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Original Article

A checklist of the southwestern Madagascar sponge fauna with taxonomic updates based on the current systematics

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Abstract

Sponges are important components of coral reefs with diverse ecological roles. They can be dominant in certain ecosystems of the western Indian Ocean (WIO) region, but their biodiversity remains poorly studied. Most of the knowledge from this region originates from studies conducted 50 years ago in the South Western (SW) region of Madagascar, near Toliara, prior to the degradation of coral reefs and associated ecosystems caused by large environmental disturbances. Here, a reference list is presented including all sponge species that were recorded at that time in different marine habitats of Toliara. This state-of-the-art work includes taxonomic updates. So far, the sponge fauna of Toliara accounts for 267 species, belonging to 3 classes, 23 orders and 68 families, a remarkable diversity when compared to other tropical locations. More than 50 % of the past taxonomic names needed to be updated and with this new baseline it will be possible to allow assessment of long-term changes in sponge biodiversity in relation to environmental stressor changes that have occurred in the SW of Madagascar during the last 50 years.

Keywords: Porifera, inventory, Toliara, Indian Ocean, biodiversity

Introduction

Sponges, phylum Porifera, are the oldest metazoans, inhabiting all aquatic ecosystems on the planet. In the ocean, these animals are distributed from the intertidal to the abyssal depths at all latitudes (for a review see Rützler, 2004). Sponges can dominate benthic communities, both in terms of diversity and

biomass, and shape structural complexity of a habitat or seascape (Vacelet, 1980; Maldonado *et al.*, 2015). Sponges are keystone components of numerous benthic ecosystems, providing a number of key ecological functions. Filter feeding on a large variety of nano-pico- and microplanktonic particles and recycling dissolved and particulate organic matter contained

in the water column (de Goeij *et al.* 2013), they contribute to bioconstruction and bioerosion processes, and offer refuge for numerous reef species (Díaz and Rützler, 2001). They also count among the diet of various predators (e.g., hawksbill turtle, angelfishes, nudibranchs, sea stars) (Wulff, 2012).

The World Porifera Database (WPD) currently accounts more than 9 000 valid sponge species from around the world (de Voogd *et al.*, 2023). However, it

been subjected to local inventories (e.g., Rützler, 2004; de Voogd *et al.*, 2023), resulting to the description of new taxa (e.g., Samaai *et al.*, 2020; Klautau *et al.*, 2021).

Toliara's reefs were once known as the WIO's most biodiverse reefs in South Western Madagascar (Bruggemann *et al.*, 2012). French scientists made significant efforts to investigate sponge biodiversity in the 1960s and the 1970s (Lévi, 1956; Vacelet and Vasseur, 1971; Hooper, 1996; Rützler, 2004). However, because

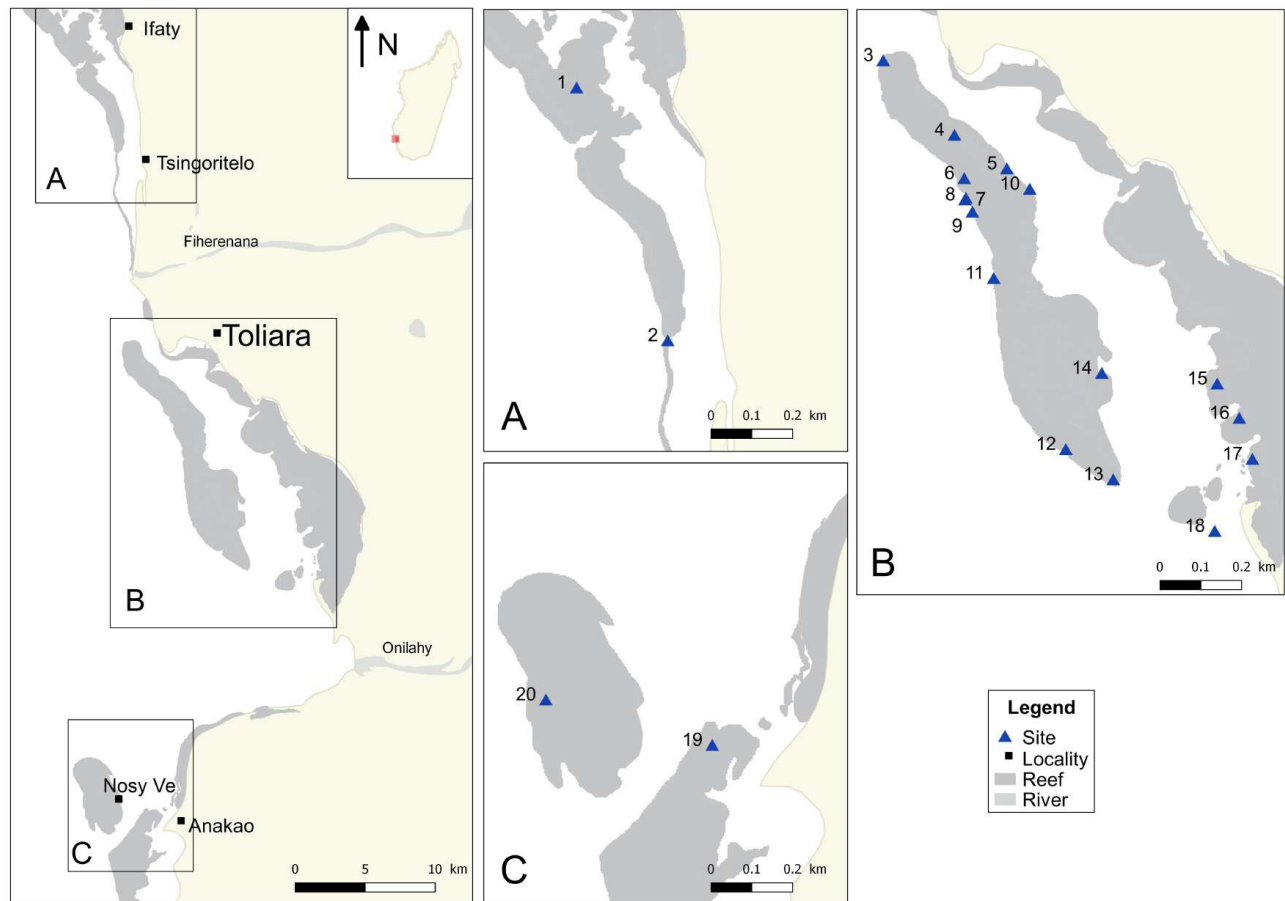


Figure 1. Detailed map of the region of Toliara (southwest of Madagascar) with enlargement of the three zones (A, B and C rectangles) where the studied sites are indicated by blue triangles.

is widely understood that this figure is vastly understated, owing in part to challenges in accessing remote environments (e.g., deep-sea and marine cave ecosystems) and understudied biogeographic regions such as the western Indian Ocean (WIO). The WIO region is home to a potentially rich sponge fauna that has mostly gone unstudied, owing to a lack of local taxonomic competence and of regional research programmes (Barnes and Bell, 2002; Van Soest *et al.*, 2012). Nonetheless, this sponge fauna of the WIO has

the reef has deteriorated significantly, sponge communities in the Toliara region may have evolved substantially since these pioneering observations. Indeed, over the last 50 years, this region's marine ecosystems have faced major environmental stressors (Walker and Fanning, 2003; Fencl, 2005; Harris *et al.*, 2010; Bruggemann *et al.*, 2012; Andréfouët *et al.*, 2013). The main drivers are linked to population growth (notably explained by migrations towards coastal cities), followed by a large number of additive anthropogenic

disturbances (overfishing, pollution, habitat destruction), as well as human-induced global climate change (Harris *et al.*, 2010; Bruggemann *et al.*, 2012).

Before investigating the potential changes in sponge communities as a result of the increasing threats to marine ecosystems in this region, a proper reference list of historical records of sponge species is needed. In this context, the aim of this study was to establish a reference list of this fauna per habitat type, updated following current systematics, but based on historical inventories of the sponge fauna of the Toliara area.

Material and methods

Data compilation and taxonomy updating

Sponge species from Toliara marine environments were inventoried and compiled in a database, mainly from the publications of Vasseur (1964), Vacelet and Vasseur (1965, 1971, 1977), Vacelet (1967a, b, 1977), and Vacelet *et al.* (1976). These pioneering studies were carried out between 1961 and 1977 as part of international research initiatives such as the “Expédition Internationale de l’Océan Indien” and the “Programme de Biologie Internationale” (Vacelet *et al.*, 1976). Some data were also gathered from the ecological works of Barnes and Bell (2002). The World Porifera Database was used to verify the species names (de Voogd *et al.*, 2023). The taxonomic status of each recorded species

was checked and updated according to the most recent sponge classification (Cárdenas *et al.*, 2012; Morrow and Cárdenas, 2015) and up-to-date species records in the WPD (de Voogd *et al.*, 2023).

Study sites

In these past studies, sponges were collected and recorded from a wide range of marine habitats from the Toliara region, including the outer reef slope (outer slope, coral flagstone, creek, pass), the reef flat (outer reef flat, residual pool, detrital ridge, inner flat), reef tunnels and galleries, lagoons (lagoon, inner slope, enclosed lagoon, reef pool, reef lagoon), phanerogam meadows, and mangroves. In these studies, scuba diving and dredging devices were used to explore these habitats from the sea surface to 60 m depth.

Here, the past study area is divided into three main zones: (A) a septentrional zone located in the north of Fiherenana river, which includes the barrier reef of Ifaty and the fringing reef of Tsingoritelo; (B) a central zone located in the bay of Toliara, which includes the barrier reef of Toliara (GRT), some patch reef of Toliara lagoon (Belaza, Dimadimatsy, and Norinkazo), and the fringing reef of Anakao and the reef cay of Nosy Ve. Overall, twenty studied sites were recognized across these three zones, each site including one to seven sampling stations (Fig. 1; Table 1).

Table 1. Location of the studied sites and sampled habitats (C = Cave, F = Flat-reef, L = Lagoon, M = Mangrove, P = Phanerogam meadow, R = Reef).

Zone	Site id.	Site Name	Latitude	Longitude	Habitat
A	1	Ifaty	-23.162778	43.581944	R, L, F
A	2	Tsingoritelo	-23.234444	43.607778	R, C, L, M
B	3	Corne Nord	-23.357222	43.6125	R, C, F, L, P
B	4	Grande Vasque	-23.3825	43.636667	L, F, P
B	5	Balise Nord	-23.393889	43.654444	F
B	6	Grande Crique	-23.403889	43.640556	R, C
B	7	Tunnel C	-23.404444	43.640278	C
B	8	Crique en V	-23.408611	43.642778	C
B	9	Trois Vasques	-23.397222	43.64	F
B	10	Pointe Angèle	-23.400833	43.662222	F, P
B	11	Antseteky	-23.431111	43.65	R, F
B	12	Crique Sud	-23.489167	43.674444	F
B	13	Corne Sud	-23.499444	43.690556	R, F, P
B	14	Ankarandava	-23.463333	43.686667	L
B	15	Norinkazo	-23.466944	43.725833	L
B	16	Dimadimatsy	-23.478611	43.733333	L
B	17	Belaza	-23.4925	43.737778	L
B	18	Sarodrano	-23.516944	43.725	F
C	19	Anakao	-23.509444	43.628056	
C	20	Nosy Ve	-23.649444	43.59	R

Reef habitats

Generally, the outer slopes of Toliara reefs comprise two main zones: (i) the coral flagstone situated between 20 m and 50 m depth, dominated by fleshy algae, sponges, hydroids, gorgonians and anthipatharians (Pichon, 1978); and (ii) the upper zone, characterized by an alternation of spurs and grooves which give to the reef front a toothed edge aspect, characteristic of Toliara reefs (Vasseur, 1964). These shallow water habitats are dominated by scleractinians, coralline algae and alcyonacea, but conspicuous sciaphilic organisms can also be present on overhangs and subvertical walls (Vasseur, 1964; Pichon, 1978). Spurs can be 50 to 100 m long and 5 to 10 m wide, whereas grooves can be up to 3 m wide and up to 5 m deep (Vasseur, 1964). In these outer reef parts, the presence of large creeks, up to 100 m long, 50 m wide and 10 m deep, is another main characteristic trait of Toliara reefs (Vasseur, 1964; Clausade *et al.*, 1971; Battistini *et al.*, 1975). Toliara reef flats are generally composed of: (i) an outer reef flat, which is exposed to the wave action and dominated by scleractinians and macrophytes; (ii) a boulder tract made of detrital elements that pursues the outer flat (Clausade *et al.*, 1971) and that generally hosts a rich fauna (Vasseur, 1964; Pichon, 1978); and (iii) an inner reef flat that may host seagrass patches and diverse types of coral formations such as lagoon reef (Belaza, Dimadimatsy, Norinkazo) (Pichon, 1978). The presence of enclosed lagoon and reef pools on the reef flat is also a particular feature of Toliara reefs (Vasseur, 1964).

