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Abstract

The inventories of marine species of La Reunion (South West Indian Ocean) are still incomplete for several phylum including the Echinodermata. The present knowledge for the five classes is reported here, in the habitats below (1) and above (2) 50 m depth. The overall diversity for (1) is 136 species and for (2), 48 species. On the whole, as in the broader western Indian Ocean, the Holothuroidea and the Ophiuroidea are the dominant classes. Several new species have been described and many still need further research.

Keywords: sea stars, brittle stars, sea urchins, sea cucumbers, feather stars, SWIO

Introduction

The South West Indian Ocean (SWIO) is recognized as one of the marine biodiversity hotspots in the world, because of high species richness and endemism (Roberts *et al.*, 2002). While fishes and corals have long been well documented from this area, other groups such as Echinoderms needed further attention. Echinoderms are a very distinct five-rayed phylum, very important in marine communities where they play critical roles (Purcell *et al.*, 2016). The five extant classes, namely Asteroidea (sea stars), Ophiuroidea (brittle stars), Echinoidea (sea urchins), Holothuroidea (sea cucumbers) and Crinoidea (feather stars) account for more than 7 000 described species for the world's oceans (Byrne and O' Hara, 2017).

Previous studies had been conducted in several countries or islands of the SWIO region, on one class, as for example for the holothurians (Conand and Muthiga, 2007; Muthiga and Conand, 2014; Conand, 2008; Eriksson *et al.*, 2015; Samyn *et al.*, 2006; Samyn and Tallon, 2005; FAO, 2013), for the ophiuroids (Stohr *et al.*, 2008; Hoareau *et al.*, 2013; Boissin *et al.,* 2016; Boissin *et al.*, 2017), and the asterids (Jangoux and Aziz, 1988; O'Loughlin and McKenzie, 2013). Other studies have focused on the whole phylum in the region (Clark and Rowe, 1971; Rowe and Richmond, 2011), or groups of islands, such as the French programme BIORECIE on the Îles Eparses (or Scattered islands) (Conand *et al.*, 2010; Mulochau *et al,* 2014; Conand *et al.*, 2015).

The current knowledge on the diversity of the Echinoderms from La Reunion are reported in this paper. This young volcanic island (21.115°S and 55.536°E), is situated 800 km east of Madagascar. Its marine biodiversity needs to be evaluated given the increases of natural and man-induced threats on the narrow fringing reefs, and the high density of human population. The Echinoderms have been studied during the last forty years and several publications report the ecology of reef populations for several abundant species of the different classes.

The whole phylum has also been focused on in different programmes conducted during this period, such as BIOTAS (ANR-06-BDIV-002) (Hoareau *et al.* 2013; Boissin *et al.,* 2016; Boissin *et al*., 2017), and BIOLAVE, on the underwater lava flows of the volcano Piton de la Fournaise (Bollard *et al.,* 2013). Recently, the book 'Oursins, Etoiles de mer & autres échinodermes' (2016) has been published in French by the authors of the present paper, with many photos and details. It is important to present this updated inventory to the scientific audience and therefore assist in identifying new species and allow comparisons with other islands or countries in the SWIO.

Methods

The data from the previous publications on the different classes have been gathered and updated.

The first inventory in English is presented here, for the five Echinoderm classes, taking into account the littoral zone, to about 50 m depth, explored by free or scuba diving (1), and deeper zones on the reef-slopes to about 1 000 m (2) which were earlier explored during different cruises by dredging, such as 'MD32' with the 'Marion Dufresne' (1982), and the La Reunion Aquarium team with the 'Explorer' (2011-2014). The species validity has been checked using Miller *et al*. (2017), Stöhr *et al*. (2016) and WoRMS (2018).

Results

Echinoderm diversity

The overall diversity for the Echinoderms of La Reunion is presented in Table 1.

The total number of species presently identified is 184; 4 specimens are identified at the genus level.

The total number of littoral species (1) is 136, while the number of the deep species (2) is 48.

