrtios erectus* (Keller, 1889)**

1889. *Heteronema erecta* Keller. Z. wiss. Zool. 48: 311-405, pls XX-XXV. page(s): 340-341/

Material Examined: 4exs. Reg.No.S.425, Androth, Date: 22.10.2019

Description: Anastomosing choanosomal skeletal fibres heavily cored by sand and debris

Distribution: Indian Ocean. (Thomas, 1986)

Elsewhere: Eastern Phillipines, Gulf of Thailand, New Caledonia, North Atlantic Ocean,

**28. *Mycale (Mycale) crassissima* (Dendy, 1905)**

1905. *Esprella crassissima* Dendy. (*Royal Society: London*). Pp. 57-246, pls I-XVI. page(s): 160-161.

Material Examined Reg.No. 6 exs,S.505. Pitty island. Date: 12.2.2022.

Description: Sponge finger shaped branches. Consistency hard but compressible. Surface reticulated.. Oscules 3mm in diameter. Spicules: Subtylostyles: 0.25x0.02mm. Sigmas: 0.026mm.

Distribution: South India Gulf of Mannar, Thomas, 1986. Srilanka

Elsewhere: Brazil, east African Coral Coast, Floridian, Gulf of Aden, Malacca strait, Papua, Archipelago, Madagascar, Kenya, Mozambique

**29. *Suberites carnosus* (Johnston, 1842)**

1842) *Halichondria carnosa* Johnston. A History of British Sponges and Lithophytes. (W.H. Lizars: Edinburgh). i-xii, 1-264, pls I-XXV., available online at <https://biodiversitylibrary.org/page/35290582>page(s): 146-147.

Material Examined: 2exs,S.506, Pitty island, 6.2.2022.

Description: Sponge ramose & club shaped. Consistency fleshy. Oscules terminal. Skeleton composed of tylostyles.

Tylostyles: 0.2-0.46x 0.003mm.

Distribution: South India, Gulf of Mannar, Thomas, 1986.Sri Lanka

Elsewhere: Adriatic Sea, Aegean Sea, Black Sea, Maldives, Mozambique, New Zealand, North Atlantic Ocean, North Sea, Red Sea, Seychelles,

**30. *Stylissa massa* (Carter, 1887)**

1887. *Axinella virgultosa* var *massa* Carter. *Journal of the Linnean Society, Zoology*. 21(127-128): 61-84, pls 5-7.page(s): 68

Material Examined: 1ex,Reg.No.373. Kalpeni, 29.10.2019

Discussion: Sponge lobate. Consistency firm. Brown in colour. Skeleton plumose and spicules are oxeas.

Distribution: India

Elsewhere: Maldives, Western India

**31. *Aplysinoopsis elegans* Lendenfeld, 1888**

1888. *Aplysinoopsis elegans* Lendenfeld. (Taylor & Francis: London). i-xiv, 1-260, pls 1-12. page(s): 149-150.

Material Examined: 1ex, Reg.No.378, Kavaratti, 2.11.2019.

Description: The sponge consists cylindrical. The oscules are downside.; the skeleton is light chestnut-brown, stiff, but compressible. The main fibres of the skeleton are 0-18 millim. thick, and cored. The connecting-fibres are slightly ramified, The meses are rectangular.

Distribution: India

Elsewhere: Madagascar, Red Sea.



**32. *Semitaspongia* sp** Cook and Bergquist, 2000

2000. *Semitaspongia bactriana* Cook and bergquist

Material Examined: 1 ex. Reg.No.S.510. Kavaratti, 2.11.2019.

Description: A The sponge is soft and massive species, forming fibre network. The surface has numerous, fine to coarse conules, with long dendritic emergent terminal fibres. Colour is brown. The primary fibers are cored. The secondary fibers are uncured.

Dsitribution: India. Not reported so far.

Elsewhere: Polynesia, Archipelago.