Reef tunnels and galleries

Reef tunnels are large cavities, usually up to 50 m long and 5 m large, resulting from the junction of two consecutive spurs thanks to bio-construction. These formations can extend from the back of a groove to below the outer reef flat, and communicate through surge openings, blowholes and fissures. The irradiance is diffuse into these reef tunnels and backwash can be high, depending on the exposure of the reef to the open ocean. These cavities are sometimes followed by galleries, which are true dark cavities (up to 10 m long and 1.5 m large) in the Toliara area and more generally on the reefs of Western Madagascar (Vasseur, 1964).

Mangroves

Mangroves are diverse along the littoral of the study area. Here, only the mangrove located in the vicinity of Tsigonritelo fringing reef was explored by past works, but no mention of the covered surface and the bathymetric range was reported.

Results

Toliara sponge inventory

Based on the available historical data, the sponge fauna of the Toliara region would be nowadays composed of at least 267 species. In this inventory, 39 sponges were identified only at the genus level and might thus include several species (e.g., *Oceanapia* spp., *Mycale* spp., *Halichondria* spp.) (Table 2). Following the World Porifera Database (WPD), 166 sponges classified at the genus and species levels have been given new valid names. For 135 of the 166 species, these updates are due to changes in taxonomic status. For example, *Acanthella carteri* is nowadays accepted as *Stylissa carteri*, after a genus transfer. *Acanthella aurantiaca* has also been transferred to the genus *Stylissa*, but is considered a junior synonym of *Stylissa carteri*. The updates also include names offered as a result of incorrect use of the Zoological code of Nomenclature. This pertains to eight sponge species, including the former *Bubaris conulosus*, now known as *B. conulosa*, and the former *Gellius cymiformis*, now known as *Haliclona (Gellius) cymaeformis*. The updates also include 28 obviously incorrect identifications. Because their original distributions (type localities) are in the Mediterranean Sea or the Atlantic Ocean, their names were amended by identifying their affinities (ex. *Cliona* aff. *schmidtii* or *Oscarella* aff. *lobularis*). However, three of these were true misidentifications, such as *Axinosa incrustans*, which is actually *Scopalinia rubra*. Finally, *Clathrina pulcherrima* is currently deemed nomen nudum, which implies that it has not been published with a sufficient description and hence remains an invalid name. It is assumed that this record by Barnes and Bell (2002) refers to a spelling error of *Clathrina pulcherrima* that was documented prior to Vacelet and Vasseur (1977), hence it was removed from the inventory.

The sponge fauna of Toliara is distributed among three classes, 23 orders, and 68 families. The class Demospongiae is the most abundant, accounting for 92 % of the reported species (247 species), whereas Calcarea and Homoscleromorpha are underrepresented, accounting for 5 % (13 species) and 3 % (7 species) of the recorded species, respectively (Fig. 2a). Poecilosclerida, with 53 species (of which eight species identified only at the genus level), Haplosclerida, with 44 species (of which eight species identified only at the genus level), and Tetractinellida, with 42 species (of which seven species identified only at the genus level), are the most numerous orders in the Demospongiae.

Table 2. Sponge inventory of Toliara, southwest Madagascar and their distribution among habitats. C = cave and galleries, F = reef flats, L = lagoon, M = mangrove, P = phanerogam meadows, R = reef; * species whose taxonomic status has been changed according to the most recent sponge classification (Morrow and Cárdenas, 2015). Sources: 1 Vasseur (1964); 2 Vacelet and Vasseur (1965); 3 Vacelet (1967a); 4 Vacelet (1967b); 5 Vacelet and Vasseur (1971); 6 Vacelet et al (1976); 7 Vacelet (1977); 8 Vacelet and Vasseur (1977); 9 Barnes and Bell (2002). All given names have been checked in WPD.

Class	Order	Family	Species	Site id.	Habitat	Source
Calcarea						
(Calcaronea) Baerida						
		Lepidoleuconidae	<i>Lepidoleucon inflatum</i> Vacelet, 1967	2, 7	C	4, 7, 8
(Calcaronea) Lithonida						
	Minchinellidae		<i>Plectroninia hindei</i> Kirkpatrick, 1900	1, 11	R	6, 7, 8
			<i>Plectroninia minima</i> Vacelet, 1967	1, 2, 7, 11	R, C	4, 6, 8
			<i>Plectroninia pulchella</i> Vacelet, 1967	1, 7, 11	R, C	4, 5, 6, 8
			<i>Plectroninia radiata</i> Vacelet, 1967	1, 2, 7, 11	R, C	4, 5, 6, 7, 8
			<i>Plectroninia tecta</i> Vacelet, 1967	2, 7	C	3, 4, 5
			<i>Plectroninia</i> sp.	19		9
			<i>Tulearinia stylifera</i> Vacelet, 1977	7	C	7, 8
(Calcinea) Clathrinida						
	Clathrinidae		<i>Arturia darwinii</i> (Haeckel, 1870)*	19		9
			<i>Clathrina pulcherrima</i> (Dendy, 1891)	1, 4	L	8
	Leucettidae		<i>Leucetta</i> aff. <i>primigenia</i> Haeckel, 1872*	2	C, L	1, 2
	Lelapiellidae		<i>Lelapiella incrustans</i> Vacelet, 1977	7	R, C	7, 8
	Paramurrayonidae		<i>Paramurrayona corticata</i> Vacelet, 1967	7	C	4, 5, 8
Demospogiae						
(Heteroscleromorpha)						
Agelasida						
	Agelasidae		<i>Acanthostylotella cornuta</i> (Topsent, 1897)	3, 6	R, F	5, 8
			<i>Agelas bispiculata</i> Vacelet, Vasseur & Lévi, 1976	11	R	6
			<i>Agelas marmarica</i> Lévi, 1958	2, 7, 9	C, F, L	1, 2, 5
			<i>Agelas mauritiana</i> (Carter, 1883)	1, 2, 7, 11	R, C	2, 5, 6
	Astroscleridae		<i>Astrosclera willeyana</i> Lister, 1900	1- 3, 11	R, C	1, 2, 3, 5, 6, 7, 8
Axinellida						
	Axinellidae		<i>Axinella arborescens</i> Ridley and Dendy, 1886*	3, 13, 14	R, L	6, 8
			<i>Axinella donnani</i> (Bowerbank, 1873)*	3, 6, 13, 14	R, L	6, 8
	Heteroxyidae		<i>Myrmekioderma granulatum</i> (Esper, 1829)*	1, 2, 4, 5, 11	F, L, P	1, 2, 5, 8
			<i>Myrmekioderma dendyi</i> (Burton, 1959)*	2, 7	C, L	5
	Raspailiidae		<i>Aulospongos gardineri</i> (Dendy, 1922)*	3	R	5
			<i>Aulospongos involutus</i> (Kirkpatrick, 1903)*	3, 13	R	6
			<i>Didiscus aceratus</i> (Ridley & Dendy, 1886)*	7	C	5, 8
			<i>Didiscus</i> aff. <i>stylifer</i> Tsumamal, 1969*	3	R	5, 6
			<i>Didiscus placospongioides</i> Dendy, 1922	3, 7	R, C	5, 6
			<i>Echinodictyum conulosum</i> Kieschnick, 1900	3	R	5, 6, 8
			<i>Echinodictyum jousseaumi</i> Topsent, 1892	3	R	5, 8
			<i>Echinodictyum</i> sp.	19		9
			<i>Eurypon calypsoi</i> Lévi, 1958	3	R	6
			<i>Eurypon</i> sp.	3, 11	R	6
	Stelligeridae		<i>Higginsia petrosioides</i> Dendy, 1922	2, 3, 7, 9, 13	R, F, C, L	1, 2, 5, 6, 8
Biemnida						
	Biemnidae		<i>Biemna anisotoxa</i> Lévi, 1963	1	L	5
			<i>Biemna bihamigera</i> (Dendy, 1922)	20	R	5
			<i>Biemna fortis</i> (Topsent, 1897)	2, 3	F	8, 9
			<i>Biemna</i> sp.	19		9
	Rhabderemiidae		<i>Rhabderemia mammillata</i> (Whitelegge, 1907)*	2, 7, 8	C	8
			<i>Rhabderemia</i> aff. <i>toxigera</i> Topsent, 1892*	2, 7, 8	C	8

Class	Order	Family	Species	Site id.	Habitat	Source
Bubarida						
	Bubaridae	<i>Bubaris conulosa</i>	Vacelet & Vasseur, 1971*	3	R	5, 8
		<i>Cerbaris topsenti</i>	(Hentschel, 1912)*	4	L	2
	Desmanthidae	<i>Desmanthus</i> aff. <i>incrustans</i>	(Topsent, 1889)*	11	R	6
	Dictyonellidae	<i>Acanthella klethra</i>	Pulitzer-Finali, 1982	19		9
		<i>Acanthella</i> sp.		19		9
Clionaida						
	Clionidae	<i>Cliona</i> aff. <i>lobata</i>	Hancock, 1849*	3	R	6
		<i>Cliona</i> aff. <i>schmidtii</i>	(Ridley, 1881)*	7, 8	C	6
		<i>Cliona celata</i>	Grant, 1826	3	F	5
		<i>Cliona ensifera</i>	Sollas, 1878	3, 13	R	6
		<i>Cliona</i> sp.		2, 4	F, L	1, 9
		<i>Cliona jullieni</i>	Topsent, 1891	3	R, F	6
		<i>Cliona mucronata</i>	Sollas, 1878	3, 7, 9, 11, 13	R, F, C	5, 6
		<i>Cliothesa</i> aff. <i>hancocki</i>	(Topsent, 1888)*	3	R, F	6
		<i>Pione margaritiferae</i>	(Dendy, 1905)*	3	F	5
		<i>Sphaciospongia excentrica</i>	(Burton, 1931)*	1, 3, 11, 14	R, L	6, 8
		<i>Sphaciospongia inconstans</i>	(Dendy, 1887)*	3, 13	R	2, 5, 6, 8
		<i>Sphaciospongia inconstans</i> var. <i>digitata</i>	(Dendy, 1887)*	2, 4	F, C	1, 2, 5
		<i>Sphaciospongia poterionides</i>	(Vacelet & Vasseur, 1971)*	10, 15, 16	F, L	5, 8
		<i>Sphaciospongia solida</i>	(Ridley & Dendy, 1886)	19		9
		<i>Sphaciospongia vagabunda</i>	(Ridley, 1884)*	2	P	8, 9
	Placospongiidae	<i>Placospongia carinata</i>	(Bowerbank, 1858)	1, 2, 7, 11	R, F, C, L	1, 2, 5, 6, 8, 9
		<i>Placospongia melobesioides</i>	Gray, 1867	19		9
	Spirastrellidae	<i>Diplastrella gardineri</i>	Topsent, 1918	3	R	6
		<i>Spirastrella</i> aff. <i>cunctatrix</i>	Schmidt, 1868*	3, 9	R, F	5, 6
		<i>Spirastrella curvistellifera</i>	(Dendy, 1905)*	2, 6, 7, 11, 20	R, C, L	1, 2, 5, 6, 8
		<i>Spirastrella pachyspira</i>	Lévi, 1958	2, 3, 7, 11, 20	R, F, C, L	1, 2, 5, 6, 8
		<i>Spirastrella</i> sp.		19		8, 9
Haplosclerida						
	Callyspongiidae	<i>Callyspongia</i> (<i>Callyspongia</i>) sp.		4	L	1, 2
		<i>Callyspongia</i> (<i>Cladochalina</i>) <i>subarmigera</i>	(Ridley, 1884)*	4	L	6
		<i>Callyspongia</i> (<i>Toxochalina</i>) <i>dendyi</i>	(Burton, 1931)*	3, 13	R	6
		<i>Callyspongia</i> (<i>Toxochalina</i>) <i>robusta</i>	(Ridley, 1884)*	3, 6, 13	R	5, 6, 8
		<i>Callyspongia</i> (<i>Toxochalina</i>) sp.		19		9
		<i>Callyspongia confederata</i>	(sensu Ridley, 1884)	3, 11, 13, 15	R, L	6
		<i>Callyspongia reticulata</i> var. <i>salomonensis</i>	(Dendy, 1922)	3	R	6
	Chalinidae	<i>Haliclona</i> (<i>Flagellia</i>) <i>amirantensis</i>	Van Soest, 2017*	3	R	6
		<i>Haliclona</i> (<i>Gellius</i>) <i>cymaeformis</i>	(Esper, 1806)*	10	P	5, 8, 9
		<i>Haliclona</i> (<i>Gellius</i>) <i>laubenfelsi</i>	Van Soest & Hooper, 2020*	2	F, P	5, 8
		<i>Haliclona</i> (<i>Gellius</i>) <i>ridleyi</i>	(Hentschel, 1912)*	7	C	5
		<i>Haliclona</i> (<i>Halichoclona</i>) <i>centrangulata</i>	(Sollas, 1902)*	3	R	6
		<i>Haliclona</i> (<i>Remiera</i>) sp.		2	C	1
		<i>Haliclona fragilis</i>	(Vacelet, Vasseur & Lévi, 1976)*	11, 14	R, L	6
		<i>Haliclona</i> sp.		19		9
		<i>Haliclona madagascarensis</i>	Vacelet, Vasseur & Lévi, 1976	3	R	6
		<i>Haliclona polypoides</i>	(Vacelet, Vasseur & Lévi, 1976)*	3, 6, 13	R	6, 8
		<i>Haliclona striata</i>	Vacelet, Vasseur & Lévi, 1976	3, 13	R	6
		<i>Haliclona tulearensis</i>	Vacelet, Vasseur & Lévi, 1976	3, 11	R	6