Diversity by classes

Asteroidea diversity

Table 2 presents the list of the Asteroidea collected and/or observed. The forty-six species belong to six orders and sixteen families. A few specimens from the family Ophidiasteridae, *Leiaster* and *Ophidiaster,* remain undetermined.

Twenty-two species are from **littoral zones** (Table 2 (1)) collected on the coral reefs or from other sandy and rocky biotopes, but are mostly from sparse individuals. During the BIOLAVE programme, 6 species where collected, including the recently described *Aquilonastra conandae* (Bollard *et al.,* 2013). An *Anthenoides* aff. *marleyi* has been found very well conserved in the stomach of a tiger shark *Galeocerdo cuvier* caught at 25 m depth; it was probably recently ingested as it was intact, while the other preys were partly digested.

A few species have been studied in more detail:
1) *Acanthaster planci* now *mauritiensis* (see discussion). Following observations by divers, a study was undertaken in 1998 based on the results of an inquiry distributed to volunteers. From the 352 forms returned during two years, the observations by Emeras *et al.* (2004) concluded that: 1) the distribution was mostly on the western coast, with 17% on reef flats, 83% on outer slopes, rarely seen under 20 meters; 2) the population densities were low (less than 4 individuals per 30 minutes dive) and declining from year 2000; 3) the modal size of the individuals was large (40 cm diameter). Only anecdotal observations have been made on the species in La Reunion since that study.

Table 1. Echinodermata from La Réunion. Number of species in each class in the littoral zone (1) and the deeper zone (2). 'Ni' is number of genera with unidentified species.

	No. spp Littoral (1)	Ni spp Littoral	No. spp Deep (2)	Ni spp Deep	Total + Ni
Asteroidea	22	1	24	1	46 +2
Ophiuroidea	38	1	16		54 +1
Echinoidea	34		7		41
Holothuroidea	38	1			38 +1
Crinoidea	4		1		4 +1
Total	136	3	48	1	184 +4

Table 2. Asteroidea from La Réunion.

Order	Family	Species	Depth
Brisingida	Brisingidae	*Brisinga aff. panopla* Fisher, 1906	2
Forcipulatida	Asteriidae	*Coronaster volsellatus* (Sladen, 1889)	1
	Zoroasteridae	*Zoroaster carinatus* Alcock, 1893	2
Notomyotida	Benthopectinidae	*Cheiraster Reunionensis* Jangoux & Aziz, 1988	2
Paxillosida	Astropectinidae	*Astropecten bengalensis* (Döderlein, 1917)	2
		Astropecten exilis Mortensen, 1933	2
		Astropecten granulatus natalensis John, 1948	2
		Astropecten hemprichi Müller & Troschel, 1842	2
		Astropecten leptus H.L. Clark, 1926	2
		Astropecten longibrachius Jangoux & Aziz, 1988	2
		Astropecten polyacanthus (Müller & Troschel, 1842)	1
		Ctenophoraster diploctenius Fisher, 1913	2
		Persephonaster exquisitus Jangoux & Aziz, 1988	2
	Luidiidae	*Luidia avicularia* Fisher, 1913	2
Valvatida	Acanthasterdidae	*Acanthaster brevispinnus* Fisher, 1917	2
		Acanthaster mauritiensis de Loriol, 1885*	1
	Asterinidae	*Aquilonastra conandae* (O'Loughlin & Rowe, 2006)	1
		Aquilonastra richmondi (O'Loughlin & Rowe, 2006)	1
		Aquilonastra samyni (O'Loughlin & Rowe, 2006)	1
		Aquilonastra aff. watersi O'Loughlin & Rowe, 2006	1
	Asteropseidae	*Tegulaster leptalacantha* (H.L. Clark, 1946)	2
		Asteropsis carinifera (Lamarck, 1816)	1
		Valvaster striatus (Lamarck, 1816)	1
	Goniasteridae	*Anthenoides cristatus* (Sladen, 1889)	2
		Anthenoides aff. marleyi Mortensen, 1925	1
		Fromia indica (Perrier, 1869)	1
		Fromia milleporella (Lamarck, 1816)	1
		Fromia monilis (Perrier, 1869)	1
		Mediaster ornatus Fisher, 1906	2
		Ogmaster capella (Müller & Troschel, 1842)	2
		Plinthaster doederleini (Koehler, 1909)	2
		Stellaster equestris (Retzius, 1805)	2
	Leilasteridae	*Leilaster spinulosus* Aziz & Jangoux, 1985	2
	Mithrodiidae	*Mithrodia clavigera* (Lamarck, 1816)	1

