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Review Article

A Review on Taxonomy of Lakshadweep Sponges and its Checklist

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Introduction

Sponge is one of the oldest group of multicellular animal found on the earth [1]. They are one of the highly diverse and successful group of marine benthic communities around the world [2]. Sponge is one of the dominant associated species in coral reef ecosystem [3] and they help to bind the live corals to the reef frames, also helps to regeneration of broken reefs, sheltering microbial symbionts of nitrifying and photosynthesizing activities and protecting from erosion processes [4-6].

The spongiology in India started with freshwater sponges by Carter [7-9] and followed by Bowerbank [10] with marine sponges. Even though India has rich history of sponge studies, from the Lakshadweep Island group, studies are very meagre. Burton [11] studied off Kilten Island sponges and latter Thomas [12-19] studied the Lakshadweep Islands sponges in detail. These studies reported 91 species of sponges from 10 islands of this location. The next detailed study was carried out by George et al. [20] after three decades. The studies after Thomas [19], most of the work of these Islands were sponge metabolites and associated microbial studies along with that few distribution studies as an extension of the earlier studies were reported. Feby and Nair [21] studied sponge associated *Dysidea granulosa* Bergquist, 1965 and *Sigmadocia (Haliclona) fibulata* Schmidt, 1862 bacterial distribution in the Kavaratti Island. Gopi and Ajithkumar [22] reported 21 species of sponges from Agatti Island, of which 19, were new report. Prabhakaran et al., [23] reported 22 species of sponges from seagrass meadows of Minicoy Island and Rocktim et al., [24] reported a new record of sponges from Bangaram and Thinnakara island.

Since, the long gap in the studies of the sponges of Lakshadweep Islands and its inconsistency in terminology makes

a perplexing situation for the upcoming researchers. This may be due to not available of updates checklist, some species name change because of the revised classification of sponges by Morrow and Cárdenas [25] as well as differences of opinion are available on about the number of sponge species recorded from Lakshadweep offshore regions. An attempt was initiated to compile the literature on sponge species and its distribution for Lakshadweep Islands waters and prepared a checklist to update the sponge taxonomy status in these Islands.

Materials and Methods

The existing published literatures were compiled and extracted the status of sponge studies in the waters of Lakshadweep Islands marine environments. The collected results were interpreted and brought out as a checklist of sponges of Lakshadweep. The taxon identified in these texts were verified with World Porifera Data Base [26] and the World Register of Marine Species [27]. The taxonomy of the reported taxon was updated based on the revised porifera classification proposed by Morrow and Cardenas [25].

Result

As on date 19 sponges related papers were published relating to Lakshadweep Islands marine environments. The published report suggested that 145 taxon of sponges belongs to 86 Genera, 49 Family and 18 Orders among 5 Subclasses and 3 Classes reported from Lakshadweep Islands. Among the 145 taxon 126 identified up to the species level and remaining 19 were identified only up to genus level. Out of 19 sponge related papers, only 6 were taxonomy paper [11,12,14-17], 6 were associated microbial and metabolites studies of sponges [28-32,21], 4 were distribution studies [18,19,22,23], along with one catalogue [13], one checklist paper [20] and a short communication by Rocktim et al., [24].

Sl. No.	ACCEPTED NAME	Synonymous representation from Lakshadweep papers.	Recorded Locations	REFERENCE
	Class: Demospongiae Subclass: Heteroscleromorpha Order: Tetractinellida Suborder: Astrophorina			
	Family: Theonellidae			
1.	<i>Theonella cupola</i> (Burton, 1928)		KLT & MCY	Burton (1928) [11]; Thomas (1989) [19]
	Family: Ancorinidae			
2.	<i>Jaspis penetrans</i> (Carter, 1880)		SUH & KPL	Thomas (1989) [19]
3.	<i>Jaspis diastra</i> (Vacelet & Vasseur, 1965)	<i>Zaplethea digonoxea</i> spp. <i>diastra</i> (Vacelet & Vasseur, 1965)	SUH	Thomas (1989) [19]
4.	<i>Ecionemia acervus</i> (Bowerbank, 1862)		MCY & AGT	Thomas (1969, 1980, 1989) [13,16,19]; Gopi and Ajith Kumar (2012) [22]
5.	<i>Ecionemia thielei</i> (Thomas, 1986)		MCY & KDM	Thomas (1980, 1989) [16,19]
6.	<i>Rhabdastrella rowi</i> (Dendy, 1916)	<i>Aurora rowi</i> (Dendy, 1916)	AMN	Thomas (1989) [19]
7.	<i>Rhabdastrella globostellata</i> (Carter, 1883)	<i>Aurora globostellata</i> (Carter, 1883)	SUH & MCY	Thomas (1989) [19]; Parbhakar et al., (2013) [23]
8.	<i>Stelletta tethyopsis</i> (Carter, 1880)		KVT	Thomas (1989) [19]

9.	Stelletta sp		AGT	Gopi and Ajith kumar (2012) [22]
10.	<i>Asteropus simplex</i> (Carter 1879)	<i>Stellettinopsis simplex</i> (Carter 1879)	MCY	Thomas (1969a) [13]
11.	<i>Dercitus (Stoebea) plicatus</i> (Schmidt, 1868)	<i>Halina plicata</i> (Schmidt, 1868)	KVT, SUH, KLP, MCY, KDM & AMN	Thomas (1989) [19]
	Family: Geodiidae			
12.	<i>Geodia lindgreni</i> (Lendenfeld, 1903)		MCY	Thomas (1980, 1989) [16.19]
	Suborder: Spirophorina			
	Family: Tetillidae			
13.	<i>Cinachyrella cavernosa</i> (Lamarck, 1815)	<i>Cynachyra cavernosa</i> (Lamarck, 1815)	KVT	Thomas (1989) [19]
14.	<i>Paratetilla bacca</i> (Selenka, 1867)		MCY	Thomas (1980, 1989) [16.19]
	Family: Samidae			
15.	<i>Samus anonymus</i> (Gray, 1867)		KVT, SUH, KPL, AND, MCY, KDM	Thomas (1989) [19]
	Family: Thoosidae			