Class	Order	Family	Species	Site id.	Habitat	Source
		Niphatidae	<i>Gelliodes incrustans</i> Dendy, 1905	2, 19	F	8, 9
			<i>Gelliodes petrosioides</i> Dendy, 1905*	11	R	6
			<i>Gelliodes</i> sp.	2	R, C, L	1, 2
		Petrosiidae	<i>Neopetrosia chaliniformis</i> (Thiele, 1899)*	19		9
			<i>Neopetrosia seriata</i> (Hentschel, 1912)*	3	R, F	5, 6
			<i>Petrosia (Petrosia) densissima</i> Dendy, 1905*	3	R	6
			<i>Petrosia (Petrosia) microxea</i> (Vacelet, Vasseur & Lévi, 1976)*	11	R	6
			<i>Petrosia (Petrosia) nigricans</i> Lindgren, 1897*	11, 13, 14, 19	R, L	6, 9
			<i>Petrosia (Petrosia) spheroida</i> Tanita, 1967*	1, 3, 4, 11	R, L	6, 8
			<i>Petrosia (Strongylophora) durissima</i> (Dendy, 1905)*	2, 7	C	1, 2, 5, 8
			<i>Petrosia</i> sp.	19		9
			<i>Xestospongia testudinaria</i> (Lamarck, 1815)*	1, 3-4	R, F, L	1, 2, 5, 6, 8
			<i>Xestospongia viridenigra</i> (Vacelet, Vasseur & Lévi, 1976)*	1, 3	R, F, L	2, 5, 6
			<i>Xestospongia</i> sp.	19		9
		Phloeodictyidae	<i>Oceanapia amboinensis</i> Topsent, 1897	1, 7, 11	R, C	5, 6
			<i>Oceanapia cribrirrhina</i> (Vacelet & Vasseur, 1971)*	3, 7	R, C	5, 6
			<i>Oceanapia dura</i> (Vacelet & Vasseur, 1971)*	3	R	5
			<i>Oceanapia fistulosa</i> (Bowerbank, 1873)*	3, 4, 13	R, L	6, 8
			<i>Oceanapia incrustata</i> (Dendy, 1922)*	1, 3, 4, 13, 14, 19	R, L	5, 6, 8, 9
			<i>Oceanapia minuta</i> (Vacelet, Vasseur & Lévi, 1976)*	3, 11	R	6
			<i>Oceanapia mucronata</i> (Vacelet, Vasseur & Lévi, 1976)*	1, 3, 13, 14	R, L	6
			<i>Oceanapia</i> sp.	1, 3, 11, 19	R, L	6, 8, 9
			<i>Oceanapia polysiphonia</i> (Dendy, 1922)*	1, 3	R	6
			<i>Oceanapia sagittaria</i> (Sollas, 1902)*	3	F	5, 8
			<i>Oceanapia toxophila</i> Dendy, 1922	3	R	6, 8
Merliida						
		Merliidae	<i>Merlia normani</i> Kirkpatrick, 1908	3	R	5
Poecilosclerida						
		Acanthidae	<i>Acanthus bergquistae</i> Van Soest, Hooper & Hiemstra, 1991*	3	R	6
			<i>Cornulella minima</i> (Vacelet, Vasseur & Lévi, 1976)*	1, 3, 11, 13	R	6
			<i>Paracornulum strepsichela</i> (Dendy, 1922)*	3	R	6
			<i>Zyzygia fuliginosa</i> (Carter, 1879)*	1	R	6
		Chondropsidae	<i>Batzella aurantiaca</i> (Lévi, 1958)*	1, 3, 11	R, F, L	5, 6
			<i>Chondropsis lamella</i> (Lendenfeld, 1888)*	1	R	6
		Coelosphaeridae	<i>Coelosphaera (Coelosphaera) fucooides</i> (Topsent, 1897)*	13	R	6
			<i>Coelosphaera</i> sp.	19		9
			<i>Lissodendoryx (Ectyodoryx) arenaria</i> Burton, 1936*	3, 19	R	6, 8, 9
		Crambeidae	<i>Crambe acuata</i> (Lévi, 1958)	3, 11, 13	R	6, 8
			<i>Crambe</i> aff. <i>crambe</i> (Schmidt, 1862)*	19		9
			<i>Monanchora dianchora</i> de Laubenfels, 1935*	3, 4	R, L	5, 6
			<i>Monanchora unguiculata</i> (Dendy, 1922)*	3	R	5, 6
		Crellidae	<i>Crella (Pytheas) ula</i> (de Laubenfels, 1950)*	3, 17	R, L	6
			<i>Spirorhabdia alata</i> Vacelet, Vasseur & Lévi, 1976	11	R	6, 8
		Esperiopsidae	<i>Ulosa</i> aff. <i>incrustans</i> (Burton, 1930)*	9	F	5
		Guitarridae	<i>Coelodischela diatomorpha</i> Vacelet, Vasseur & Lévi, 1976	11	R	6
		Hymedesmiidae	<i>Acanthancora stylifera</i> Burton, 1959	4	F, L, P	2, 5
			<i>Hymedesmia (Hymedesmia) mertoni</i> Hentschel, 1912*	3	R	6, 8
			<i>Hymedesmia</i> sp.	2, 7, 8, 19	C	8
			<i>Phorbas clathrodes</i> (Dendy, 1922)*	3	R	6
			<i>Phorbas scabida</i> (sensu Vacelet, Vasseur & Lévi, 1976)*	3	R	6
		Iotrochotidae	<i>Iotrochota baculifera</i> Ridley, 1884	1-3	R, F, L, P	1, 2, 5, 6
			<i>Iotrochota purpurea</i> (Bowerbank, 1875)	1-4, 13	R, F, L, P	1, 2, 5, 6, 8

Class	Order	Family	Species	Site id.	Habitat	Source
	Microcionidae		<i>Clathria (Clathria) foliascens</i> Vacelet & Vasseur, 1971*	3	R	5, 6, 8
			<i>Clathria (Clathria) spongodes</i> Dendy, 1922*	1	R	6
			<i>Clathria (Microciona) microxea</i> (Vacelet & Vasseur, 1971)*	3	F	5
			<i>Clathria (Microciona) vacelettia</i> Hooper, 1996*	2	L	1, 2
			<i>Clathria (Microciona) sp.</i>	1- 3, 6, 8, 9, 19	R, F, C, L, P	5, 6, 9
			<i>Clathria (Thalysias) abietina</i> (Lamarck, 1814)*	3	R	6, 8
			<i>Clathria (Thalysias) cactiformis</i> (Lamarck, 1814)*	2, 3	R, F, P	5, 6, 8
			<i>Clathria (Thalysias) cervicornis</i> (Thiele, 1903)*		R	5
			<i>Clathria (Thalysias) sp.</i>	1, 3	R, F, L	5, 6
			<i>Clathria (Thalysias) toxifera</i> (Hentschel, 1912)*	2	P	8
			<i>Clathria (Thalysias) vulpina</i> (Lamarck, 1814)*	3, 14	R, F, L	6, 8
			<i>Clathria (Wilsonella) cercidochela</i> (Vacelet & Vasseur, 1971)*	1, 3	R, L	5, 6, 8
			<i>Clathria sp.</i>	19		9
	Mycalidae		<i>Mycale (Aegogropila) crassissima</i> (Dendy, 1905)*	3	F	5
			<i>Mycale (Aegogropila) sulevoidea</i> (Sollas, 1902)*	1, 4, 7, 19	C, L, P	1, 2, 5
			<i>Mycale (Arenochalina) imperfecta</i> Baer, 1906*	1, 19	L	5, 8
			<i>Mycale (Grapelia) vaceleti</i> Hajdu, 1995*	11	R	6
			<i>Mycale (Mycale) grandis</i> Gray, 1867*	1, 4, 9	F, L	1, 2, 5, 8
			<i>Mycale (Mycale) gravelyi</i> Burton, 1937*	2, 4	R, L	1, 2, 5
			<i>Mycale (Naviculina) cleistochela</i> Vacelet & Vasseur, 1971*	9	F	5, 8
			<i>Mycale (Naviculina) microxea</i> Vacelet, Vasseur & Lévi, 1976*	3	R	6
			<i>Mycale sp.</i>	3, 4, 19	F, L	5, 9
	Podospongiidae		<i>Diacarnus globosus</i> (Vacelet, Vasseur & Lévi, 1976)*	3	R	6, 8
			<i>Sigmosceptrella quadrilobata</i> Dendy, 1922	2, 6	R, C	6, 8
	Tedaniidae		<i>Strongylamma arenosa</i> (Vacelet & Vasseur, 1971)*	3, 19	R	5, 8
			<i>Strongylamma sp.</i>			8
			<i>Strongylamma wilsoni</i> (Dendy, 1922)*	3	R	5
			<i>Tedania (Tedania) assabensis</i> Keller, 1891*	1, 3, 11	R, L	5
			<i>Tedania (Tedania) sp.</i>	6, 7, 9	R, F, C	5
Polymastiida						
	Polymastiidae		<i>Polymastia megasclera</i> Burton, 1934	3	R	6, 8
Scopalinida						
	Scopalinidae		<i>Scopalina aff. lophyropoda</i> Schmidt, 1862*	3	R	5, 6, 8
			<i>Scopalina rubra</i> (Vacelet & Vasseur, 1971)*	2-4, 9, 19	R, F, C, L, P	5, 6, 8, 9
			<i>Stylissa carteri</i> (Dendy, 1889)*	2-4, 7, 11, 13-14, 19	R, C, L	1, 2, 5, 6, 8, 9
			<i>Stylissa conulosa</i> (Dendy, 1922)*	19		9
Suberitida						
	Halichondriidae		<i>Amorphinopsis fistulosa</i> (Vacelet, Vasseur & Lévi, 1976)*	3, 13	R, F, P	6
			<i>Amorphinopsis foetida</i> (Dendy, 1889)*	2, 19	M	2, 8, 9
			<i>Axinyssa aplysinoidea</i> (Dendy, 1922)	3, 7, 20	R, C, P	5, 6
			<i>Ciocalypta sp.</i>	19		9
			<i>Ciocalypta microstrongylata</i> Vacelet, Vasseur & Lévi, 1976	3, 19	R	6, 8, 9
			<i>Halichondria sp.</i>	2- 4, 19	R, F, L	1, 6, 8
			<i>Hymeniacion aff. perlevis</i> (Montagu, 1814)*	2, 4	F	1, 2
			<i>Spongosorites indicus</i> Hentschel, 1912*	2, 4	F	1, 2
			<i>Topsentia halichondrioides</i> (Dendy, 1905)*	3	R	6
			<i>Topsentia stellettoidea</i> (Lévi, 1961)*		R	6
	Suberitidae		<i>Aaptos aff. aaptos</i> (Schmidt, 1864)*	2, 4, 11	R, F	2, 5, 6
			<i>Terpios cruciatus</i> (Dendy, 1905)*	3	R, F	6
			<i>Terpios granulosus</i> Bergquist, 1967*	3, 9	R, F, P	5, 6, 8
			<i>Terpios sp.</i>	19		9