Order	Family	Species	Depth
Valvatida	Ophidiasteridae	*Cistina columbiae* (Gray, 1840)	1
		Dactylosaster cylindricus (Lamarck, 1816)	1
		Ferdina flavescens Gray, 1840	1
		Linckia guildingi Gray, 1840	1
		Linckia multifora (Lamarck, 1816)	1
		Nardoa variolata (Retzius, 1805)	1
	Oreasteridae	*Astrosarkus idipi* Mah, 2003	1
		Culcita schmideliana (Retzius, 1805)	1
	Poraniidae	*Marginaster paucispinus* Fisher, 1913	2
Velatida	Pterasteridae	*Calyptraster gracilis* Jangoux & Aziz, 1988	2
		Euretaster cribrosus (von Martens, 1867)	2
		Hymenaster aff. bartschi Fisher, 1916	2

**Acanthaster mauritiensis* replaces *Acanthaster planci* (see text)

2) *Acanthaster brevispinnus* has been observed and filmed in 2001, as a dense population at 40 m depth at the foot of the reef-slope of St Gilles. Despite several dives at the site afterwards, it has not been seen again, suggesting a rapid migration.

3) Several species of Asterinidae have been collected on La Reunion reef flats. A first study was undertaken to determine the modalities of the asexual reproduction by fission and regeneration of an abundant species from the outer reef flat (Kojadinovic *et al.,* 2004) which was later described as *Aquilonastra conandae* (O'Loughlin and Rowe, 2006) and is endemic to the island. These authors identified three other species of *Aquilonastra* from La Reunion also present in the WIO. The sexual reproduction of *Aquilonastra conandae* shows a seasonal gametogenesis with large oocytes suggesting direct development (Ooka *et al.*, 2010).

Half of the species come from **deeper zones** (Table 2 (2)).

Several species were collected during the MD2 cruise in 1982 and identified by Jangoux and Aziz (1988). They described several new species, as *Cheiraster Reunionensis, Astropecten longibrachius, Persephonaster exquisitus, Leilaster spinulosus,* and *Calyptraster gracilis.*

Echinoidea diversity

Table 3 presents the list of the Echinoidea collected and/or observed. The thirty-four species belong to eight orders and sixteen families. Most have been collected in littoral zones on coral reefs and sandy bays (Table 3 (1). During the BIOLAVE programme, 10 species were identified (Bollard *et al.,* 2013).

The biology of some abundant populations important in ecosystem functioning has been studied in detail.
1) *Echinometra mathaei* and *Echinometra mathaei oblonga* present dense populations which play an important role as grazers in the carbonate budget. In La Reunion, they are major eroders on the outer reef flat at one site, with CaCO3= 8kg m-2. Y-1 (Conand *et al.,* 1997b). A further comparison with other sites of different eutrophication levels shows large differences in urchin sizes and densities and therefore in bioerosion rates, and a clear gradient from the back-reef to the outer reef on the non-degraded sites (Conand *et al.,* 1998; Peyrot-Clausade *et al.,* 2000).

2) *Tripneustes gratilla* is one of the most common herbivorous sea urchin on La Reunion reefs with densities up to 5 individuals. m-2 (Naim *et al.,* 1997). It was selected for studying carbon and nitrogen cycling. Its feeding rythms showed two periods of maximum ingestion (before dawn and after sunset) and a minimum near midday (Lison de Loma *et al.,* 1999). Its diet was mainly algae, with a strong selectivity for *Turbinaria ornata* and avoidance for other species, but with differences between sites (Lison de Loma *et al.,* 2002).