16.	<i>Thoosa armata</i> (Topsent, 1888)		----NA---	Thomas (1989) [19]
	Order: Haplosclerida Family: Chalinidae			
17.	<i>Haliclona (Gellius) fibulata</i> (Schmidt, 1862)	<i>Sigmatocia fibulata</i> (Schmidt, 1862)	MCY, KVT, SUH, MCY, AND, KLP, KPT & AGT.	Thomas (1979, 1989) [15,19]; Parbhakar et al., (2013) [23]; Feby and Nair (2010) [21]; Gopi and Ajithkumar (2012) [22]
18.	<i>Haliclona (Gellius) cellaria</i> (Rao, 1941)	<i>Gelliodes cellaria</i>	MCY	Parbhakar et al. (2013) [23]
19.	<i>Haliclona (Gellius) aff. Cymaeformis (nov)</i> George et al., 2020		MCY,AGT & KVT	George et al. (2020) [20]
20.	<i>Haliclona (Haliclona) oculata</i> (Linnaeus, 1759)	<i>Haliclona oculata</i> (Linnaeus, 1759)	KLP	Thomas (1989) [19]
21.	<i>Haliclona tenuiramosa</i> (Burton, 1930)		KLP & MCY	Thomas (1989) [19]; Parbhakar et al. (2013) [23]
22.	<i>Haliclona pigmentifera</i> (Dandy, 1905)	<i>Haliclona pigmentifera</i>	MCY	Parbhakar et al. (2013) [21]
23.	<i>Chalinula nematifera</i> (de Laubenfels, 1954)	<i>Haliclona nematifera</i> Grant, 1836	AGT	Gopi and Ajithkumar (2012) [23]
	Family: Petrosiidae			
24.	<i>Neopetrosia chaliniformis</i> (Thiele, 1899)	<i>Haliclona exigua</i> (Kirkpatrick, 1900)	KVT	Thomas (1989) [19]
	Family: Niphatidae			

25.	<i>Gelliodes fibulata</i> (Carter, 1881)	<i>Gelliodes fibulata</i> sensu (Ridley, 1884)	KVT	Thomas (1989) [19]
26.	<i>Gelliodes pumila</i> (Lendenfeld, 1887)	<i>Sigmatocia pumila</i> (Lendenfeld, 1887)	MCY	Thomas, (1979, 1989) [15,19]
	Family: Phloeodictyidae			
27.	<i>Oceanapia sagittaria</i> (Sollas, 1902)	<i>Orina sagittaria</i> (Sollas, 1902)	KVT	Thomas (1989) [19]
28.	<i>Siphonodictyon minutum</i> (Thomas, 1972)	<i>Aka minuta</i> (Thomas, 1972)	KVT, SUH, KPL, AND, MCY	Thomas (1989) [19]
	Family: Callyspongiidae			
29.	<i>Callyspongia (Cladochalina) diffusa</i> (Ridley, 1884)	<i>Callyspongia diffusa</i> (Ridley, 1884)	MCY	Thomas (1979, 1989) [15,19]
30.	<i>Callyspongia (Cladochalina) fibrosa</i> (Ridley & Dendy, 1886)	<i>Callyspongia fibrosa</i> (Ridley & Dendy, 1886)	AND, MCY & AMN	Thomas (1989) [19]
31.	<i>Callyspongia (Callyspongia) tubulosa</i> (Linnaeus, 1759)	<i>Callyspongia tubulosa</i> (de Laubenfels, 1936)	AGT	Gopi and Ajithkumar, (2012) [22]
32.	<i>Callyspongia (Euplacella) retiarmata</i> comb (nov) George et al., 2020		MCY, KDM, AGT & KVT	George et al. (2020) [20]
33.	<i>Callyspongia (Euplacella) mannaarensis</i> comb (nov) George et al., 2020		MCY	George et al. (2020) [20]
34.	<i>Callyspongia crassifibra</i> (Dendy, 1889)		KVT	George et al. (2020) [20]

35.	<i>Callyspongia sp</i>		MCY	Parbhakar et al. (2013) [23]
	Order: Poecilosclerida Family: Iotrochotidae			
35.	<i>Iotrochota baculifera</i> (Ridley, 1884)		KVT & KLP	Thomas (1989) [19]
	Family: Isodictyidae			
36.	<i>Coelocarteria singaporensis</i> (Carter, 1883)	<i>Cornulum vesiculatum</i> (Dendy, 1905)	KLP	Thomas (1989) [19]
	Family: Acarnidae			
37.	<i>Zyzya fuliginosa</i> (Carter, 1879)	<i>Damirina laccadivensis</i> (Thomas, 1989) and <i>Aka laccadivensis</i> (Thomas 1989)	KLP & MCY	Thomas (1989) [19]
38.	<i>Acarnus souriei</i> (Lévi, 1952)	<i>Acanthacarnus souriei</i> (Lévi, 1952)	KVT & KLP	Thomas (1989) [19]
	Family: Coelosphaeridae			
39.	<i>Lissodendoryx (Waldoschmittia) schmidti</i> (Ridley, 1884)	<i>Damiriana schmidti</i> (Ridley, 1884)	KVT, SHU, KLP, MCY	Thomas (1980, 1989) [16,19]
	Family: Myxillidae			
40.	<i>Myxilla (Ectyomyxilla) arenaria</i> (Dendy, 1905)	<i>Myxilla arenaria</i> (Dendy, 1905)	KLP	Thomas (1989) [19]