Class	Order	Family	Species	Site id.	Habitat	Source
Tethyida						
	Hemiasterellidae	<i>Hemiasterella complicata</i>	Topsent, 1919	3	R	6
		<i>Liosina arenosa</i>	(Vacelet & Vasseur, 1971)*	1, 19	L	5, 8, 9
	Tethyidae	<i>Tethya seychellensis</i>	(Wright, 1881)	7, 11, 19	R, F, C	1, 2, 5, 6, 8, 9
	Timeidae	<i>Timea aff. unistellata</i>	(Topsent, 1892)*	2, 7, 11	F, C, L	1, 2, 5, 8
		<i>Timea</i> sp.		19		9
Tetractinellida						
	Ancorinidae	<i>Ancorina aff. radix</i>	Marenzeller, 1889*	3, 7	F, C	5
		<i>Ancorina nanosclera</i>	Lévi, 1967*	1, 3, 11, 14	R, L	6
		<i>Asteropus simplex</i>	(Carter, 1879)	3	R	5, 8
		<i>Dercitus (Stoeba) extensus</i>	(Dendy, 1905)*	3	F	5, 8
		<i>Dercitus (Stoeba)</i> sp.		3	F	5, 8
		<i>Ecionemia acervus</i>	Bowerbank, 1862*	2, 3, 11, 14, 18, 19	R, F, L	8, 9
		<i>Jaspis aff. johnstonii</i>	(Schmidt, 1862)*	4, 19	L	8, 9
		<i>Jaspis diastra</i>	(Vacelet & Vasseur, 1965)*	2	L	1, 2
		<i>Jaspis</i> sp.		19		9
		<i>Stelletta osculifera</i>	(Lévi, 1964)*	7	C	8
		<i>Stelletta tulearensis</i>	Vacelet, Vasseur & Lévi, 1976	3, 11	R	5
		<i>Stellettinopsis laviniensis</i>	(Dendy, 1905)*	11	R	6
	Geodiidae	<i>Caminus aff. sphaeroconia</i>	Sollas, 1886*	3	R	6
		<i>Erylus lendenfeldi</i>	Sollas, 1888	2, 3, 9, 13, 19	R, F, C	5, 6, 8, 9
		<i>Geodia carcinophila</i>	(Lendenfeld, 1897)*	3	R	6
		<i>Geodia littoralis</i>	Stephens, 1915	2	L	5
		<i>Geodia peruncinata</i>	Dendy, 1905	8	C	5, 8
		<i>Geodia sollasi</i>	(Lendenfeld, 1888)*	7, 9, 11	R, F, C	5, 6
		<i>Geodia sphaerulifer</i>	(Vacelet & Vasseur, 1965)*	7, 2	R, C	2, 5
	Neopeltidae	<i>Homophymia lamellosa</i>	Vacelet & Vasseur, 1971	2, 6-8, 11	R, C	5, 6, 8
		<i>Macandrewia</i> sp.		2, 7, 8	C	1, 2, 8
		<i>Sollasipelta cavernicola</i>	(Vacelet & Vasseur, 1965)*	1, 2, 7, 11	R, C	5, 6, 8
		<i>Sollasipelta mixta</i>	(Vacelet, Vasseur & Lévi, 1976)*	2, 3, 7, 8	R, C	6, 8
		<i>Sollasipelta ornata</i>	(Sollas, 1888)	2-4, 7, 11	R, C, L	5, 6, 8
		<i>Sollasipelta</i> sp.		19		9
	Pachastrellidae	<i>Acanthotriaena crypta</i>	Vacelet, Vasseur & Lévi, 1976	3	R	6, 8
	Phymaraphiniidae	<i>Kaliapsis incrustans</i>	(Vacelet & Vasseur, 1971)*	1-3, 7, 8, 11	R, C	1, 2, 5
	Scleritodermidae	<i>Aciculites spinosa</i>	Vacelet & Vasseur, 1971	8	C	5, 8
		<i>Aciculites tulearensis</i>	Vacelet & Vasseur, 1965	2-3, 7	C	2, 5, 6, 8
		<i>Scleritoderma nodosum</i>	Thiele, 1900	13	R	5, 8
	Tetillidae	<i>Cinachyrella australiensis</i>	Carter, 1886*	2	L	1, 2, 5, 6, 8
		<i>Craniella aff. cranium</i>	(Müller, 1776)*		R	6, 8
		<i>Paratetilla bacca</i>	Dendy, 1905	1-4, 7	R, C, L	2, 5
		<i>Paratetilla</i> sp.		19		9
	Theonellidae	<i>Discodermia discifera</i>	(Lendenfeld, 1907)*	2	L	2, 5
		<i>Discodermia</i> sp.		19		9
		<i>Discodermia dubia</i>	Vacelet & Vasseur, 1971	7	C	6, 8
		<i>Discodermia japonica</i>	Döderlein, 1884	1, 7, 11	C, R	5, 8
		<i>Discodermia panoplia</i>	Sollas, 1888	2, 3, 7, 8, 11	C, R	5, 6, 8
		<i>Theonella conica</i>	(Kieschnick, 1896)	1-3, 13	R, F, L	5, 6, 8
		<i>Theonella swinhoei</i>	Gray, 1868	1, 13, 14	R, L	1, 2, 5, 6
	Thoosidae	<i>Alectona primitiva</i>	Topsent, 1932	7	C	6

Class	Order	Family	Species	Site id.	Habitat	Source
(Keratosa)						
Dendroceratida						
	Darwinellidae	<i>Aplysilla</i> aff. <i>sulfurea</i> Schulze, 1878*		3, 4, 19	R, L	1, 2, 5, 6, 8
		<i>Chelonaplysilla</i> aff. <i>noevus</i> (Carter, 1876)*		3, 5	R, F	5
		<i>Darwinella australiensis</i> Carter, 1885		4	L	5, 6, 8
	Dictyodendrillidae	<i>Igernella mirabilis</i> Lévi, 1961			F	5, 6
		<i>Spongionella nigra</i> Dendy, 1889*		11	R	6
		<i>Spongionella retiara</i> (Dendy, 1916)*		3	R	5
Dictyoceratida						
	Dysideidae	<i>Dysidea cinerea</i> Keller, 1889		13	R	6
		<i>Dysidea</i> sp.		19		9
	Irciniidae	<i>Ircinia</i> aff. <i>dendroides</i> (Schmidt, 1862)*		1, 3	R, L	1, 2, 5
		<i>Ircinia</i> aff. <i>strobilina</i> (Lamarck, 1816)*		1, 3	R, L	6
		<i>Ircinia cylindracea</i> Vacelet, Vasseur & Lévi, 1976		3	R	6, 8
		<i>Ircinia irregularis</i> (Poléjaeff, 1884)		3, 2	R, L	6, 8
		<i>Ircinia</i> sp.		1, 4	L	6
		<i>Ircinia ramosa</i> (Keller, 1889)*		1, 4	L	6
	Spongiidae	<i>Spongia</i> sp.		3	R	6
	Thorectidae	<i>Phyllospongia papyracea</i> (Esper, 1806)*		3, 4, 11, 12, 19	R, F, L	5, 6, 8, 9
		<i>Phyllospongia foliascens</i> (Pallas, 1766)*		3	R, F	5, 6, 8
		<i>Lendenfeldia dendyi</i> (Lendenfeld, 1889)*		1, 4, 10	F, L, P	6, 8
		<i>Hyrrios cavernosus</i> (Vacelet, Vasseur & Lévi, 1976)*		13	R	6
(Verongimorpha)						
Verongiida						
	Ianthellidae	<i>Hexadella</i> aff. <i>racovitzai</i> Topsent, 1896*		3, 11, 13	R, F	6, 8
		<i>Hexadella</i> sp.		1, 2, 4, 7, 19	F, C, L	9
		<i>Ianthella</i> sp.		19		9
	Pseudoceratinidae	<i>Pseudoceratina purpurea</i> (Carter, 1880)*		3, 14, 17	R, L	6, 8
Chondrillida						
	Chondrillidae	<i>Chondrilla</i> aff. <i>nucula</i> Schmidt, 1862		3, 13, 19	F	5, 8, 9
		<i>Chondrilla australiensis</i> Carter, 1873*		3, 4	L, F	1, 2, 5
		<i>Chondrilla mixta</i> Schulze, 1876*		3	R, F	5, 6
		<i>Chondrilla sacciformis</i> Carter, 1879		2	C	1, 2, 5
	Halisarcidae	<i>Halisarca ectofibrosa</i> Vacelet, Vasseur & Lévi, 1976		2, 3	R, C	6, 8
		<i>Halisarca</i> sp.		1, 4, 5	L, F	
Chondrosiida						
	Chondrosiidae	<i>Chondrosia debilis</i> Thiele, 1900		3, 5, 9	F	
Homoscleromorpha						
Homosclerophorida						
	Oscarellidae	<i>Oscarella</i> aff. <i>lobularis</i> (Schmidt, 1862)*		3, 7	C, P	6
	Plakinidae	<i>Plakina</i> aff. <i>monolopha</i> Schulze, 1880*		7	C	5
		<i>Plakina</i> aff. <i>trilopha</i> Schulze, 1880*		3	R	6
		<i>Plakina corticioides</i> Vacelet, Vasseur & Lévi, 1976		3	R	6
		<i>Plakinastrella ceylonica</i> (Dendy, 1905)		11	R	5, 6
		<i>Plakinastrella</i> sp.			R	8
		<i>Plakortis</i> aff. <i>simplex</i> Schulze, 1880*		3, 14	R, L	6

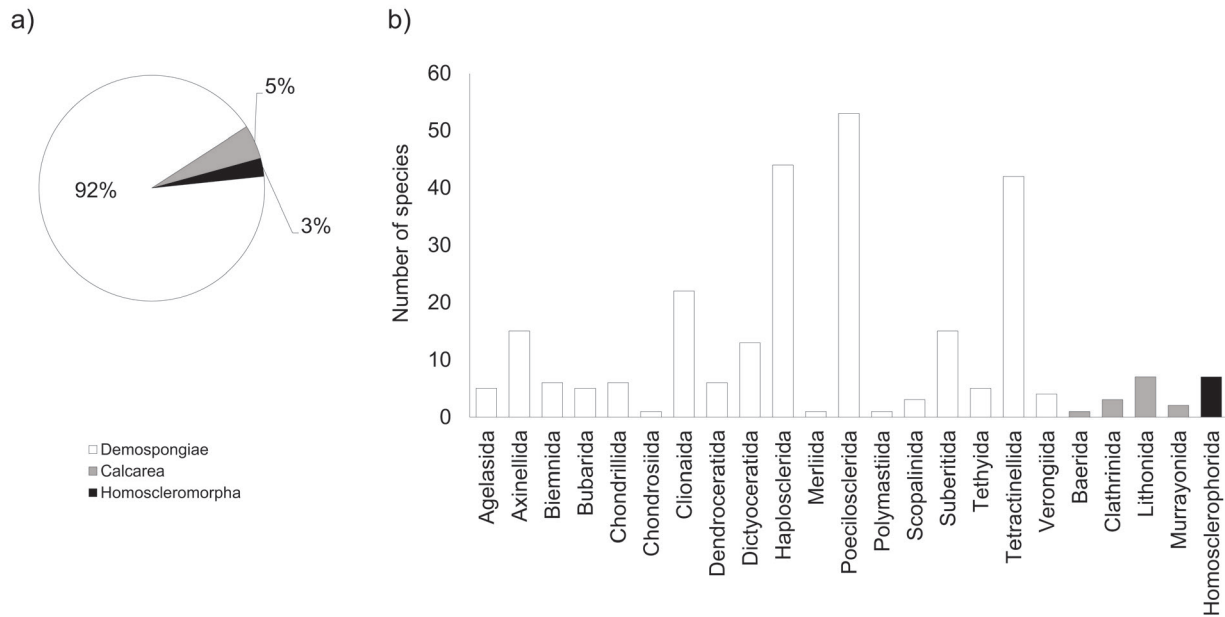


Figure 2. Taxonomic distribution of the sponge species recorded in the region of Toliara. a) pie representing the proportion of sponges per class; b) histogram representing the proportion of sponges per order.

Chondrosiida, Merliida, and Polymastiida are the three Demospongiae orders with the fewest species each. Among the four Calcarea orders now accepted, Lithonida has the most species with seven, while Baerida has only one (Fig. 2b). Toliara sponge fauna presents only seven species of the Homoscleromorpha class, which currently includes only one order, Homosclerophorida.

Ecological distribution of Toliara sponge species

Of the 267 species, 257 species were found on hard bottoms (238 Demospongiae, 12 Calcarea, and seven Homoscleromorpha) and 39 on soft bottoms (37 Demospongiae, one Calcarea, and one Homoscleromorpha) (Fig. 3a). Thus, 236 species were restricted to one type of substratum and 30 species were found in both types of substratum.

According to the rather precise indications given by Vasseur and his co-workers (Vasseur, 1964; Vacelet and Vasseur, 1965, 1971, 1977; Vacelet 1967a, b, 1977; Vacelet *et al.*, 1976), 239 species could be assigned to a habitat type.

The outer reef slope had the highest number of species (163). There were 76, 67, and 64 species in lagoons, reef flats, and caves, respectively. There were 17 species found in phanerogam meadows and only one species in mangroves (Fig. 3b). The sponge fauna of the outer slope was composed of about 94 % of Demospongiae (53 families), 3 % of Calcarea (2 families) and 3 %

Homoscleromorpha (1 family). In the lagoon, 96 % of the species were Demospongiae (38 families), 3 % Calcarea (2 families) and only 1 % was Homoscleromorpha (one family). In the reef caves and tunnels, the reported species were composed by 83 % of Demospongiae (33 families), 14 % of Calcarea (5 families) and 3 % of Homoscleromorpha (2 families). In the phanerogam meadows, 94 % of the species were Demospongiae (11 families) and the remaining 6 % were Homoscleromorpha (1 family). On reef flats and in the mangrove, the only species recorded was Demospongiae.