Table 3. Echinoidea from La Réunion.

Order	Family	Species	Depth
Cidaroida	Cidaridae	*Eucidaris metularia* (Lamarck, 1816)	1
		Phyllacanthus imperialis (Lamarck, 1816)	1
		Stereocidaris indica Döderlein, 1901	2
		Stylocidaris badia (H.L. Clark, 1925)	2
Echinothurioida	Echinothuriidae	*Asthenosoma marisrrubri* Weinberg and de Ridder 1998 *	1
	Diadematidae	*Astropyga radiata* (Leske, 1778)	1
		Diadema setosum (Leske, 1778)	1
		Diadema savignyi (Michelin, 1845)	1
		Diadema paucispinum (Agassiz, 1863)	1
		Echinothrix calamaris (Pallas, 1774)	1
		Echinothrix diadema (Linnaeus, 1758)	1
		Lissodiadema lorioli Mortensen, 1903	1
Camarodonta	Echinometridae	*Colobocentrotus (Podophora) atratus* (Linnæus, 1758)	1
		Echinometra mathaei (Blainville, 1825)	1
		Echinometra oblonga (Blainville, 1825)	1
		Echinostrephus molaris (Blainville, 1825)	1
		Heterocentrotus mamillatus (Linnaeus, 1758)	1
		Heterocentrotus trigonarius (Lamarck, 1816)	1
		Nudechinus verruculatus (Lütken, 1864)	1
	Toxopneustidae	*Pseudoboletia maculata* Troschel, 1869	1
		Pseudoboletia indiana (Michelin, 1862)	1
		Toxopneustes pilleolus (Lamarck, 1816)	1
		Tripneustes gratilla (Linnæus, 1758)	1
Stomopneustoida	Stomopneustidae	*Stomopneustes variolaris* (Lamarck, 1816)	1
Holasteroida	Calymnidae	*Sternopatagus sibogae* de Meijere, 1904	2
Spatangoida	Brissidae	*Brissopsis luzonica* (Gray, 1851)	1
		Brissus latecarinatus (Leske, 1778)	1
		Metalia dicrana H.L. Clark, 1917	1
		Metalia spatagus (Linnæus, 1758)	1
		Metalia sternalis (Lamarck, 1816)	1
	Loveniidae	*Lovenia elongata* (Gray, 1845)	2
	Maretiidae	*Maretia planulata* (Lamarck, 1816)	1
	Schizasteridae	*Schizaster gibberulus* L. Agassiz & Desor, 1847	1
Echinoneoida	Echinoneidae	*Echinoneus cyclostomus* Leske, 1778	1

Order	Family	Species	Depth
Clypasteroida	Astriclypeidae	*Sculpsitechinus auritus* (Leske, 1778)	2
		Echinodiscus bisperforatus Leske, 1778	1
	Clypasteridae	*Clypeaster reticulatus* (Linnæus, 1758)	1
	Echinocyamidae	*Echinocyamus megapetalus* H.L. Clark, 1914	1
	Laganidae	*Jacksonaster depressum* (L. Agassiz, 1841)	1
		Laganum decagonale (Blainville, 1827)	2
	Periscomidae	*Pericosmus macronesius* Koehler, 1914	2

* *Asthenosoma varium* (Grube 1868) has been replaced by *A. marisrubri* after checking by the authors

3) *Colobocentrotus (Podophora) atratus* dense populations on the wave swept intertidal basaltic rocks (Santos and Flammang, 2008); the annual reproduction is during the warm season but its recruitment in this extreme environment needs more studies (Conand, 2001).