41.	<i>Myxilla sp.</i>		MCY	Thomas (1980, 1989) [16,19]
	Family: Tedaniidae			
42.	<i>Tedania (Tedania) anhelans</i> (Vio in Olivi, 1792)	<i>Tedania anhelans</i> (lieberakuhn ?)	KVT, SUH, KPL, AND, MCY, KDM, & AMN	Thomas (1980, 1989) [16,19]
	Family: Microcionidae Subfamily: Ophlitaspongiinae			
43.	<i>Antho (Plocamia) manaarensis</i> (Carter, 1880)	<i>Plocamilla manaarensis</i> (Carter, 1880)	MCY	Thomas (1989) [19]
44.	<i>Echinoclathria rimosa</i> (Ridley, 1884)	<i>Ophlitaspongia rimosa</i> (Ridley, 1884)	AGT	Thomas (1989) [19]
	Subfamily: Microcioninae			
45.	<i>Clathria (Microciona) aceratoobtusa</i> (Carter, 1887)	<i>Microciona aceratoobtusa</i> (Carter, 1887)	KVT & SUH	Thomas (1989) [19]
46.	<i>Clathria (Microciona) rhopalophora</i> (Hentschel, 1912)	<i>Microciona rhopalophora</i> (Hentschel, 1912)	SUH	Thomas (1989) [19]
47.	<i>Clathria (Thalysias) reinwardti</i> (Vosmaer, 1880)	<i>Clathria reinwardti</i> (Vosmaer, 1880)	MCY	Thomas (1980, 1989) [16,19]
48.	<i>Clathria (Thalysias) procera</i> (Ridley, 1884)	<i>Clathira procera</i> (Schmidt, 1862)	AGT	Gopi and Ajithkumar, (2012) [22]
49.	<i>Clathria (Thalysias) vulpina</i> (Lamarck, 1814)	<i>Clathria procera</i>	KVT	George et al. (2020) [20]

50.	<i>Clathria (Clathria) indica</i> (Dendy, 1889)		KDM & KVT	George et al. (2020) [20]
51.	Clathira spp.		AGT	Gopi and Ajithkumar, (2012) [22]
	Family: Mycalidae			
52.	<i>Mycale grandis</i> (Gray, 1867)		MCY	Thomas (1980, 1989) [16,19]
53.	<i>Mycale (Zygomycale) parishii</i> (Bowerbank, 1875)	<i>Zygomycale parishii</i> (Bowerbank, 1875)	MCY	Thomas (1980, 1989) [16,19]; George et al. (2020) [20]
	Order: Clionaida Family: Spirastrellidae			
54.	<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864)		KVT, AND & MCY	Thomas (1989) [19]
	Family: Clionaidae			
55.	<i>Cervicornia cuspidifera</i> (Lamarck, 1815)	<i>Spirastrella cuspidifera</i> (Lamarck, 1815)	SUH & MCY	Thomas (1969,1980, 1989) [13,16,19]
56.	<i>Cervicornia inconstans</i> comb (nov) George et al., 2020		AGT	George et al. (2020) [20]
57.	<i>Sphaciospongia inconstans</i> (Dendy, 1887)	<i>Spirastrella inconstans</i> (Dendy, 1887)	KVT, SUH, MCY, AND, AMN, KLT, AGT, KLP & KDM	Thomas (1969,1980, 1989) [13,1619]; Parbhakar et al. (2013) [23]
58.	<i>Sphaciospongia vagabunda</i> (Ridley, 1884)		MCY, KDM & KVT	George et al. (2020) [20]

59.	<i>Sphaciospongia</i> sp.		AGT, KDM & KVT	George et al. (2020) [20]
60.	<i>Cliothosa aurivillii</i> (Lindgren, 1897)	<i>Spirastrella aurivillii</i> (Lindgren, 1897)	SUH, KPL, AND & AMN	Thomas (1989) [19]
61.	<i>Cliona celata</i> (Grant, 1826)		KVT, SUH, MCY, AND, AMN, AGT & KLP	Thomas (1980, 1989) [16,19]; Gopi and Ajithkumar (2012) [22]
62.	<i>Cliona viridis</i> (Schmidt, 1862)		KVT, KPL	Thomas (1989) [19]
63.	<i>Cliona ensifera</i> (Sollas, 1878)		KVT, SUH, KLP, AND, MCY & KDM	Thomas (1989) [19]
64.	<i>Cliona mucronata</i> (Sollas, 1878)		SUH, AND & MCY	Thomas (1989) [19]
65.	<i>Cliona</i> sp		MCY	Parbhakar et al. (2013) [23]
66.	<i>Pione vastifica</i> (Hancock, 1849)	<i>Cliona vastifica</i> (Hancock, 1849)	KVT, SUH & KLP	Thomas (1980, 1989) [16,19]
67.	<i>Pione carpenteri</i> (Hancock, 1867)	<i>Cliona carpenteri</i> (Hancock, 1867)	KVT, SUH, KPL, AND MCY & KDM	Thomas (1989) [19]
	Family: Placospongiidae			
68.	<i>Placospongia carinata</i> (Bowerbank, 1858)		MCY	Thomas (1969, 198a, 1989) [13,16,19]
	Order: Suberitida Family: Halichondriidae			