Among all sponges recorded, 102 species (95 Demospongiae, 5 Calcarea and 2 Homoscleromorpha) had a broad distribution, recorded in at least two different habitats. However, only two sponges were recorded in all five habitat categories; *Scopalina rubra*, and an undetermined *Clathria (Microciona)* which may actually correspond to a different species. On the other hand, 137 species (126 Demospongiae, six Calcarea and five Homoscleromorpha) seem to be restricted to only one habitat category. For instance, *Plectroninia hindei*, *Plakina corticoides* or *Petrosia (Petrosia) microxea* are among the species which were recorded only on the outer reef slope. *Cliona celata*, *Clathria (Microciona) microxea* or *Igernella mirabilis* were only recorded on reef flats. *Lepidoleucon inflatum*, *Aciculites spinosa* or *Plakina aff. monolopha* are typical cave-dwelling sponge species, whereas *Clathrina pulcherrima*, *Jaspis diastra* or *Liosina arenosa* are exclusive to reef lagoons.

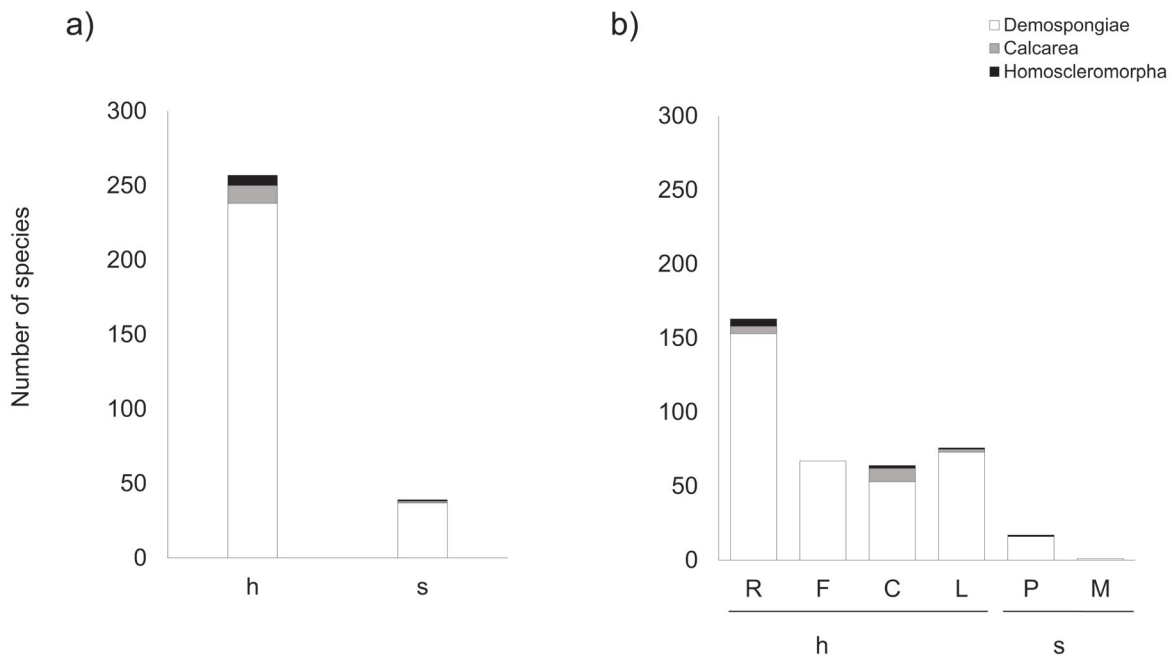


Figure 3. Ecological distribution of Toliara sponge species. a) species distribution per type of substratum according to Barnes and Bell (2002) and later references. h = hard bottoms, s = soft bottoms. b) species distribution per habitat category according to Vasseur (1964), Vasseur (1965, 1977), Vacelet (1967a, 1967b, 1977), Vacelet *et al.* (1976). C = cave and galleries, F = reef flats, L = lagoon, M = mangrove, P = phanerogam meadows, R = reef.

Discussion

The marine sponge fauna in the Toliara region has at least 267 species, however this inventory is likely underestimated and it is believed that this will increase in the near future. This check-list was obtained by updating almost 62 % of the species referenced in the WPD in our database (de Voogd *et al.*, 2023). This update allows the presentation of a reliable repository that can be used by scientists from different disciplinary fields (e.g., ecology, biodiversity, conservation, chemistry) and managers of the marine environment. This revision rate illustrates the great changes in the taxonomy and systematics of sponges (Porifera) that has occurred over the last two decades (Cárdenas *et al.*, 2012; Morrow and Cárdenas, 2015). However, this inventory also includes species to which affinities have been assigned and for which new descriptions will have to be made. In addition, this list could also be enriched if genus-level identifications of some sponges were completed. Therefore, more than 10 % of the fauna known today should be re-examined to provide more precise identifications.

Toliara's sponge biodiversity alone accounts for 67 % of all known valid species in the WIO (401 species) (de Voogd *et al.*, 2023). However, this part of the world ocean is still largely unexplored (Barnes and

Bell, 2002), which explains why its sponge biodiversity now accounts for only 4 % of all valid species recorded worldwide (de Voogd *et al.*, 2023). Ten years after the state of the art by Van Soest *et al.* (2012), the highly fragmented nature of the knowledge related to sponge diversity has not changed, and a special effort should be made in the Indian Ocean. Given the extent of Madagascar and the latitudes covered, the inventory undertaken in Toliara suggests a high potential for new discoveries. Indeed, the Toliara region alone has 2.5 times the number of species of the Indian Peninsula (George *et al.*, 2020). However, when compared to other regions where extensive sampling has been undertaken, sponge diversity in the Toliara region appears to be quite low, accounting for only a fifth of North Western Australia's sponge biodiversity (Fromont *et al.*, 2016), for example. Despite the fact that the Calcarea and Homoscleromorpha classes in these two later regions display comparable number of species, the greater diversity of Demospongiae and the presence of Hexactinellida in the NW Australia inventory compared to the present inventory may be explained in part by the larger bathymetric range explored (0 to 5000 m) in the NW Australia (Fromont *et al.*, 2016). Finally, in comparison with other tropical regions that have been studied extensively, such as the Caribbean region for example (Van Soest, 1981; Díaz *et al.*, 2004;

Díaz and Rützler, 2009; Valderrama and Zea, 2013; Rützler *et al.*, 2014; Pérez *et al.*, 2017), Toliara region harbours about half the specific richness, which confirms a little more the potential for new sponges to be inventoried and described in Madagascar and in the western Indian Ocean.

In this Toliara sponge inventory, the class Demospongiae, which contains 82 % of the species recognized today, is naturally the best represented (247 species), with 18 orders out of the 36 recognized (de Voogd *et al.*, 2023). Quite classically as in tropical, subtropical and temperate areas well studied so far (*e.g.* Fromont *et al.*, 2016; Pérez *et al.*, 2017; Grenier *et al.*, 2018; Castellanos-Pérez *et al.*, 2020), Poecilosclerida and Haplosclerida are the two dominant orders displaying the largest number of inventoried species. In contrast, the Calcarea and Homoscleromorpha are the two least represented classes in this inventory. Although these two sponge classes also include the lower numbers of sponge species worldwide, it is believed by these authors that their diversities may be largely underestimated in the Toliara region. Indeed, a better exploration of cryptic habitats, such as underwater caves and reef tunnels, may reveal a greater number of new species, as found in other regions (Pérez *et al.*, 2017; Klautau *et al.*, 2021). In Reunion Island for example, very few explorations of underwater caves resulted in 11 new records of Calcarea, seven of which being new to science (Klautau *et al.*, 2021).

In addition, further investigation of some habitats could significantly increase Toliara's sponge inventory. Indeed, the great variability in species richness observed among habitat types also illustrates a great variability in sampling efforts. In the mangrove, for example, only one species has been recorded, but this environment has been mostly unexplored (Vacelet and Vasseur, 1977). Sponges, on the other hand, are good colonisers of mangrove roots in many places of the world, such as in the Caribbean, where species richness can range from 3 to 147 species (Díaz *et al.*, 2004). The number of sponge species in Toliara's mangrove may thus be greatly underestimated, even if this habitat has recently been significantly reduced in this region, due to the exploitation of mangrove trees for fuel wood and livestock feed (Vasseur, 1997), and because of the Ambondrolava sand spit extending to the north, at an average of 50 m per year (Onjanambo 2018). Furthermore, even in habitats where sampling efforts have been important, such as the outer slopes or reef tunnels of Toliara, Vasseur (1964) did not

rule out the possibility that many sponges have been missed during these past surveys because they were not very visible or were difficult to collect.

After 50 years of increasing environmental pressures, it is likely that significant modifications may be observed in the coastal ecosystems of the Toliara region. Since sponges are excellent bio-indicators (Carballo *et al.*, 1996; Pérez, 2000), several trends could be expected: (i) an increase in sponge biomass related to the coral decline, with a dominance of excavating sponges (Carballo *et al.*, 1996); or (ii) a decrease in sponge biomass and species richness related to pronounced competition between sponges and fleshy algae in degraded shallow habitats (Rützler, 2004); and/or (iii) a decrease in sponge biomass and species richness due to mass mortality events related to sponge diseases (Webster, 2007). In particular, heavy coastal urbanization and increased untreated wastewater discharges may have benefited Clionaidae, a family known for its ability to proliferate by boring calcareous bioconstructions of algae and corals (Rützler, 2012; Schönberg and Wisshak, 2014). Coral reef degradation in Toliara (Bruggemann *et al.*, 2012; Andréfouët *et al.*, 2013) could be another factor favoring Clionaidae development, particularly in shallow areas (lagoon or reef flat). On the other hand, underwater caves are ecosystems that are generally much better preserved from nearshore disturbances (Harmelin *et al.*, 1985). They could therefore be used as "reference ecosystems", being little impacted by the changing pressure regime. Thus, a good characterization of these pressure regimes, from the past to the present, will allow Toliara to become an observatory of anthropic disturbances on marine benthic ecosystems using sponges as bioindicators, thanks to the present updated inventory.

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References

Andréfouët S, Guillaume MMM, Delval A, Rasoamanendrika FMA, Blanchot J, Bruggemann JH (2013) Fifty years of changes in reef flat habitats of the Grand

- Récif of Toliara (SW Madagascar) and the impact of gleaning. *Coral Reefs* 32: 757–768 [doi: 10.1007/s00338-013-1026-0]
- Barnes DKA, Bell JJ (2002) Coastal sponge communities of the West Indian Ocean: taxonomic affinities, richness and diversity. *African Journal of Ecology* 40: 337-349 [doi: 10.1046/j.1365-2028.2002.00387.x]
- Battistini R, Bourrouilh F, Chevalier J-P, Coudray J, Denizot M, Faure G, Fisher J-C, Guilcher A, Harmelin-Vivien M, Jaubert J, Laborel J, Montaggioni L, Masse J-P, Mauge L-A, Peyrot-Clausade M, Pichon M, Plante R, Plaziat J-C, Plessis YB, Richard G, Salvat B, Thomassin BA, Vasseur P, Weydert P (1975) *Éléments de terminologie récifale indopacifique*. *Téthys* 7 (1): 1-111
- Bruggemann JH, Rodier M, Guillaume MMM, Andréfouët S, Arfi R, Cinner JE, Pichon M, Ramahatratra F, Rasoamanendrika F, Zinke J, McClanahan TR (2012) Wicked social-ecological problems forcing unprecedented change on the latitudinal margins of coral reefs: the case of SouthWest Madagascar. *Ecology and Society* 17 (4): 47 [doi: 0.5751/ES-05300-170447]
- Carballo J, Naranjo S, García-Gómez JC (1996) Use of marine sponges as stress indicators in marine ecosystems at Algeciras Bay (southern Iberian Peninsula). *Marine Ecology Progress Series* 135: 109-122 [doi: doi.org/10.3354/meps135109]
- Cárdenas P, Pérez T, Boury-Esnault N (2012) Sponge systematics facing new challenges. In: Becerro MA, Uriz MJ, Maldonado M, Turon X (eds) *Advances in Marine Biology*. Elsevier. pp 79-209 [doi: 10.1016/B978-0-12-387787-1.00010-6]
- Castellanos-Pérez P de J, Vázquez-Maldonado LE, Ávila E, Cruz-Barraza JA, Canales-Delgadillo JC (2020) Diversity of mangrove root-dwelling sponges in a tropical coastal ecosystem in the southern Gulf of Mexico region. *Helgoland Marine Research* 74: 1–9 [doi: 10.1186/s10152-020-00545-6]
- Clausade M, Gravier N, Picard J, Pichon M, Roman M-L, Thomassin B, Vasseur P, Vivien M, Weydert P (1971) Morphologie des récifs coralliens de la région de Tuléar (Madagascar): *Éléments de terminologie récifale*. [Coral reef morphology in the vicinity of Tuléar (Madagascar): Contribution to a coral reef terminology]. *Téthys*, supplément 2: 1-76
- de Goeij JM, van Oevelen D, Vermeij MJA, Osinga R, Middelburg JJ, de Goeij AFPM, Admiraal W (2013) Surviving in a marine desert: the sponge loop retains resources within coral reefs. *Science* 342: 108-110 [doi: 10.1126/science.1241981]
- de Voogd NJ, Alvarez B, Boury-Esnault N, Carballo JL, Cárdenas P, Díaz MC, Dohrmann M, Downey R, Hadju E, Hooper JNA, Kelly M, Klautau M, Manconi R, Morrow CC, Pisera AB, Ríos P, Rützler K, Schönberg C, Vacelet J, Van Soest RWM (2023) *World Porifera Database* [doi:10.14284/359]
- Díaz MC, Rützler K (2001) Sponges: an essential component of the caribbean coral reefs. *Bulletin of Marine Science* 69 (2): 535-546
- Díaz MC, Smith KP, Rützler K (2004) Sponge species richness and abundance as indicators of mangrove epibenthic community health. *Atoll Research Bulletin* 518: 1-17 [doi: 10.5479/si.00775630.518.1]
- Díaz MC, Rützler K (2009) Proceedings of the Smithsonian marine science symposium. In: Lang MA, Macintyre IG, Rützler K (eds) *Smithsonian Contributions to the Marine Sciences*. 529 pp [doi: 10.5479/si.01960768.38.1]
- Fencl A (2005) The role of Malagasy women in community development: analyzing the potential for the creation of a women's association for alternative livelihoods in Ifaty. *Independent Study Project (ISP) Collection* 410. 29 pp
- Fromont J, Abdul Wahab M, Gomez O, Ekins M, Grol M, Hooper J (2016) Patterns of sponge biodiversity in the Pilbara, Northwestern Australia. *Diversity* 8 (4): 1-22 [doi: 10.3390/d8040021]
- George AM, Van Soest RWM, Sluka RD, Lazarus S (2020) A checklist of marine sponges (Porifera) of peninsula India. *Zootaxa* 4885 (2): 277-300 [doi: 10.11646/zootaxa.4885.2.10]
- Grenier M, Ruiz C, Fourt M, Santonja M, Dubois M, Klautau M, Vacelet J, Boury-Esnault N, Pérez T (2018) Sponge inventory of the French Mediterranean waters, with an emphasis on cave-dwelling species. *Zootaxa* 4466 (1): 205-228 [doi: 10.11646/zootaxa.4466.1.16]
- Harmelin J-G, Vacelet J, Vasseur P (1985) Les grottes sous-marines obscures : un milieu extrême et un remarquable biotope refuge. *Téthys* 11 (3-4): 214–229
- Harris A, Manahira G, Sheppard A, Gough C, Sheppard C (2010) Demise of Madagascar's once Great Barrier Reef - Change in coral reef condition over 40 years. *Atoll Research Bulletin* 574: 1-16 [doi: 10.5479/SI.00775630.574.16]
- Holmes KE (1996) The effects of eutrophication on clonoid (Porifera) communities in Barbados, West Indies. PhD thesis, McGill University. 100 pp
- Hooper JNA (1996) A toxic *Biemna* from Madagascar (Demospongiae:Poecilosclerida). In: Willenz P (ed) *Recent advances in sponge biodiversity inventory and documentation*. *Bulletin de l'Institut royal des Sciences naturelles de Belgique*. *Biologie* 66: 123-133