4) A few Echinothuriid *Asthenosoma* were collected, they were first listed as *A. varium* Grube, 1868, but are probably *A. marisrubri* (Weinberg and De Ridder, 1998), a species described as endemic to the Red Sea; one specimen was found at 80m depth near St Gilles, one juvenile came from BIOLAVE; it has also been collected near Madagascar during the MIRIKY cruise. These observations extend its distribution in the WIO significantly.

A few species came from local dredging at depths of over 100 meters (Table 3 (2), but no data from MD32 has yet been published.

Ophiuroidea diversity

Table 4 presents the list of the Ophiuroidea collected and/or observed. The fifty-four species belong to seven orders and thirteen families.

In La Reunion, this class was first been studied by Guille & Ribes (1981) who reported 21 species associated with scleractinian corals from La Saline on the west coast. In 1984, 20 species collected from deep water by the 'Marion Dufresne' cruise in 1982 were reported by Vadon & Guille (1984). The only species in common between these two studies was *Ophiolepis irregularis*. More recently, non-focal sampling and the description of *Ophiocanops multispina* Stöhr, Conand & Boissin, 2008 raised the known fauna to 45 species, 26 of which were recorded from shallow waters (Stöhr *et al.*, 2008). From the BIOLAVE programme, 13 species were identified from 8 genera including juveniles, which made the ophiuroids the more diverse class of echinoderms in Reunion (Bollard *et al.,* 2013). Recently, Boissin *et al.* (2016) presented the results of extensive sampling in shallow water reef ophiuroids and a DNA barcoding study of SWIO brittle-stars revealed that up to 20% of ophiuroid biodiversity might still be unknown (Boissin *et al.*, 2017). The new classification of higher taxa in Ophiuroidea by O'Hara *et al.* (2018) has been followed in this paper. Noticeably, regarding the superorder Ophintegrida, *Ophiopeza* is in a new family Ophiopezidae that belongs together with Ophiocomidae, Ophiodermatidae and Ophiomyxidae to the order Ophiacanthida, suborder Ophiodermatina. Ophiotrichidae, Ophiactidae and Amphiuridae belong to the order Amphilepidida, suborder Gnathophiurina, while Ophionereididae and Ophiolepididae belong to the suborder Ophionereidina. Regarding the superorder, Euryophiurida, Gorgonocephalidae and Euryalidae belong to the order Euryalida, while Ophiuridae belongs to Ophiurida.

The littoral species are presented in Table 4 (1) and the deeper species in Table 4 (2).

Holothuroidea diversity

Table 5 presents the list of the littoral Holothuroidea collected and/or observed. The thirty-eight species belong to four orders and five families. Several specimens from the genera *Holothuria (Stauropora), Stichopus, Leptosynapta* and *Polylectana* are not yet determined to species level.

Several programmes, first supported by The Regional Council of La Reunion (Conand & Mangion, 2002; Conand *et al.,* 2003), then WIOMSA (Conand and Frouin, 2007), BIOLAVE where only 5 species were identified (Bollard *et al.,* 2013), and BIOTAS (Conand *et al.,*

Table 4. Ophiuroidea from La Réunion.