**33. *Callyspongia* ( *Cladochalina*) *subarmigera* ( Duchassaing & Michelotti, 1864)**

1864. Tuba armigera Duchassaing & Michelotti. *Natuurkundige verhandelingen van de Hollandsche maatschappij der wetenschappen te Haarlem*. 21(2): 1-124, pls I-XXV.

page(s): 48-49; pl VIII fig 3

Material examined: 1ex,Reg.No.S.439, Sta: Agatti, Date: 4.11.2019.

Description: Sponge surface conules. Oscules distributed terminal. Dermal skeleton reticulate meshes triangular. Ectosomal skeleton large. Primaries of 0.12mm and connectives 0.03mm in diameter. Oxeas: slightly curved tips pointed. 43-69-70 mm x 0.153mm in diameter.

Distribution: First time reported in Lakshadweep.

Elsewhere: West Indies, Florida, jamaika.

**34. *Hyattella intestinalis* (Lamarck, 1814)**

1814. *Spongia intestinalis* Lamarck. *Annales du Museum national d'Histoire naturelle*. 20: 294-312; 370-386; 432-458.

Materials Examined: 4exs. Banagaram, 23.2.2020.

Description: Surface minutely conulose. Oscules terminal, Pores numerous. Texture hard with poor resiliency. Skeleton consist of amber coloured spongin fibers. Primaries are cored by objects 0.14mm thickness. The secondaries are much slender 0.006 mm thickness. The mesges are polygonal.

Distribution: India: Gulf of Mannar ( Thomas, 1986) Sri Lanka.

Elsewhere: Atlantic Ocean, Mediterranean Sea.

**35. *Hyattella* sp**

Material Examined: 1 ex, Reg.No.456, Bangaram, 23.2.2020

Description: Sponge body is soft. Oscules are numerous. Minutely conulose. Skeleton is reticulated primaries and connectives. Primaries are cored and secondaries are uncured.

Distribution: India and Sri Lanka.

Elsewhere: Mediterranean Sea.

36. *Scalarispongia* n. sp Cook and Bergquist, 2000

2000. *Cacospongia scalaris* Cook and Bergquist. Leipzig: i-viii, 1-88, pls 1-7.  
page(s): 27-28; pl II fig 4.

Material Examined: 1 ex. 397, Sta: Androth, Date: 22.11.2019.

Description: Sponge tubular, surface conulose, Oscules are rare. Colour yellow. Primaries are cored inseparable from the connectives diameter 0.12 mm. Connectives are free from uncured. This has ladder-like skeletal pattern arranged throughout body and has pseudo-tertiary fibers.

Distribution: India. Not reported so far.

Elsewhere: Mediterranean Sea.

37. *Acanthus* sp Ridley, 1884.

1884. (*British Museum (Natural History): London*). 366-482, pls 39-43; 582-630, pls 53-54.  
page(s): 453 & 615 .

Material Examined: S.443, Androth, Date: 22.11.2019.

Description: Sponge finger shaped colour pale yellow. Surface hispid. Skeleton well developed reticulation of spongin fibers cored by styles and tyloes. Main fibers are not demarcated with connectives. Spicules styles: 0.31- 0.42mm, Tyloes: 0.204x0.002mm. Toxas: long one are 0.155x 0.003 mm and small one are 0.062-0.21mm, Isochelas: 0.003-0.01mm.

Distribution: India; Gulf of Mannar, Thomas, 1986.

Elsewhere: Red Sea, Australina region.

38. *Axinella minor* Thomas, 1981.

1981. *Axinella minor* Thomas. s, 1973, p. 43, pl. II, fig. 17

Material Examined: 5 exs, Reg.No.340, Androth, 22.10.19

Description: : Body finger shaped, tips blunt, Colour: Orange when alive brown after dry..

Consistency : Compressible with good resiliency. Skeleton consist of primaries and connectives.

Spicules: Styles. Slightly curved and sharply pointed; head conspicuous in younger forms.

Size, 0.183 - 0.245 mm x 0.002 - mm.

Distribution : Indian Ocean. Thomas, 1981. ( Mahe island ). First time reported from Lakshadweep.

Elsewhere: Indian Ocean.