- Klautau M, Lopes MV, Tavares G, Pérez T (2021) Integrative taxonomy of calcareous sponges (Porifera: Calcarea) from Réunion Island, Indian Ocean. *Zoological Journal of the Linnean Society*: 1-55 [doi: 10.1093/zoolinnea/zlab014]
- Lévi C (1956) Spongiaires des côtes de Madagascar. *Mémoires de l'Institut scientifique de Madagascar (A)* 10: 1-23
- Maldonado M, Aguilar R, Bannister RJ, Bell JJ, Conway KW, Dayton PK, Díaz C, Gutt J, Kelly M, Kenchington ELR, Leys SP, Pomponi SA, Rapp HT, Rützler K, Tendal OS, Vacelet J, Young CM (2015) Sponge grounds as key marine habitats: a synthetic review of types, structure, functional roles, and conservation concerns. In: Rossi S, Bramanti L, Gori A, Orejas Saco del Valle C (eds) *Marine Animal Forests*. Springer International Publishing, Cham. pp 1-39 [doi: 10.1007/978-3-319-17001-5_24-1]
- Morrow C, Cárdenas P (2015) Proposal for a revised classification of the Demospongiae (Porifera). *Frontiers in Zoology* 12 (1): 1-27 [doi: 10.1186/s12983-015-0099-8]
- Onjanambo RA (2018) Dynamique récente d'évolution des mangroves de la région de Toliara (Madagascar). PhD thesis, University of Angers; University of Toliara. 310 pp
- Pérez T (2000) Evaluation de la qualité des milieux côtiers par les spongiaires : état de l'art. *Bulletin de la Société Zoologique de France* 125: 17-25
- Pérez T, Díaz M-C, Ruiz C, Cándor-Luján B, Klautau M, Hajdu E, Lobo-Hajdu G, Zea S, Pomponi SA, Thacker RW, Carteron S, Tollu G, Pouget-Cuvelier A, Thélamon P, Marechal J-P, Thomas OP, Ereskovsky AV, Vacelet J, Boury-Esnault N (2017) How a collaborative integrated taxonomic effort has trained new spongiologists and improved knowledge of Martinique Island (French Antilles, eastern Caribbean Sea) marine biodiversity. *PLoS ONE* 12 (3): 1-27 [doi: 10.1371/journal.pone.0173859]
- Pichon M (1978) Recherches sur les peuplements à dominance d'anthozoaires dans les récifs coralliens de Tuléar (Madagascar). *Atoll Research Bulletin*: 1-447 [doi: 10.5479/si.00775630.222.1]
- 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
- Rützler K (2012) The role of sponges in the Mesoamerican Barrier-Reef Ecosystem, Belize. In: Becerro MA, Uriz MJ, Maldonado M, Turon X (eds) *Advances in Marine Biology*. Elsevier. pp 211-271 [doi: 10.1016/b978-0-12-387787-1.00002-7]
- Rützler K, Piantoni C, Van Soest RWM, Díaz MC (2014) Diversity of sponges (Porifera) from cryptic habitats on the Belize barrier reef near Carrie Bow Cay. *Zootaxa* 3805 (1): 1-129 [doi: 10.11646/zootaxa.3805.1.1]
- Samaai T, Kelly M, Ngwakum B, Payne R, Teske PR, Janson L, Kerwath S, Parker D, Gibbons, MJ (2020). New Latrunculiidae (Demospongiae, Poecilosclerida) from the Agulhas ecoregion of temperate southern Africa. *Zootaxa*, 4896 (3): 409-442 [doi: 10.11646/zootaxa.4896.3.4].
- Schönberg CHL, Wisshak M (2014) Marine bioerosion. In: Goffredo S, Dubinsky Z (eds) *The Mediterranean Sea: Its history and present challenges*. Springer, Dordrecht, Netherlands. pp 449-461 [doi: 10.1007/978-94-007-6704-1_26]
- Vacelet J, Vasseur P (1965) Spongiaires des grottes et surplombs des récifs de Tuléar (Madagascar). *Recueil des Travaux de la Station Marine d'Endoume* 2-4: 71-123
- Vacelet J (1967a) Description d'éponges Pharétronides actuelles des tunnels obscurs sous-récifaux de Tuléar (Madagascar). *Recueil des Travaux de la Station Marine d'Endoume, (Fascicule hors-série) Supplément* 6: 37-62
- Vacelet J (1967b) Quelques éponges Pharétronides et 'Silico-calcaires' de grottes sous-marines obscures. *Recueil des Travaux de la Station Marine d'Endoume* 42: 121-132
- Vacelet J, Vasseur P (1971) Éponges des récifs coralliens de Tuléar (Madagascar). *Téthys Supplément* 1: 51-126
- Vacelet J, Vasseur P, Lévi C (1976) Spongiaires de la pente externe des récifs coralliens de Tuléar (Sud-Ouest de Madagascar). *Mémoires du Muséum national d'Histoire naturelle (A, Zoologie)* 49: 1-116
- Vacelet J, Vasseur P (1977) Sponge distribution in coral reefs and related areas in the vicinity of Tuléar (Madagascar). *Proceedings of the Third International Coral Reef Symposium*: 113-117
- Vacelet J (1977) Éponges pharétronides actuelles et sclérosponges de Polynésie française, de Madagascar et de la Réunion. *Bulletin du Muséum national d'Histoire naturelle (3, Zoologie)* 444 (307): 345-368
- Vacelet J (1980) Rôle écologique des éponges marines. In: Jangoux M, Van de Vyver G (eds) *BIOMAR Comptes rendus des Séminaires de biologie marine (1980-1981)*. Presses Universitaires de Bruxelles. pp 100-114
- Valderrama D, Zea S (2013) Annotated checklist of sponges (Porifera) from the Southernmost Caribbean reefs (North-West Gulf of Urabá), with description of new records for the Colombian Caribbean. *Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 37 (144): 353-378
- Van Soest RWM (1981) A checklist of the Curaçao sponges (Porifera Demospongiae) including a pictorial key to

- the more common reef-forms. *Verslagen en Technische Gegevens* 31 (1): 1-39
- Van Soest RWM, Boury-Esnault N, Vacelet J, Dohrmann M, Erpenbeck D, De Voogd NJ, Santodomingo N, Vanhoorne B, Kelly M, Hooper JNA (2012) Global diversity of sponges (Porifera). *PLoS ONE* 7: e35105 [doi: 10.1371/journal.pone.0035105]
- Vasseur P (1964) Contribution à l'étude bionomique des peuplements sciaphiles infralittoraux de substrat dur dans les récifs de Tuléar. *Recueil des Travaux de la Station Marine d'Endoume, (Fascicule hors-série) Supplément 2: 1-77*
- Vasseur P (1997) Écosystèmes côtiers en danger dans la région de Tuléar. Analyse des agressions humaines et problèmes de gestion. In: Talence G (ed) *Milieux et sociétés dans le Sud-Ouest de Madagascar*. Centre de Recherches sur les Espaces Tropicaux, Michel de Montaigne University, Bordeaux 3: 97-120
- Walker R, Fanning E (2003) Anakaofringing reef system : biodiversity and anthropogenic impacts. *Frontier Madagascar Environmental Research report 1*. Society for Environmental Exploration, UK and Institute of Marine Sciences, Toliara, Madagascar. 21 pp
- Webster NS (2007) Sponge disease: a global threat? *Environmental Microbiology* 9 (6): 1363-1375 [doi: 10.1111/j.1462-2920.2007.01303.x]
- Wulff J (2012) Ecological interactions and the distribution, abundance, and diversity of sponges. *Advances in Marine Biology*. Elsevier: 273-344 [doi: 10.1016/B978-0-12-387787-1.00003-9]

Appendix

Supplementary material S1. Revision of species names in the World Porifera Database.