Order	Family	Species	Depth
Euryalida	Euryalidae	*Asterostegus tuberculatus* Mortensen, 1933	2
	Gorgonocephalidae	*Astroboa nuda* (Lyman, 1874)	1
Ophiurida	Ophiuridae	*Amphiophiura bullata convexe* (Lyman, 1878)	2
		Amphiophiura paupera (Koehler, 1897)	2
		Amphiophiura sculptilis (Lyman, 1878)	2
		Anthophiura ingolfi Fasmer, 1930	2
		Ophiomastus platydiscus H.L. Clark, 1939	2
		Ophiophyllum borbonica Vadon & Guille, 1984	2
		Ophioplinthus abyssorum (Lyman, 1883)	2
		Ophiotypa simplex Koehler, 1897	2
		Ophiura aequalis (Lyman, 1878)	2
		Ophiura irrorata (Lyman, 1878)	2
		Ophiura irrorata loveni (Lyman, 1878)	2
		Ophiura kinbergi Ljungman, 1866	2
		Perlophiura profundissima Belyaev & Litvinova, 1972	2
		Uriopha ios Paterson, 1980	2
Amphilepidida	Amphiuridae	*Amphioplus* sp.	1
		Amphipholis squamata (Delle-Chiaje, 1828)	1
		Amphiura crispa Mortensen, 1940	1
	Ophiactidae	*Ophiocentrus aspera* (Koehler, 1905)	2
		Ophiactis lymani Ljungman, 1872	1
		Ophiactis modesta Brock, 1888	1
		Ophiactis picteti (De Loriol, 1893)	1
		Ophiactis quadrispina H.L. Clark, 1915	1
		*Ophiactis savignyi (*Müller & Troschel, 1842)	1
	Ophionereididae	*Ophionereis porrecta* Lyman, 1860 sp1	1
		Ophionereis porrecta Lyman, 1860 sp2	1
	Ophiotrichidae	*Macrophiothrix* aff. *belli* (Döderlein, 1896)	1
		*Macrophiothrix longipeda (*Lamarck, 1816)	1
		Macrophiothrix aff. *paucispina* Hoggett, 1991	1
		Macrophiothrix propinqua (Lyman, 1861)	1
		Macrophiothrix robillardi (De Loriol, 1893)	1
		Ophiothela aff. *danae* Verrill, 1869	1
		Ophiothrix foveolata Marktanner-Turneretscher, 1887	1
		Ophiothrix trilineata trilineata Lütken, 1869	1

Order	Family	Species	Depth
Amphilepidida	Ophiolepididae	*Ophiolepis cincta* Müller & Troschel, 1842 complex sp1	1
		Ophiolepis cincta Müller & Troschel, 1842 complex sp2	1
		Ophiolepis irregularis Brock, 1888	1
		Ophiolepis superba H.L. Clark, 1915	1
		Ophiomusium luetkeni Lyman, 1878	2
		Ophiomusium lymani Wyville-Thomson, 1873	2
		Ophiomusium scalare Lyman, 1878	2
		Ophioplocus imbricatus Müller & Troschel, 1842	1
		Ophiosphalma fimbriatum (Koehler, 1922)	2
		Ophiosphalma planum (Lyman, 1878)	2
Ophiacanthida	Ophiacanthidae	*Ophiacantha funebris* (Koehler, 1930)	2
		Ophiacantha pentagona Koehler, 1897	2
	Ophiomyxidae	*Neoplax ophiodes* Bell, 1884	1
		Ophiocanops multispina Stohr Conand et Boissin, 2008	1
		Ophiomyxa compacta (Koehler, 1905)	2
	Ophiocomidae	*Ophiocoma brevipes* Peters, 1851	1
		Ophiocoma cynthiae Benavides-Serrato & O'Hara, 2008	1
		Ophiocoma dentata Müller & Troschel, 1842	1
		Ophiocoma doederleini De Loriol, 1899	1
		Ophiocoma erinaceus Müller & Troschel, 1842	1
		Ophiocoma krohi Stöhr Boissin & Hoareau, 2013	1
		Ophiocoma pica Müller & Troschel, 1842	1
		Ophiocoma pusilla (Brock, 1888)	1
		Ophiocoma scolopendrina (Lamarck, 1816)	1
		Ophiocomella sexradia (Duncan, 1887)	1
		Ophiopsila pantherina Koehler, 1898	1
	Ophiodermatidae	*Ophiarachnella aff. gorgonia* (Müller & Troschel, 1842)	1
		Ophiarachnella septemspinosa (Müller et Troschel, 1842)	1
		Ophioconis cupida Koehler, 1905	1
	Ophiopezidae	*Ophiopeza fallax fallax* Peters, 1951	1
		Ophiopeza spinosa (Ljungman, 1867)	1

Table 5. Holothuroidea from La Réunion.