69.	<i>Halichondria (Halichondria) panicea</i> (Pallas, 1766)	<i>Halichondria panacea</i> (Pallas 1766)	KLP	Thomas (1989) [19]
70.	<i>Halichondria sp</i>		MCY	Parbhakar et al. (2013) [23]
71.	<i>Amorphinopsis excavans</i> (Carter, 1887)		KVT, SUH, KLP, AND, MCY & KDM	Thomas (1989) [19], Gopi and Ajithkumar (2012) [23]
72.	<i>Amorphinopsis foetida</i> (Dendy, 1889)	<i>Prostylissa foetida</i> (Dendy, 1889)	MCY	Thomas (1969, 1980, 1989) [13,16,19]
73.	<i>Ciocalypta polymastia</i> (Lendenfeld, 1888)		MCY	Thomas (1973, 1980, 1989) [14,16,19]
74.	<i>Ciocalypta digitata</i> (Dendy,1905)		KDM	George et al. (2020) [20]
75.	<i>Spongosorites topsenti</i> (Dendy, 1905)		KVT.	George et al. (2020) [20]
	Family: Suberitidae			
76.	<i>Suberites carnosus</i> (Johnston, 1842)		MCY	Thomas (1980, 1989) [16,19]
77.	<i>Suberites sp</i>		MCY	Parbhakar et al. (2013) [23]
78.	<i>Terpios cruciatus</i> (Dendy, 1905)	<i>Laxosuberites cruciatus</i> (Dendy, 1905)	MCY, SUH, KDM, AGT & KVT.	Thomas (1980, 1989) [16,19]; George et al. (2020) [20]
79.	<i>Psedosuberites sp.</i>		KPL & MCY	Thomas (1989) [19]

80.	<i>Aptos aptos</i> (Schmidt, 1864)		MCY	Thomas (1969,1980, 1989) [13,16,19]
81.	<i>Terpios hoshinota</i> (Rützler & Muzik, 1993)		BNG, TNK	Rocktim et al. (2019) [24]
	Order: Bubarida Family: Bubaridae			
82.	<i>Bubaris sp.</i>		MCY	Thomas (1980, 1989) [16,19]
	Family: Dictyonellidae			
83.	<i>Acanthella cavernosa</i> (Dendy, 1922)		MCY	Thomas (1969,1980, 1989) [13,16,19]
	Family: Desmanthidae			
84.	<i>Desmanthus rhabdophorus</i> (Hentschel, 1912)	<i>Lophacanthus rhabdophorus</i> (Hentschel, 1912)	MCY	Thomas (1980, 1989) [16,19]
	Order: Tethyida Family: Timeidae			
85.	<i>Timea stellivarians</i> (Carter, 1880)		MCY	Thomas (1989) [19]
86.	<i>Timea stellata</i> (Bowerbank, 1866)		AMN	Thomas (1989) [19]
	Family: Tethyidae			

87.	<i>Tethya robusta</i> (Bowerbank, 1873)		SUH, MCY, KDM	Thomas (1969, 1980, 1989) [13,16,19]
89.	<i>Tethya japonica</i> (Sollas, 1888)		MCY & KDM	Thomas (1980, 1989) [16,19]
90.	<i>Tethya diploderma</i> (Schmidt, 1870)		SUH & MCY	Thomas (1989) [19] Parbhakar et al., (2013) [23]
91.	<i>Stellitethya repens</i> (Schmidt, 1870)	<i>Tethytimea repens</i> (Schmidt, 1870)	MCY	Thomas (1980, 1989) [16,19]
92.	<i>Xenospongia sp.</i>		MCY	Parbhakar et al. (2013) [23]
	Order: Biemnida Family: Rhabderemiidae			
93.	<i>Rhabderemia prolifera</i> (Annandale, 1915)		KVT, SHU, KLP, AND & MCY	Thomas (1989) [19]
	Family: Biemnidae			
94.	<i>Biemna fortis</i> (Topsent, 1897)		MCY	Thomas (1980, 1989) [16,19]
95.	<i>Biemna ehrenbergi</i> (Keller,1889)		KDM,AGT & KVT	George et al. (2020) [20]
96.	<i>Sigmaxinella flabellate</i> (Carter, 1885)	<i>Sigmaxinella flabellata</i> (Dendy, 1867)	AGT	Gopi and Ajithkumar (2012) [22]
	Order: Agelasida Family: Agelasidae			

97.	<i>Agelas mauritiana</i> (Carter, 1883)		MCY	Thomas (1980, 1989) [16,19]
98.	<i>Agelas ceylonica</i> (Dendy, 1905)		MCY	Thomas (1980, 1989) [16,19]
99.	<i>Agelas sp.</i>		MCY	Thomas (1980, 1989) [16,19]
	Order: Axinellida Family: Raspailiidae Subfamily: Echinodictyinae			
100.	<i>Echinodictyum longistylum</i> (Thomas, 1968)		MCY	Thomas (1980, 1989) [16,19]; Parbhakar et al. (2013) [23]
	Family: Heteroxyidae			
101.	<i>Myrmekioderma granulatum</i> (Esper, 1794)	<i>Myrmekioderma granulate</i> (Esper, 1794)	MCY	Thomas (1969,1980, 1989) [13,16,19]
	Family: Axinellidae			
102.	<i>Axinella donnani</i> (Bowerbank, 1873)		KVT	George et al. (2020) [20]
103.	<i>Axinella manus</i> (Dendy, 1905)		MCY & KDM	George et al. (2020) [20]
104.	<i>Axinella tenuidigitata</i> (Dendy, 1905)		KDM,AGT & KVT	George et al. (2020) [20]
105.	<i>Drasmacidon agariciforme</i> (Dendy, 1905)		MCY	George et al. (2020) [20]