N°	Species	Status	Accepted name
1	<i>Aaptos aaptos</i> (Schmidt, 1864)	inaccurate distribution	<i>Aaptos</i> aff. <i>aaptos</i> (Schmidt, 1864)
2	<i>Acanthella aurantiaca</i> Keller, 1889	genus transfer & junior synonym	<i>Stylissa carteri</i> (Dendy, 1889)
3	<i>Acanthella carteri</i> Dendy, 1889	genus transfer	<i>Stylissa carteri</i> (Dendy, 1889)
4	<i>Acarnus tortilis</i> Topsent, 1892	misapplication	<i>Acarnus bergquistae</i> van Soest, Hooper & Hiemstra, 1991
5	<i>Adocia fragilis</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Haliclona fragilis</i> (Vacelet, Vasseur & Lévi, 1976)
6	<i>Anchinoe clathrodes</i> (Dendy, 1922)	genus transfer	<i>Phorbas clathrodes</i> (Dendy, 1922)
7	<i>Ancorina radix</i> Marenzeller, 1889	inaccurate distribution	<i>Ancorina</i> aff. <i>radix</i> Marenzeller, 1889
8	<i>Ancorina radix</i> var. <i>nanosclera</i> Lévi, 1967	status change	<i>Ancorina nanosclera</i> Lévi, 1967
9	<i>Aplysilla sulfurea</i> Schulze, 1878	inaccurate distribution	<i>Aplysilla</i> aff. <i>sulfurea</i> Schulze, 1878
10	<i>Axinella</i> (<i>Homaxinella</i>) <i>arborescens</i> Ridley & Dendy, 1886	unaccepted	<i>Axinella arborescens</i> Ridley & Dendy, 1886
11	<i>Axinella</i> (<i>Stylissa</i>) <i>donnani</i> (Bowerbank, 1873)	unaccepted	<i>Axinella donnani</i> (Bowerbank, 1873)
12	<i>Axinella carteri</i> (Dendy, 1889)	genus transfer	<i>Stylissa carteri</i> (Dendy, 1889)
13	<i>Axinosa incrustans</i> Burton, 1930	misapplication genus transfer & inaccurate distribution	<i>Scopalina rubra</i> (Vacelet & Vasseur, 1971) <i>Ulosa</i> aff. <i>incrustans</i> (Burton, 1930)
14	<i>Bajalus</i> Lendenfeld, 1885 sp. (undetermined)	junior synonym	<i>Halisarca</i> Johnston, 1842 sp. (undetermined)
15	<i>Bubaris conulosus</i> Vacelet & Vasseur, 1971	agreement in gender	<i>Bubaris conulosa</i> Vacelet & Vasseur, 1971
16	<i>Cacospongia lamellosa</i> (Esper, 1794)	unaccepted	<i>Phyllospongia foliascens</i> (Pallas, 1766)
17	<i>Callipelta cavernicola</i> (Vacelet & Vasseur, 1965)	genus transfer	<i>Sollasipelta cavernicola</i> (Vacelet & Vasseur, 1965)
18	<i>Callipelta mixta</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Sollasipelta mixta</i> (Vacelet, Vasseur & Lévi, 1976)
19	<i>Callipelta ornata</i> Sollas, 1888	genus transfer	<i>Sollasipelta ornata</i> (Sollas, 1888)
20	<i>Callipelta</i> Sollas, 1888 sp. (undetermined)	preoccupied	<i>Sollasipelta</i> Van Soest & Hooper, 2020 sp. (undetermined)
21	<i>Callyspongia subarmigera</i> (Ridley, 1884)	alternate representation (subgenus assignment)	<i>Callyspongia</i> (<i>Cladochalina</i>) <i>subarmigera</i> (Ridley, 1884)
22	<i>Caminus sphaeroconia</i> Sollas, 1886	inaccurate distribution	<i>Caminus</i> aff. <i>sphaeroconia</i> Sollas, 1886
23	<i>Ceraochalina</i> Lendenfeld, 1887 sp. (undetermined)	junior synonym	<i>Callyspongia</i> (<i>Callyspongia</i>) <i>Duchassaing & Michelotti</i> , 1864 sp. (undetermined)
24	<i>Chelonaplysilla noevus</i> (Carter, 1876)	inaccurate distribution	<i>Chelonaplysilla</i> aff. <i>noevus</i> (Carter, 1876)
25	<i>Chondrilla nucula</i> Schmidt, 1862	inaccurate distribution	<i>Chondrilla</i> aff. <i>nucula</i> Schmidt, 1862
26	<i>Chondrillastra australiensis</i> (Carter, 1873)	reverted genus transfer	<i>Chondrilla australiensis</i> Carter, 1873
27	<i>Chondrillastra mixta</i> (Schulze, 1877)	reverted genus transfer	<i>Chondrilla mixta</i> Schulze, 1876
28	<i>Clathria dichela</i> Hentschel, 1912	junior synonym	<i>Clathria</i> (<i>Thalysias</i>) <i>vulpina</i> (Lamarck, 1814)
29	<i>Clathria foliascens</i> Vacelet & Vasseur, 1971	alternate representation (subgenus assignment)	<i>Clathria</i> (<i>Clathria</i>) <i>foliascens</i> Vacelet & Vasseur, 1971
30	<i>Clathria spongodes</i> Dendy, 1922	alternate representation (subgenus assignment)	<i>Clathria</i> (<i>Clathria</i>) <i>spongodes</i> Dendy, 1922
31	<i>Clathria typica</i> (Carter, 1881)	junior synonym	<i>Clathria</i> (<i>Thalysias</i>) <i>cactiformis</i> (Lamarck, 1814)

32	<i>Clathrina darwinii</i> (Haeckel, 1870)	genus transfer	<i>Arturia darwinii</i> (Haeckel, 1870)
33	<i>Clathriopsamma cercidochela</i> Vacelet & Vasseur, 1971	genus transfer	<i>Clathria (Wilsonella) cercidochela</i> (Vacelet & Vasseur, 1971)
34	<i>Cliona lobata</i> Hancock, 1849	inaccurate distribution	<i>Cliona</i> aff. <i>lobata</i> Hancock, 1849
35	<i>Cliona margaritiferae</i> Dendy, 1905	genus transfer	<i>Pione margaritiferae</i> (Dendy, 1905)
36	<i>Cliona schmidtii</i> (Ridley, 1881)	inaccurate distribution	<i>Cliona</i> aff. <i>schmidtii</i> (Ridley, 1881)
37	<i>Cliothesa hancocki</i> (Topsent, 1888)	inaccurate distribution	<i>Cliothesa</i> aff. <i>hancocki</i> (Topsent, 1888)
38	<i>Coelosphaera fucooides</i> (Topsent, 1897)	alternate representation (subgenus assignment)	<i>Coelosphaera (Coelosphaera) fucooides</i> (Topsent, 1897)
39	<i>Cornulum strepsichela</i> Dendy, 1922	genus transfer	<i>Paracornulum strepsichela</i> (Dendy, 1922)
40	<i>Crambe crambe</i> (Schmidt, 1862)	inaccurate distribution	<i>Crambe</i> aff. <i>crambe</i> (Schmidt, 1862)
41	<i>Craniella australiensis</i> (Carter, 1886)	genus transfer	<i>Cinachyrella australiensis</i> Carter, 1886
42	<i>Craniella cranium</i> (Müller, 1776)	inaccurate distribution	<i>Craniella</i> aff. <i>cranium</i> (Müller, 1776)
43	<i>Desmanthus incrustans</i> (Topsent, 1889)	inaccurate distribution	<i>Desmanthus</i> aff. <i>incrustans</i> (Topsent, 1889)
44	<i>Didiscus clavigerus</i> (Kirkpatrick, 1900)	junior synonym	<i>Didiscus aceratus</i> (Ridley & Dendy, 1886)
45	<i>Didiscus styliferus</i> Tsumamal, 1969	adaptation of species name & inaccurate distribution	<i>Didiscus</i> aff. <i>stylifer</i> Tsumamal, 1969
46	<i>Ecionema rotundum</i>	misspelling of species name & junior synonym	<i>Ecionemia acervus</i> Bowerbank, 1862
47	<i>Ecionemia laviniensis</i> Dendy, 1905	genus transfer	<i>Stellettinopsis laviniensis</i> (Dendy, 1905)
48	<i>Gelliodes flagellifera</i> (Ridley & Dendy, 1886)	genus transfer	<i>Haliclona (Flagellia) amirantensis</i> Van Soest, 2017
49	<i>Gellius centrangulatus</i> Sollas, 1902	genus transfer	<i>Haliclona (Halichoclona) centrangulata</i> (Sollas, 1902)
50	<i>Gellius cymiformis</i>	genus transfer & misspelling of species name	<i>Haliclona (Gellius) cymaeformis</i> (Esper, 1806)
51	<i>Gellius petrosioides</i> (Dendy, 1905)	genus transfer	<i>Gelliodes petrosioides</i> Dendy, 1905
52	<i>Gellius ridleyi</i> Hentschel, 1912	genus transfer	<i>Haliclona (Gellius) ridleyi</i> (Hentschel, 1912)
53	<i>Gellius sagittarius</i> Sollas, 1902	genus transfer	<i>Oceanapia sagittaria</i> (Sollas, 1902)
54	<i>Hemectyonilla involuta</i> (Kirkpatrick, 1903)	genus transfer	<i>Aulospongius involutus</i> (Kirkpatrick, 1903)
55	<i>Hexadella racovitzae</i> Topsent, 1896	inaccurate distribution	<i>Hexadella</i> aff. <i>racovitzae</i> Topsent, 1896
56	<i>Hymedesmia mertoni</i> Hentschel, 1912	alternate representation (subgenus assignment)	<i>Hymedesmia (Hymedesmia) mertoni</i> Hentschel, 1912
57	<i>Hymeniacion conulosa</i> (Dendy, 1922)	genus transfer	<i>Stylissa conulosa</i> (Dendy, 1922)
58	<i>Hymeniacion sanguinea</i> (Grant, 1826)	junior synonym & inaccurate distribution	<i>Hymeniacion</i> aff. <i>perlevis</i> (Montagu, 1814)
59	<i>Inflatella dura</i> Vacelet & Vasseur, 1971	genus transfer	<i>Oceanapia dura</i> (Vacelet & Vasseur, 1971)
60	<i>Ircinia (Sarcotragus) ramosa</i> (Keller, 1889)	unaccepted	<i>Ircinia ramosa</i> (Keller, 1889)
61	<i>Ircinia fasciculata</i> var. <i>dendroides</i> (Schmidt, 1862)	status change & inaccurate distribution	<i>Ircinia</i> aff. <i>dendroides</i> (Schmidt, 1862)
62	<i>Ircinia strobilina</i> (Lamarck, 1816)	inaccurate distribution	<i>Ircinia</i> aff. <i>strobilina</i> (Lamarck, 1816)
63	<i>Isops carcinophila</i> Lendenfeld, 1897	unaccepted	<i>Geodia carcinophila</i> (Lendenfeld, 1897)
64	<i>Isops sollasi</i> Lendenfeld, 1888	unaccepted	<i>Geodia sollasi</i> (Lendenfeld, 1888)
65	<i>Isops sphaerulifer</i> Vacelet & Vasseur, 1965	unaccepted	<i>Geodia sphaerulifer</i> (Vacelet & Vasseur, 1965)
66	<i>Jaspis johnstonii</i> (Schmidt, 1862)	inaccurate distribution	<i>Jaspis</i> aff. <i>johnstonii</i> (Schmidt, 1862)
67	<i>Latrunculia globosa</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Diacarnus globosus</i> (Vacelet, Vasseur & Lévi, 1976)
68	<i>Laxosuberites arenosus</i> Vacelet & Vasseur, 1971	genus transfer	<i>Liosina arenosa</i> (Vacelet & Vasseur, 1971)

69	<i>Laxosuberites cruciatus</i> (Dendy, 1905)	genus transfer	<i>Terpios cruciatus</i> (Dendy, 1905)
70	<i>Leucetta primigenia</i> Haeckel, 1872	inaccurate distribution	<i>Leucetta</i> aff. <i>primigenia</i> Haeckel, 1872
71	<i>Lissodendoryx arenaria</i> Burton, 1936	alternate representation (subgenus assignment)	<i>Lissodendoryx (Ectyodoryx) arenaria</i> Burton, 1936
72	<i>Macandrewia cavernicola</i> Vacelet & Vasseur, 1965	genus transfer	<i>Sollasipelta cavernicola</i> (Vacelet & Vasseur, 1965)
73	<i>Macandrewia ornata</i> (Sollas, 1888)	unaccepted	<i>Sollasipelta ornata</i> (Sollas, 1888)
74	<i>Megalopastas nigra</i> (Dendy, 1889)	unaccepted	<i>Spongionella nigra</i> Dendy, 1889
75	<i>Megalopastas retiara</i> Dendy, 1916	genus transfer	<i>Spongionella retiara</i> (Dendy, 1916)
76	<i>Microciona curvichela</i> Vacelet & Vasseur, 1965	genus transfer & subsequent preoccupation	<i>Clathria (Microciona) vacelettia</i> Hooper, 1996
77	<i>Microciona toxifera</i> (Hentschel, 1912)	unaccepted	<i>Clathria (Thalysias) toxifera</i> (Hentschel, 1912)
78	<i>Microciona</i> Bowerbank, 1862 sp. (undetermined)	genus transfer	<i>Clathria (Microciona)</i> Bowerbank, 1862 sp. (undetermined)
79	<i>Mycale (Grapelia) parasitica</i> (Carter, 1885)	misapplication	<i>Mycale (Grapelia) vaceleti</i> Hajdu, 1995
80	<i>Mycale cleistochela</i> Vacelet & Vasseur, 1971	alternate representation (subgenus assignment)	<i>Mycale (Naviculina) cleistochela</i> Vacelet & Vasseur, 1971
81	<i>Mycale crassissima</i> (Dendy, 1905)	alternate representation (subgenus assignment)	<i>Mycale (Aegogropila) crassissima</i> (Dendy, 1905)
82	<i>Mycale grandis</i> Gray, 1867	alternate representation (subgenus transfer)	<i>Mycale (Mycale) grandis</i> Gray, 1867
83	<i>Mycale gravelyi</i> Burton, 1937	alternate representation (subgenus transfer)	<i>Mycale (Mycale) gravelyi</i> Burton, 1937
84	<i>Mycale imperfecta</i> Baer, 1906	alternate representation (subgenus assignment)	<i>Mycale (Arenochalina) imperfecta</i> Baer, 1906
85	<i>Mycale microxea</i> Vacelet, Vasseur & Lévi, 1976	alternate representation (subgenus transfer)	<i>Mycale (Naviculina) microxea</i> Vacelet, Vasseur & Lévi, 1976
86	<i>Mycale sulevoidea</i> (Sollas, 1902)	alternate representation (subgenus assignment)	<i>Mycale (Aegogropila) sulevoidea</i> (Sollas, 1902)
87	<i>Myriastria osculifera</i> Lévi, 1964	unaccepted	<i>Stelletta osculifera</i> (Lévi, 1964)
88	<i>Myrmekioderma granulata</i> (Esper, 1829)	agreement in gender	<i>Myrmekioderma granulatum</i> (Esper, 1829)
89	<i>Neofolitispa dianchora</i> (de Laubenfels, 1935)	genus transfer	<i>Monanchora dianchora</i> de Laubenfels, 1935
90	<i>Neofolitispa unguiculata</i> (Dendy, 1922)	genus transfer	<i>Monanchora unguiculata</i> (Dendy, 1922)
91	<i>Oligoceras cavernosa</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Hyrtios cavernosus</i> (Vacelet, Vasseur & Lévi, 1976)
92	<i>Oscarella lobularis</i> (Schmidt, 1862)	inaccurate distribution	<i>Oscarella</i> aff. <i>lobularis</i> (Schmidt, 1862)
93	<i>Paracornulum atoxa</i> Vacelet, Vasseur & Lévi, 1976	genus transfer & junior synonym	<i>Zyzzya fuliginosa</i> (Carter, 1879)
94	<i>Paracornulum minimum</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Cornulella minima</i> (Vacelet, Vasseur & Lévi, 1976)
95	<i>Paratenaciella microxea</i> Vacelet & Vasseur, 1971	genus transfer	<i>Clathria (Microciona) microxea</i> (Vacelet & Vasseur, 1971)
96	<i>Pellina</i> Schmidt, 1870 sp. (undetermined)	junior synonym	<i>Halichondria (Halichondria)</i> Fleming, 1828 sp. (undetermined)
97	<i>Petrosia densissima</i> Dendy, 1905	alternate representation (subgenus assignment)	<i>Petrosia (Petrosia) densissima</i> Dendy, 1905
98	<i>Petrosia imperforata</i> Thiele, 1899	junior synonym	<i>Petrosia (Petrosia) nigricans</i> Lindgren, 1897
99	<i>Petrosia nigricans</i> Lindgren, 1897	alternate representation (subgenus assignment)	<i>Petrosia (Petrosia) nigricans</i> Lindgren, 1897
100	<i>Petrosia seriata</i> Hentschel, 1912	genus transfer	<i>Neopetrosia seriata</i> (Hentschel, 1912)
101	<i>Petrosia spheroida</i> Tanita, 1967	alternate representation (subgenus assignment)	<i>Petrosia (Petrosia) spheroida</i> Tanita, 1967
102	<i>Petrosia testudinaria</i> (Lamarck, 1815)	genus transfer	<i>Xestospongia testudinaria</i> (Lamarck, 1815)