Order	Family	Species	Depth
		Actinopyga capillata Rowe & Massin, 2006	1
		Actinopyga aff. *echinites* (Jaeger, 1833)	1
		Actinopyga mauritiana (Quoy & Gaimard, 1834)	1
		Actinopyga aff. *obesa* (Selenka, 1867)	1
		Bohadschia subrubra (Quoy & Gaimard, 1834)	1
		Bohadschia vitiensis (Semper, 1867)	1
		Holothuria (Cystipus) inhabilis Selenka, 1867	1
		Holothuria (Lessonothuria) insignis Ludwig, 1875	1
		Holothuria (Halodeima) atra Jaeger, 1833	1
		Holothuria (Lessonothuria) lineata Ludwig, 1875	1
		Holothuria (Lessonothuria) pardalis Selenka, 1867	1
		Holothuria (Lessonothuria) verrucosa Selenka, 1867	1
		Holothuria (Mertensiothuria) hilla Lesson, 1830	1
Aspidochirotida * othuriida *	Holothuriidae	*Holothuria (Mertensiothuria) leucospilota* (Brandt, 1835)	1
		Holothuria (Microthele) aff. *fuscogilva* Cherbonnier, 1980	1
		Holothuria (Microthele) nobilis (Selenka, 1867)	1
		Holothuria (Platyperona) difficilis Semper, 1868	1
		Holothuria (Semperothuria) cinerascens (Brandt, 1835)	1
		Holothuria (Semperothuria) flavomaculata Semper, 1868	1
		Holothuria (Stauropora) fuscocinerea Jaeger, 1833	1
		Holothuria (Stauropora) pervicax Selenka, 1867	1
		Holothuria (Theelothuria) turriscelsa Cherbonnier, 1980	1
		Holothuria (Thymiosycia) arenicola Semper, 1868	1
		Holothuria (Thymiosycia) impatiens (Forskål, 1775) complex sp.1	1
		Holothuria (Thymiosycia) impatiens (Forskål, 1775) complex sp.2	1
		Labidodemas pertinax (Ludwig, 1875)	1
		Pearsonothuria graeffei (Semper, 1868)	1
		Stichopus chloronotus Brandt, 1835	1
		Stichopus herrmanni Semper, 1868	1
Synallactida *	Stichopodidae	*Stichopus monotuberculatus* (Quoy & Gaimard, 1834)	1
		Stichopus sp	1
		Thelenota ananas (Jaeger, 1833)	1
Apodida	Chiridotidae	*Chiridota stuhlmanni* Lampert, 1896	1
		Polycheira rufescens (Brandt, 1835)	1

Order	Family	Species	Depth
Apodida	Synaptidae	*Euapta godeffroyi* (Semper, 1868)	1
		Opheodesoma grisea (Semper, 1867)	1
		Synapta maculata (Chamisso and Eysenhardt, 1821)	1
Dendrochirotida	Sclerodactylidae	*Afrocucumis africana* (Semper, 1867)	1
		Ohshimella ehrenbergi (Selenka, 1868)	1

* Recent revision by Miller *et al*. 2017

2010) have allowed the biodiversity in La Reunion shallow environments to be recorded. One new species *Actinopyga capillata* has been described from these collections (Rowe and Massin, 2006).

Deeper habitats have not been studied yet.

During recent decades, several studies have also been conducted on the reproductive biology, the ecology and the genetics of several common holothurian species.

The **reproductive biology** has been detailed for several species with dense populations which display seasonal sexual reproduction as well as asexual scission. *Holothuria atra* is the most frequent and abundant Holothuriidae species; the biometry and reproduction have been analyzed at several sites (Conand, 1996; Jaquemet *et al.,*1999; Conand, 2004). *H. leucospilota* is another abundant black littoral species (Conand *et al.,* 1997a; Gaudron *et al.,* 2008).

The **ecological role** through feeding and bioturbation of these two species has been analysed by Mangion *et al.* (2004). The species were more abundant in eutrophic areas where the mixed populations were able to rework 82 kg dry weight.$m^{-2}.Y^{-1}$. *Stichopus chloronotus* is the most frequent and abundant Stichopodidae on La Reunion reefs. The population parameters and the reproductive strategies have been studied (Conand *et al*., 1998; Hoareau and Conand, 2001; Conand *et al.,* 2002.)