106.	<i>Auleta aurantiaca</i> Dendy, 1889		MCY	George et al. (2020) [20]
107.	<i>Phycopsis</i> sp1		AGT	Thomas (1989) [19]
108.	<i>Phycopsis</i> sp2		MCY	Thomas (1989) [19]
	Order: Scopalinida Family: Scopalinidae			
109.	<i>Stylissa carteri</i> (Dendy,1889)		MCY & KDM	George et al. (2020) [20]
110.	<i>Stylissa petrosioides</i> comb (nov) George et al., 2020		AGT & KVT.	George et al. (2020) [20]
	Subclass: Keratosa Order: Dictyoceratida Family: Dysideidae			
111.	<i>Dysidea fragilis</i> (Montagu, 1814)		KLP, MCY, KLT & AGT	Thomas (1979, 1989) [15,19]; Gopi and Ajithkumar (2012) [22]; Parbhakar et al (2013) [23]
112.	<i>Dysidea granulosa</i> (Bergquist, 1965)		KVT & AGT	Feby and Nair (2010) [21]; Gopi and Ajithkumar (2012) [23]; George et al. (2020) [20]
113.	<i>Lamellodysidea herbacea</i> (Keller, 1889)	<i>Dysidea herbacea</i> (Keller, 1889)	KLP,MCY,KLT & AGT	Thomas (1979, 1989) [15,19]; Gopi and Ajithkumar (2012) [22]
	Family: Spongiidae			
114.	<i>Spongia (Spongia) ceylonensis</i> (Dendy, 1905)	<i>Spongia officinalis var. ceylonensis</i> (Dendy, 1905)	MCY, KVT, SUH,AND, AMN, KLT, AGT, KLP KPT	Thomas (1979, 1989) [15,19]; Gopi and Ajithkumar (2012) [22]; Prabhakar et al. (2013) [23]; George et al. (2020) [20]

115.	<i>Spongia</i> aff. <i>Ceylonensis</i> (nov) George et al., 2020		MCY &KVT	George et al. (2020) [20]
116.	<i>Spongia</i> (<i>Spongia</i>) sp.		KDM	George et al. (2020) [20]
117.	<i>Hippiospongia</i> sp.		KVT, SUH, KLP, AND, MCY, KDM, AMN, KPT	Thomas (1989) [19]
118.	<i>Hyattella cribriformis</i> (Hyatt, 1877)		KVT, MCY, AMN, KLP & AGT	Thomas (1979, 1989) [15,19]; Parbhakar et al. (2013) [23]; Gopi and Ajithkumar (2012) [22]
119.	<i>Hyattella intestinalis</i> (Lamarck, 1814)		KDM	George et al. (2020) [20]
120.	<i>Hyattella</i> aff. <i>Intestinalis</i> (nov) George et al., 2020		KDM	George et al. (2020) [20]
121.	<i>Hyattella tubaria</i> Lendenfeld, 1889		KDM & KVT	George et al. (2020) [20]
122.	<i>Hyattella cavernosa</i> (Pallas, 1766)		KVT	George et al. (2020) [20]
123.	<i>Hyattella</i> aff. <i>cavernosa</i> (nov) George et al., 2020		MCY & KVT	George et al. (2020) [20]
	Family: Thorectidae Subfamily: Thorectinae			
124.	<i>Hyrtios erectus</i> (Keller, 1889)	<i>Hyrtios erectus</i> (Keller, 1889)	KLP & AGT	Thomas (1989) [19]; Gopi and Ajithkumar (2012) [22]
125.	<i>Phyllospongia foliascens</i> (Pallas, 1766)		SUH,MCY,KLT	Thomas (1979, 1989) [15,19]

126.	<i>Fasciospongia cavernosa</i> (Schmidt, 1862)		KLP, AND, KDM, MCY & AMN	Thomas (1989) [19]; Parbhakar et al. (2013) [23]
127.	<i>Thorectopsamma</i> sp.		KLP	Thomas (1989) [19]
128.	<i>Fasciospongia anomala</i> (Dendy, 1905)		KDM, AGT & KVT	George et al. (2020) [20]
129.	<i>Hyrtios reticulatus</i> (Thiele, 1899)		MCY, KDM & KVT	George et al. (2020) [20]
130.	<i>Hyrtios</i> sp.		AGT & KVT	George et al. (2020) [20]
131.	<i>Luffariella herdmani</i> (Dendy, 1905)		KDM, AGT & KVT	George et al. (2020) [20]
	Subfamily: Phyllospongiinae			
132.	<i>Lendenfeldia dendyi</i> (Lendenfeld, 1889)	<i>Phyllospongia dendyi</i> (Lendenfeld, 1889)	MCY	Thomas (1973 1979,1989) [14,15,19]
	Order: Dendroceratida Family: Darwinellidae			
133.	<i>Dendrilla cactos</i> (Selenka, 1867)		KVT, SHU, KLP	Thomas (1989) [19]
	Family: Irciniidae			
134.	<i>Ircinia ramose</i> (Keller 1889)		BNG	Parameswaren et al. (1989) [28]

135.	<i>Ircinia compana</i> (Lamarck, 1814)	<i>Ircinia compana</i>	MCY	Parbhakar et al. (2013) [23]
136.	<i>Ircinia vallata</i> (Dendy, 1887)		MCY, KDM & KVT	George et al. (2020) [20]
	Family: Dictyodendrillidae			
137.	<i>Spongionella nigra</i> (Dendy 1889)		AGT & KVT	George et al. (2020) [20]
	Subclass: Verongimorpha Order: Verongiida Family: Pseudoceratinidae			
138.	<i>Pseudoceratina purpurea</i> (Carter, 1880)	<i>Psammaplysilla purpurea</i> (Carter, 1880)	KVT, SUH, MCY, AND, AMN, KDM & AGT	Thomas (1989) [19]; Gopi and Ajithkumar (2012) [22]; Parbhakar et al. (2013) [23]; George et al. (2020) [20]
	Family: Ianthellidae			
139.	<i>Ianthella flabelliformis</i> (Linnaeus, 1759)		AGT	Gopi and Ajithkumar (2012) [22]
	Order: Chondrillida Family: Chondrillidae			
140.	<i>Chondrilla sacciformis</i> (Carter, 1879)		SUH	Thomas (1989) [19]
	Class: Homoscleromorpha Order: Homosclerophorida Family: Plakinidae			
141.	<i>Plakinastrella minor</i> (Dendy, 1916)	<i>Dercitopsis minor</i> (Dendy, 1916)	SUH	Thomas (1989) [19]