**39. *Phakettia ridleyi* (Dendy, 1887)**

1887. *Phakellia ridleyi* Dendy. *Annals and Magazine of Natural History*. (5) 20(117):153-165, pls IX-XII. page(s): 159-160 .

Material Examined: 4exs, Reg.No.S.447, Kavaratti, 22.11.2019.

Description: Body lamellar and ridged. Colour blood red when alive yellow in dry condition.

Texture rough and cartilaginous. Oscules and pores not traceable. Skeleton axial and extra axial spicules in plumose manner. Styles: 0.213-0.267x 0.003mm.

Distribution: India; Andaman, gulf of Mannar ( Thomas, 1986)

Elsewhere: Cosmopolitan.

**40. *Callyspongia spinosissima* (Dendy, 1887)**

1887. *Pachychalina spinosissima* Dendy. *Proceedings of the Zoological Society, London*, 35: 524-526.

Material Examined: 2exs, Reg.No.2 exs, S.463. Androth, 22.11.2019.

Description: Sponge repent cylindrical branches. Colour yellow. Oscules scattered, pore minute. The main skeleton is coarse and composed of primaries and connectives.

Oxeas: 0.21-0.2x 0.003-0.01mm.

Distribution: India; Gulf of Mannar Thomas, 1986.

Elsewhere: Indian Ocean.

**41. *Spheciospongia inconstans margaritifera* Dendy, 1887**

1887. *Suberites inconstans* Dendy. *Annals and Magazine of Natural History*. (5) 20(117):153-165, pls IX-XII. page(s): 154

Material Examined: 1ex, Reg.No.S.511. Kavaratti, 2.11.2019.

Description: This is boring sponge in oyster. Cavities formed inside the shell. Tylostyles: 0.21-0.002mm, Spirasters: 0.0012mm.

Distribution: India. Tamilnadu, Thomas, 1986.

42. *Ectyodorys lissostyla* Thomas, 1970.

1970. Lissodendoryx ( Ectyodoryx) lissostyla ( Thomas 1970). *Journal of the Marine Biological Association of India*. 12(1): 202-209.page(s): 203.

Material Examined:s. 1ex, Reg.No.512.Androth, 2.11.2019.

Description: Sponge encrusting. Colour pale yellow. Consistency hard. Surface conulose. Oscules small. Dermal skeletons consist of styles. Styles: 0.318-0.003mm, Sigmas: ).023-0.01mm.

Distribution: India. Gul of Mannar

Elsewhere: Cosmopolitan.

43. *Chondrilla australiensis* Carter, 1873

1873. *Chondrilla australiensis* Carter. *Annals and Magazine of Natural History*. (4)12(67): 17-30, pl. I. page(s): 23-24; pl I fig 10-14 & 16.

Material Examined: 1ex. Reg.No.513, Kavaratti, 2.11.2019.

Description: Sponge lobose. Colour brown with dark specks. Consistency tough and cartilaginous. Surface smooth. Cortex well developed. Spherasters and oxyasters in the cortex. Sphaerasters. 0.016-0.23mm, Oxyasters: 0.0012-0.020mm.

Distribution: Gulf od mannar.

Elsewhere: Indo Pacific.

**Discussion:** A total of 43 species of sponges belonging to 9 orders, 12 families and 32 genera from class Demospongiae were recorded. Out of which one new species (*Scalarispongia*) recorded first time in India and three new records such as *Axinella minor*, *Haliclona cymaeformis*, *Callyspongia subarmigera* and one rare calcareous sponges were recorded from Lakshadweep region. *Axinella minor* species was not described from these before. But it is a common species from other areas. Twenty four species of sponges were found to be most common and abundant in Agatti, Kadmat & Pitti silands. They are *Clathria procera*, *Stylissa carteri*, *Agelas dispar*, *Dysidea granulosa*, etc. *Cliona celata*, *Cliona orientalis*, *Cliona margarifera* are the boring sponges from Lakshadweep. Earlier (Thomas (1989) published a checklist of 91 species of sponges from Lakshadweep. George et al (2020) listed 21 new records from Lakshadweep. *Scalarispongia* species of sponges distributed in Kora and brazil earlier. Now it is recorded from Lakshadweep. This report will be helpful for protection and conservation of diversity of Lakshadweep. DNA barcoding of one calcarean species of *Leucetta chagosensis* was submitted in NCBI as a part of the study of molecular taxonomy. Species voucher number GenBank (ITS): *Leucetta chagosensis* QMG313774 AM850505

**Comment [d6]:** Revised : "*Axinella minor* has not been previously described from this region, although it is a common species in other areas."