The population characteristics of these species and *Actinopyga aff echinites*, another abundant species, have been summarized in view of regional management efforts of their populations (Kohler *et al.,* 2009).

A first inventory of **diversity** had been prepared for the Regional Council (Conand *et al.,* 2003) and more recent programmes have allowed completion of the inventory for the littoral areas (Conand *et al.,* 2010). Small and cryptic species still need more investigation and deeper populations are not known.

The first genetic data have been collected through a collaboration with Australia on the fissiparous species *S. chloronotus* and *H. atra* (Uthicke *et al.,* 2001; Uthicke and Conand, 2005). The barcoding has been undertaken and established for several commercial species (Uthicke *et al.,* 2010); it will be important in the future for international regulations of CITES or other regulations.

Crinoidea diversity

Table 6 presents the list of the **Crinoidea** collected and/or observed. The five species belong to the order Comatulidae and three families.

Table 6. Crinoidea from La Réunion.

Order	Family	Species	Depth
Comatulida	Guillecrinidae	*Guillecrinus Reunionensis* Roux, 1985	2
	Colobometridae	*Cenometra aff.emendatrix madagascarensis* AM Clark, 1972	1
	Mariametridae	*Stephanometra indica* (Smith, 1876)	1
		Lamprometra palmata (Muller, 1841)	1
	Tropiometridae	*Tropiometra aff. carinata* (Lamarck, 1816)	1

The littoral species are not very diverse, with only 4 species from 3 families. During the programme BIOLAVE, 2 of these species were found again on the lava flows (Bollard *et al.,* 2013).

For the deeper species, the MD32 cruise was interesting, as the new species (and new gender and family) *Guillecrinus Réunionensis* was described by Roux (1985) and other specimens are still under study.

Discussion

The different classes show the same proportions as reported by Rowe and Richmond (2011) for the whole WIO, with the dominance of the Holothuroidea and Ophiuroidea. The high diversity of Ophiuroidea comes from many deep species collected during the MD32 cruise. The Holothuroidea, given the increasing commercial value of several species (Conand, 2008), have received much attention, with several local studies in the SWIO. Illegal fisheries, not reported to occur in La Reunion, are an important problem, which needs new tools to be documented and managed (Conand, 2017, 2018). The systematics of the Crinoidea is presently being revised, using integrative taxonomy/morphology coupled with genetics. The Crown-of-Thorns (COT) populations (*Acanthaster*, Asteroidea) deserve special monitoring in the context of climate change and numerous recent outbreaks (Pratchett *et al.,* 2017). The species has previously been reported as *A. planci*, but a recent large-scale study by Haszprunar *et al.* (2017) proposes *A. mauritiensis* de Loriol, 1885 for the WIO. *A. mauritiensis* is therefore used before changes are introduced in the main database WoRMS and Asteroidea (Mah, 2018).

Despite the small size of the reef and deeper habitats of La Reunion, a few new species have been collected and identified: 1 Asteroidea *Aquilonastra conandae*, 1 Holothuroidea *Actinopyga capillata,* 2 littoral Ophiuroidea *Ophiocanops multispina,* and *Ophiocoma krohi*, and several specimens still need further studies.

Many species in each class are new records for La Reunion.

Additional sampling over time in the different habitats will be necessary to follow this diversity and to complete this inventory. Since recent inventories coupled with DNA barcoding in the SWIO have shown that biodiversity might be underestimated in the ophiuroids by 20% (but also in other phyla: e.g. hydroid diversity could be underestimated by two thirds (Boissin *et al.* 2018), further inventories on cryptic habitats and specimens of small size will certainly add to these lists. It is also necessary to conserve and protect these echinoderm species that play such critical ecological roles in coral reefs (Purcell *et al.*, 2016).

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