	Class: Calcarea Subclass: Calcinea Order: Clathrinida Family: Leucettidae			
142.	<i>Pericharax heteroraphis</i> (Poléjaeff, 1883)		AGT	Gopi and Ajithkumar (2012) [22]
143.	<i>Leucetta chagosensis</i> (Dendy, 1913)		MCY, KDM, AGT & KVT	Gopi and Ajithkumar (2012) [22]; Van Soest (2018) [33]; George et al. (2020) [20]
	Family: Clathrinidae			
144.	<i>Clathrina sp.</i>		AGT, MCY	Gopi and Ajithkumar (2012) [22]; Parbhakar et al. (2013) [23]
	Subclass: Calcaronea Order: Leucosolenida Family: Sycettidae			
145.	<i>Sycon ciliatum</i> (Fabricius, 1780)	<i>Scypha ciliata</i>	MCY	Parbhakar et al. (2013) [23]

Location code and Names: MCY- Minicoy, KVT- Kavaratti, AND- Androth, AGT- Agatti, KDM- Kadmat, AMN- Amini, KLT- Kiltan, SUH-Suhali, KPT- Kalpitti, BNG- Bangarum, TNK- Thinnakara.

Table 1: The List of Sponge reported from Lakshadweep Islands.

Discussion

Off the cost of Kiltan Island, the first sponge report from Lakshadweep islands was made [11]. This sponge species were the collections of R.I.M.S. “Investigator” expedition. After that, it took about 40 years to get an attention to the sponge fauna of these Island ecosystems by Thomas [12]. This work was a Ph.D. thesis and it’s an unpublished data. However, Central Marine Fisheries Research Institutes (CMFRI) reference sponge specimens catalogue mentioned only 10 species from Lakshadweep, which was published by Thomas [13]. A subsequent study by Thomas [19] mentioned that 11 sponge species were identified from the Minicoy Island of Lakshadweep. So, the 11th specimen mentioned by Thomas [12,19] was not clear from these literatures.

Subsequently, a series of publications from Thomas [14-17] described about 41 species of sponges exclusively from Minicoy Islands of Lakshadweep. Among the 41 species, 3 identified up to genus and 20 species are remaining in the same name as he

mentioned, and the rest of the 18 species have got synonym or transferred to new names.

The sponge availability from different Islands of Lakshadweep other than Kiltan and Minicoy was established by Thomas [18]. This article has not a systematic paper, but he reported distribution and diversity of boring sponges from nine islands of Lakshadweep, namely- Kavaratti, Kalpeni, Suhali, Androth, Minicoy, Amini, Kiltan, Agatti and Kadmat. A total of 18 boring sponges from 9 different genus (*Rhabderrmia*, *amorphinopsis*, *Aka*, *Cliona*, *Spirastrella*, *Thoosa*, *Jaspis*, *Halina*, *Samus*) were identified and 6 sponges like *Cliona celata*, *Cliona ensifera*, *Cliona mucurnata*, *Cliona vastifica*, *Spirastrella inconstans* and *Spirastrella cuspidifera* are mentioning for its abundance in different Islands of Lakshadweep.

The most acknowledged research article on the sponge of Lakshadweep was published by Thomas [19] with a compiled report of 91 sponges from 10 islands of Lakshadweep, including

his previous studies from these Islands. But this paper has not provided any detailed systematic account of the sponge species for these 91 sponges. At present, 44 species Out of 91 sponges mentioned in this paper got their synonym or transferred to new names.

Furthermore, from the 91 sponges of Lakshadweep 8 sponges identified only up to genus level, namely *Myxilla* sp, *Pseudosuberties* sp, *Phycopsis* sp1, *Phycosis* sp2, *Agelas* sp, *Bubaris* sp, *Hippospongia* sp, *Thorectopsamma* sp and 2 got the same name according to the current systematics, i.e. *Aka laccadivensis* and *Damirrina laccadivensis* are accepted as *Zyzzya fuliginosa*. This is the reason in many papers, a number of the sponge species available from these Islands became 82. While going through the distribution table of Thomas [19] suggested that distributional data of 2 sponge species are missing, i.e. the species *Ecionemia acervus* and *Thoosa armata*. The species described as *Tedani anhelan* have an unrecognized author, which was repeated in all other publications of Thomas too.

Parameswaran et al., [28] studied secondary metabolites of the species *Ircinia ramose* (Keller), collected from Bangaram Islands. The work done by Feby and Nair [21] on associated bacterial studies from *Dysidea granulosa* Bergquist, 1965 and *Sigmatocia (Haliclona) fibulata* Schmidt, 1862, of Kavaratti Island. Above these articles doesn't mention that the species *Ircinia ramose* (Keller) and *Dysidea granulosa* Bergquist, 1965 were a new report to Lakshadweep.