103	<i>Phyllospongia dendyi</i> Lendenfeld, 1889	genus transfer	<i>Lendenfeldia dendyi</i> (Lendenfeld, 1889)
104	<i>Phyllospongia madagascarensis</i>	misspelling of species name & junior synonym	<i>Phyllospongia papyracea</i> (Esper, 1806)
105	<i>Plakina monolopha</i> Schulze, 1880	inaccurate distribution	<i>Plakina</i> aff. <i>monolopha</i> Schulze, 1880
106	<i>Plakina trilopha</i> Schulze, 1880	inaccurate distribution	<i>Plakina</i> aff. <i>trilopha</i> Schulze, 1880
107	<i>Plakortis simplex</i> Schulze, 1880	inaccurate distribution	<i>Plakortis</i> aff. <i>simplex</i> Schulze, 1880
108	<i>Plumohalichondria gardineri</i> Dendy, 1922	genus transfer	<i>Aulospongius gardineri</i> (Dendy, 1922)
109	<i>Prianos aurantiaca</i> Lévi, 1958	genus transfer	<i>Batzella aurantiaca</i> (Lévi, 1958)
110	<i>Pronax scabida</i> sensu Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Phorbax scabida</i> (sensu Vacelet, Vasseur & Lévi, 1976)
111	<i>Prostylissa fistulosa</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Amorphinopsis fistulosa</i> (Vacelet, Vasseur & Lévi, 1976)
112	<i>Prostylissa foetida</i> (Dendy, 1889)	genus transfer	<i>Amorphinopsis foetida</i> (Dendy, 1889)
113	<i>Psammaphysilla purpurea</i> (Carter, 1880)	genus transfer	<i>Pseudoceratina purpurea</i> (Carter, 1880)
114	<i>Psammascus lamella</i> (Lendenfeld, 1888)	genus transfer	<i>Chondropsis lamella</i> (Lendenfeld, 1888)
115	<i>Pytheas ula</i> (de Laubenfels, 1950)	unaccepted	<i>Crella (Pytheas) ula</i> (de Laubenfels, 1950)
116	<i>Racodiscula incrustans</i> Vacelet & Vasseur, 1971	genus transfer	<i>Kaliapsis incrustans</i> (Vacelet & Vasseur, 1971)
117	<i>Raspaiella tulearensis</i> Vacelet & Vasseur, 1971	genus transfer & junior synonym	<i>Myrmekioderma dendyi</i> (Burton, 1959)
118	<i>Reniera polypoides</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Haliclona polypoides</i> (Vacelet, Vasseur & Lévi, 1976)
119	<i>Reniera viridenigra</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Xestospongia viridenigra</i> (Vacelet, Vasseur & Lévi, 1976)
120	<i>Reniera</i> Schmidt, 1862 sp. (undetermined)	genus transfer	<i>Haliclona (Reniera)</i> Schmidt, 1862 sp. (undetermined)
121	<i>Rhabderemia toxigera</i> Topsent, 1892	inaccurate distribution	<i>Rhabderemia</i> aff. <i>toxigera</i> Topsent, 1892
122	<i>Rhabdoploca topsenti</i> Hentschel, 1912	genus transfer	<i>Cerbaris topsenti</i> (Hentschel, 1912)
123	<i>Rhabdosigna mammillata</i> (Whitelegge, 1907)	genus transfer & inaccurate distribution	<i>Rhabderemia</i> aff. <i>mammillata</i> (Whitelegge, 1907)
124	<i>Rhaphidophlus aculeatus</i> (Ridley, 1884)	unaccepted	<i>Clathria (Thalysias) abietina</i> (Lamarck, 1814)
125	<i>Rhaphidophlus cervicornis</i> Thiele, 1903	genus transfer	<i>Clathria (Thalysias) cervicornis</i> (Thiele, 1903)
126	<i>Rhaphidophlus</i> Ehlers, 1870 sp. (undetermined)	junior synonym	<i>Clathria (Thalysias)</i> Duchassaing & Michelotti, 1864 sp. (undetermined)
127	<i>Rhaphidophlus typica</i> (Lendenfeld, 1888)	genus transfer & junior synonym	<i>Clathria (Thalysias) cactiformis</i> (Lamarck, 1814)
128	<i>Rhizochalina cribrirrhina</i> Vacelet & Vasseur, 1971	genus transfer	<i>Oceanapia cribrirrhina</i> (Vacelet & Vasseur, 1971)
129	<i>Rhizochalina fistulosa</i> (Bowerbank, 1873)	genus transfer	<i>Oceanapia fistulosa</i> (Bowerbank, 1873)
130	<i>Rhizochalina incrustans</i> Barnes & Bell, 2002	misspelling of species name	<i>Oceanapia incrustata</i> (Dendy, 1922)
131	<i>Rhizochalina incrustata</i> (Dendy, 1922)	genus transfer	<i>Oceanapia incrustata</i> (Dendy, 1922)
132	<i>Rhizochalina minuta</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Oceanapia minuta</i> (Vacelet, Vasseur & Lévi, 1976)
133	<i>Rhizochalina mucronata</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Oceanapia mucronata</i> (Vacelet, Vasseur & Lévi, 1976)
134	<i>Rhizochalina polysiphonia</i> (Dendy, 1922)	unaccepted	<i>Oceanapia polysiphonia</i> (Dendy, 1922)
135	<i>Rhizochalina</i> Schmidt, 1870 sp. (undetermined)	junior synonym	<i>Oceanapia</i> Norman, 1869 sp. (undetermined)
136	<i>Scopalina lophyropoda</i> Schmidt, 1862	inaccurate distribution	<i>Scopalina</i> aff. <i>lophyropoda</i> Schmidt, 1862
137	<i>Spirastrella cunctatrix</i> Schmidt, 1868	inaccurate distribution	<i>Spirastrella</i> aff. <i>cunctatrix</i> Schmidt, 1868
138	<i>Spirastrella excentrica</i> Burton, 1931	genus transfer	<i>Spheciospongia excentrica</i> (Burton, 1931)
139	<i>Spirastrella inconstans</i> (Dendy, 1887)	genus transfer	<i>Spheciospongia inconstans</i> (Dendy, 1887)

140	<i>Spirastrella inconstans</i> var. <i>digitata</i> (Dendy, 1887)	genus transfer	<i>Sphaciospongia inconstans</i> var. <i>digitata</i> (Dendy, 1887)
141	<i>Spirastrella poterionides</i> Vacelet & Vasseur, 1971	genus transfer	<i>Sphaciospongia poterionides</i> (Vacelet & Vasseur, 1971)
142	<i>Spirastrella solida</i> Ridley & Dendy, 1886	genus transfer	<i>Sphaciospongia solida</i> (Ridley & Dendy, 1886)
143	<i>Spirastrella vagabunda</i> Ridley, 1884	genus transfer	<i>Sphaciospongia vagabunda</i> (Ridley, 1884)
144	<i>Spongosorites indica</i> Hentschel, 1912	unaccepted	<i>Spongosorites indicus</i> Hentschel, 1912
145	<i>Stoeba extensa</i> Dendy, 1905	genus transfer	<i>Dercitus (Stoeba) extensus</i> (Dendy, 1905)
146	<i>Stoeba</i> Sollas, 1888 sp. (undetermined)	status change	<i>Dercitus (Stoeba) Sollas</i> , 1888 (undetermined)
147	<i>Strongylophora durissima</i> Dendy, 1905	genus transfer	<i>Petrosia (Strongylophora) durissima</i> (Dendy, 1905)
148	<i>Tedania anhelans</i> var. <i>assabensis</i> Keller, 1891	unaccepted	<i>Tedania (Tedania) assabensis</i> Keller, 1891
149	<i>Tedania</i> Gray, 1867 sp. (undetermined)	alternate representation	<i>Tedania (Tedania) Gray</i> , 1867 sp. (undetermined)
150	<i>Tedanione wilsoni</i> Dendy, 1922	genus transfer	<i>Strongylamma wilsoni</i> (Dendy, 1922)
151	<i>Tedaniopsamma arenosa</i> Vacelet & Vasseur, 1971	unaccepted	<i>Strongylamma arenosa</i> (Vacelet & Vasseur, 1971)
152	<i>Terpios granulosa</i> Bergquist, 1967	correction of species name to match gender of genus name	<i>Terpios granulosis</i> Bergquist, 1967
153	<i>Theonella discifera</i> Lendenfeld, 1907	genus transfer	<i>Discodermia discifera</i> (Lendenfeld, 1907)
154	<i>Timea curvistellifera</i> (Dendy, 1905)	genus transfer	<i>Spirastrella curvistellifera</i> (Dendy, 1905)
155	<i>Timea unistellata</i> (Topsent, 1892)	inaccurate distribution	<i>Timea</i> aff. <i>unistellata</i> (Topsent, 1892)
156	<i>Toxadocia microxea</i> Vacelet, Vasseur & Lévi, 1976	genus transfer	<i>Petrosia (Petrosia) microxea</i> (Vacelet, Vasseur & Lévi, 1976)
157	<i>Toxadocia violacea</i> de Laubenfels, 1950	genus transfer & preoccupied	<i>Haliclona (Gellius) laubenfelsi</i> Van Soest & Hooper, 2020
158	<i>Toxochalina robusta</i> Ridley, 1884	genus transfer	<i>Callyspongia (Toxochalina) robusta</i> (Ridley, 1884)
159	<i>Toxochalina robusta</i> var. <i>dendyi</i> Burton, 1931	unaccepted	<i>Callyspongia (Toxochalina) dendyi</i> (Burton, 1931)
160	<i>Toxochalina</i> Ridley, 1884 sp. (undetermined)	genus transfer	<i>Callyspongia (Toxochalina) Ridley</i> , 1884
161	<i>Trachyopsis aplysinoides</i> (Dendy, 1922)	genus transfer	<i>Axinyssa aplysinoides</i> (Dendy, 1922)
162	<i>Trachyopsis halichondrioides</i> Dendy, 1905	genus transfer	<i>Topsentia halichondrioides</i> (Dendy, 1905)
163	<i>Trachyopsis stellettoides</i> Lévi, 1961	genus transfer	<i>Topsentia stellettoides</i> (Lévi, 1961)
164	<i>Ulosa rubra</i> Vacelet & Vasseur, 1971	genus transfer	<i>Scopalina rubra</i> (Vacelet & Vasseur, 1971)
165	<i>Xestospongia exigua</i> (Kirkpatrick, 1900)	genus transfer	<i>Neopetrosia chaliniformis</i> (Thiele, 1899)
166	<i>Zaplethea digonoxea diastra</i> Vacelet & Vasseur, 1965	genus transfer & upgrade to species	<i>Jaspis diastra</i> (Vacelet & Vasseur, 1965)