**Comment [d7]:** islands

**Comment [d8]:** italicized

**Comment [d9]:** The relationship between these findings and the studies by Thomas (1989) and George et al. (2020) needs to be explained more clearly. It should be mentioned whether the number of species found in this study represents an increase or a change compared to previous studies.

**Comment [d10]:** italicized

**Comment [d11]:** The last paragraph mentions the DNA barcoding of *Leucetta chagosensis* but does not explain why this species was chosen or how the results contribute to the study.

## References

- Burton, M., 1930. Addition to the fauna of Gulf of Mannar .Annals and Magazine of natural History, London (10)5: 665-676.
- Burton, M., 1937. Supplement to the littoral fauna of Krusadai Island. Bulletin of the Madras Government Museum, Madras, 1(2), pt. 4: 1-58, pls. I-IX.
- Dendy, (1905). Report on the sponges collected by Prof. Herdman, at Ceylon, in 1902. Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Mannar, Royal Society, London, suppl. 3(18): 57-246.
- Joy Gopal Pattanayak J.G and Manna Buddhadeb 2001. Distribution of Marine sponges (Porifera) in India, Proc. Zool. Soc. Calcutta, 54(1): 73-101.
- JONES, W. C. (1987) Seasonal variations in the skeleton and spicule dimensions of *Haliclona elegans* (Bowerbank) sensu Topsent (1887) from two sites in North Wales. In Jones, W. C. (ed) European Contributions to the Taxonomy of Sponges: 109-129. Publications of the Sherkin Island Marine Station No. 1, ISBN 1-870492- 05-6.
- HOOPER, J. N. A. & VAN SOEST, R. W. M. (eds.) Systema Porifera. Guide to the classification of sponges. (Kluwer Academic/ Plenum Publishers: New York, Boston, Dordrecht, London, Moscow).
- Venkataraman, K. and Wafer, M. (2005) Coastal and Marine Biodiversity of India. Indian Journal of Marine Sciences, 34, 57-75.
- Thomas, P.A. 1889. Sponge fauna of Lakshadweep. Bull. CMFRI. 150-161.
- Thomas, P.A. (1998). Faunal Diversity in India: Porifera, pp. 27–36. In: *Faunal Diversity in India*. Alfred, Das and Sanyal (eds.) ENVIS Centre, Zoological Survey of India, Kolkata.
- Pattanayak, J.G. 2006. Marine Sponges of Andaman & Nicobar Island, India. Occasional Paper No. 255. ZSI, India. Ramesh, R, P. Nammalwar and V.S. Gowri, 2008. Data base on coastal information of Tamilnadu.
- Thomas, P.A., (1968).The sponge resources of India. Symposium on the living resources of the seas around India. Central Marine Fisheries Research Institute, Mandapam Camp, December, 1968. Abstract: 31-32. Thomas, 1986. Demospongiae of Gulf of Mannar and Palk Bay. In: recent advance in Marine Biology, P.S.B.R. James (Ed.). Today tomorrow's printers and publishers, New Delhi: 205-365. Thomas, P.A., (1998). Faunal diversity in India: Porifera. IN: Faunal diversity in India (eds: Alfred, Das and Sanyal), ENVIS Centre, Zoological Survey of India, Calcutta, pp-25-36.
- Preeti pereira and Raghunathan, C. 2020. New records of Indo-Pacific sponges from the Andaman and Nicobar Islands, India, Zootaxa 4894 (4) 081-097, 2020.

UNDER PEER REVIEW