The work done by Gopi and Ajithkumar [22] from Agatti Island, suggested that they identified 21 species, of which 14 species were new to Agatti Island and 3 were identified only to genus level and remaining 4 species were reported by Thomas [19]. Furthermore, from their identification, 12 specimens mentioned the species name with wrong author or year. This information leads to confusion among the researchers on sponges. The lists of the Species mention with a wrong author name or year are mentioned in the Table 2:

Sl.No.	Name Mentioned in the Reviwed Literaure	Accepted Name
1	<i>Callyspongia tubulosa</i> de Laubenfels, 1936	<i>Callyspongia (Callyspongia) tubulosa</i> (Linnaeus, 1759)
2	<i>Clathira procera</i> Schmidt, 1862	<i>Clathria (Thalysias) procera</i> (Ridley, 1884)
3	<i>Dysidea fragilis</i> Gray, 1867	<i>Dysidea fragilis</i> (Montagu, 1814)
4	<i>Dysidea granulosa</i> Gray, 1867	<i>Dysidea granulosa</i> Bergquist, 1965
5	<i>Ecionemia acervus</i> Bowerbank, 1864	<i>Ecionemia acervus</i> Bowerbank, 1862
6	<i>Haliclona nematifera</i> Grant, 1836	<i>Haliclona nematifera</i> (De Laubenfels, 1954) now accepted as <i>Chalinula nematifera</i> (de Laubenfels, 1954)
7	<i>Hyattella cribriformis</i> Lendenfeld, 1888	<i>Hyattella cribriformis</i> (Hyatt, 1877)
8	<i>Lanthella flabelliformis</i> Schmidt, 1862	<i>Ianthella flabelliformis</i> (Linnaeus, 1759)
9	<i>Leucetta chagosensis</i> Haeckel, 1872	<i>Leucetta chagosensis</i> Dendy, 1913
10	<i>Psammaphysilla purpurea</i> Keller, 1889	<i>Psammaphysilla purpurea</i> (Carter, 1880) now accepted as <i>Pseudoceratina purpurea</i> (Carter, 1880)
11	<i>Sigmatosia fibulata</i> de Laubenfels, 1936	<i>Sigmatocia fibulata</i> (Schmidt, 1862) accepted as <i>Haliclona (Gellius) fibulata</i> (Schmidt, 1862)
12	<i>Sigmaxinella flabellata</i> Dendy, 1867	<i>Sigmaxinella flabellata</i> (Carter, 1885)

Table 2: Name Mentioned in the Reviwed Literature and Accepted in Database.

Prabhakar et al. [23] reported 22 species of sponges from the seagrass associated environment of Minicoy Island, Lakshadweep. Among them, 16 was identified to species level and the remaining 6 identified only to genus level. Of the 16 species, 5 species, namely, *Haliclona pigmentifera*, *Gelliodes cellaria*, *Trcinia comana*, *Sypha ciliata* and *Xenospongia* sp. were not reported from Lakshadweep Island before this study and three more species, namely, *Haliclona tenmosa*, *Rhavdastrrella globostella* and *Tethya diploderma* were the first report of Minicoy Island. However, the detailed taxonomy

was not presented for the above species mentioned in this article. Gopi and Ajithkumar [22] and Prabhakar et al. [23] reported four species of calcareous sponges *Pericharax heteroraphis* (Poléjaeff, 1883), *Leucetta chagosensis* (Dendy, 1913), *Clathrina* sp., and *Sycon ciliatum* (Fabricius, 1780). However, they did not mention any description of this species. But, latter the species *Leucetta chagosensis* (Dendy, 1913) was described by van Soest and de Voogd [33] from Minicoy and Kavarati Islands.

A recent short communication of Rocktim et al., [24] reported coral killing sponges outbreak, *Terpios hoshinota* (Rützler and Muzik, 1993) from Bangaram and Thinnakara Islands, which was also a first report of the Lakshadweep Islands.

George et al. [20] reported 101 species of sponges from the Indian nearshore waters. Among them, 38 sponges were reported from Lakshadweep Islands. Out of reported species from Lakshadweep 24 species were first reports. However, the cursory analysis of data in this article suggested that, 25 species were new to Lakshadweep Island, 6 species were reported in previous works of these Islands and the remaining 3 species were identified up to genus and the last 4 species are aff. species.

Conclusion

This study concluded that, a total of 145 species of sponges is recorded in 19 published papers from Lakshadweep Islands. Except Hexactinellida all the three remaining Classes are recorded from these Islands. Demosponges has the most predominant Class followed by 4 records of Calcarea from these locations and a single record off Class Homoscleromorpha was observed. The major contributions of these records were contributed by Thomas. It is interesting to note that every author got one or more new records from these islands proves that the diversity of the sponges in this location are enormous and the detailed and intensive study is needed to reveal the sponge diversity of these Islands.

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References

1. Muller WEG. (1995) Molecular phylogeny of Metazoa (animals): monophyletic origin. *Naturwiss*, 82: 321-329.
2. Hartman WD. (1977) Sponges as reef builders and shapers. In: S.H. Frost, M.P. Weiss, and J.B. Saunders, eds. *Reefs and related carbonates ecology and sedimentology*. Tulsa, OK: American Association of Petroleum Geologists, 127-134.
3. Rützler K, (2004) Sponges on coral reefs: a community shaped by competitive cooperation. *Bollettino dei Musei e degli Istituti Biologici dell'Università di Genova*, 68: 85-148.
4. Diaz MC, Rützler K. (2001) Sponges: An essential component of Caribbean coral reefs. *Bulletin of Marine Science*, 69: 535-546.
5. Wulff JL. (2001) Assessing and monitoring coral reef sponges: why and how? *Bulletin of Marine Science*, 69: 831-846.
6. Wulff JL. (2006) Rapid diversity and abundance decline in a Caribbean coral reef sponge community. *Biological Conservation*, 127: 167-176.
7. Carter HJ. (1847) Notes on the species, structure, and animality of the freshwater sponges in the tanks of Bombay (Genus *Spongilla*). *Annals and Magazine of Natural History*, 2: 303-310.
8. Carter HJ. (1849) A descriptive Account of the Freshwater Sponges (genus *Spongilla*) in the Island of Bombay, with Observations on their Structure and Development. *Annals and Magazine of Natural History*, 4: 81-100.
9. Carter HJ. (1859) On the identity in structure and composition of the so-called seed-like body of *Spongilla* with the winter-egg of the Bryozoa; and the presence of starch-granules in each. *Annals and Magazine of Natural History*, 3: 331-343.
10. Bowerbank JS. (1873) Report on a Collection of Sponges found at Ceylon In: *Esq. Proceedings of the Zoological Society of London*, (Ed.) E.W.H. Holdsworth. 25-32.
11. Burton M. (1928) Report on some Deep-Sea Sponges from the Indian Museum collected by R.I.M.S. 'Investigator'. Part II. Tetraxonida (concluded) and Euceratosa. *Records of the Indian Museum*, 30: 109-138.
12. Thomas PA. (1968) Studies on sponges, Ph. D. Thesis, University of Kerala. (Unpublished)
13. Thomas PA. (1969) Catalogue of sponges in the reference collections of the central Marine Fisheries Research Institute. *Bulletin of the central marine fisheries research institute*, Bulletin 7: 13-30.
14. Thomas PA. (1973) Two new records of Demospongiae from the Indian Ocean. *Journal of the Marine Biological Association of India*. 15: 439-441.
15. Thomas PA. (1985 [1979]) Demospongiae of Minicoy Island (Indian Ocean) Part 1 - Orders Keratosa and Haplosclerida. *Journal of the Marine Biological Association of India*, 21: 10-16.
16. Thomas PA. (1986a [1980]) Demospongiae of Minicoy Island (Indian Ocean). - Part 3. Orders Halichondrida, Hadromerida, Epipolasida and Choristida. *Journal of the Marine Biological Association of India*, 22: 8-20.
17. Thomas PA. (1986b [1980]) Demospongiae of Minicoy Island (Indian Ocean).- Part 2. Order Poecilosclerida. *Journal of the Marine Biological Association of India*, 22: 1-7.
18. Thomas PA. (1988) Sponge-generated bioerosion in Lakshadweep. *Marine Fisheries Information Service, Technical and Extension Series*, 86: 20-26.
19. Thomas PA. (1989) Sponge fauna of Lakshadweep. *Bulletin of the Central Marine Fisheries Research Institute*, 43: 150-161.
20. George AM, Van Soest RWM, Sluka RD, Lazarus S. (2020) A checklist of marine sponges (Porifera) of peninsula India. *Zootaxa*, 4885: 277-300.
21. Feby A, Nair S (2010) Sponge-associated bacteria of Lakshadweep coral reefs, India: resource for extracellular hydrolytic enzymes. *Advances in Bioscience and Biotechnology*. 1: 330-337.
22. Gopi M, Ajithkumar TT. (2012) Sponge Fauna of Lakshadweep Archipelago. XI Conference of Parties to the convention on Biological Diversity, Seshaiyana, 20: 1-5.
23. Prabhakaran MP, Pillai NK, Jayachandran PR, Bijoy Nandan S. (2013) Species Composition and Distribution of Sponges (Phylum: Porifera) in the Seagrass Ecosystem of Minicoy Atoll, Lakshadweep, India. *Springer, Berlin, Heidelberg*. 43-54.
24. Rocktim RD, Sreeraj CR, Gopi M, Abhilash KR, Samuel D, et al. (2020) Incursion of killer sponge *Terpios hoshinota* on the coral reefs of Lakshadweep archipelago. *Journal of Threatened Taxa*, 2: 17009-17013.

25. Morrow C, Cardenas P. (2015) Proposal for a revised classification of the Demospongiae (Porifera). *Frontiers in Zoology*, 12.
26. Van Soest RWM, Boury-Esnault N, Hooper JNA, Rützler K, de Voogd NJ, et al. (2020) *World Porifera Database*.
27. WoRMS (2020), *World Register of Marine Species*.
28. Parameswaran PS, Naik CG, Das B, Kamat SY. (1989), Sterols from the Lakshadweep sponge, *Ircinia ramosa* (Killer). *Indian Journal of Chemistry, Section B*, 28: 1091-1092.
29. Parameswaran PS, Naik CG, Das B, Kamat SY. (1992) Minor sterols from the sponge *Ircinia ramosa* (Killer), *Oceanography of the Indian Ocean*. Ed. Desai, B.N., 413-416.
30. Gopi M, Ajithkumar TT, Balagurunathan R, Vinoth R, Dhaneesh KV, et al., (2011) Phylogenetic study of sponge associated bacteria from the Lakshadweep archipelago and the antimicrobial activities of their secondary metabolites. *World Journal of Microbial and Biotechnology*, 28: 761-766.
31. Gopi M, Kumaran S, Ajithkumar TT, Deivasigamani B, Alagappan KM, et al. (2012) Antibacterial potential of sponge endosymbiont marine *Enterobacter* sp at Kavaratti Island, Lakshadweep archipelago. *Asian Pacific Journal of Tropical Medicine*, 22: 142-146.
32. Gopi M, Ajithkumar TT, Ramasamy B. (2016) Antimicrobial activities of secondary metabolites and phylogenetic study of sponge endosymbiotic bacteria, *Bacillus* sp. at Agatti Island, Lakshadweep Archipelago. *Biotechnology Reports*, 11: 44-52.
33. Van Soest RWM, de Voogd NJ. (2018) Calcareous sponges of the Western Indian Ocean and Red Sea. *Zootaxa*, 4426: 001-160.