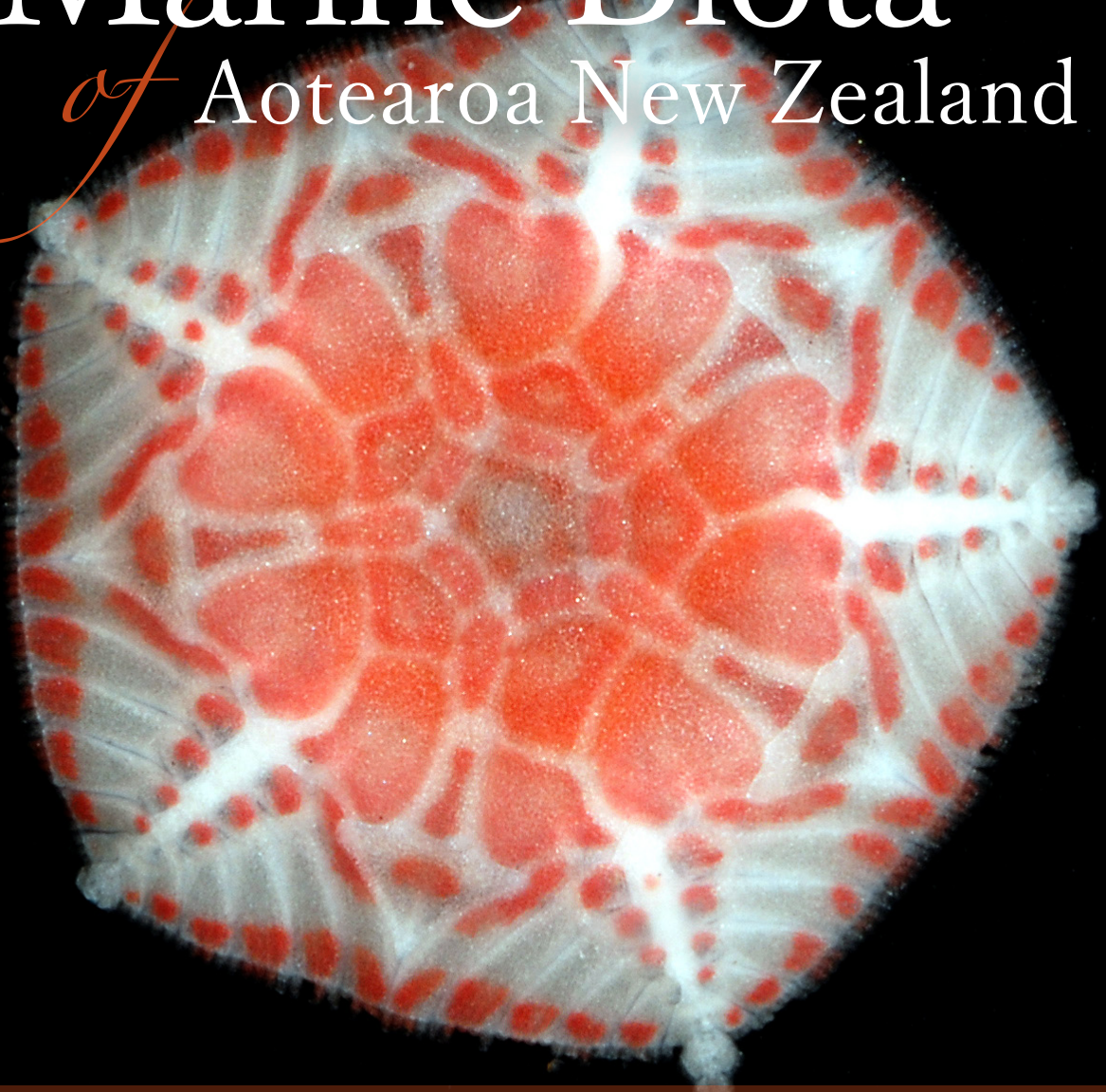
the Marine Biota of Aotearoa New Zealand



Kingdom Animalia, phylum Echinodermata

sea stars, brittle stars, sea lilies, feather stars, sea urchins, & sea cucumbers

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20 Kingdom Animalia, phylum Echinodermata (sea stars, brittle stars, basket stars, snake stars, sea lilies, feather stars, sea urchins & sea cucumbers)

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Summary

The total number of described, and known but undescribed, extant echinoderm species from the Aotearoa New Zealand region to date is 787 (Table 20.1; Fig. 20.1). The New Zealand species totals are 10%, 14%, 10%, 8%, and 6% of the global totals for the echinoderm classes Asteroidea, Ophiuroidea, Echinoidea, Crinoidea, and Holothuroidea, respectively. Since Mah *et al.* (2009) inventoried the echinoderm taxa of New Zealand, there have been: 20 new echinoderm species described; an additional 157 species added to the checklist as new records for the region; and an additional 30 new known but undescribed species added to the checklist for the New Zealand region. Our knowledge of echinoderm diversity in New Zealand waters has advanced over the past two decades, with a more than 24% increase in the number of described species and an almost 50% increase in the number of known but undescribed taxa. The inventory of New Zealand Echinodermata has been updated here and a checklist of extant taxa is included. Apart from one new and one updated record, the fossil checklist compiled by Michael Eagle in Mah et al. (2009) has not been revised and has not been included here. An investment in taxonomic expertise is necessary to continue momentum and formally document the true diversity of Echinodermata in the region.

Introduction

Echinodermata are found in all marine habitats, from intertidal to abyssal depths, from the polar regions to the tropics. There are five classes of extant echinoderms: Asteroidea (sea stars), Ophiuroidea (brittle stars), Crinoidea (feather stars and sea lilies), Echinoidea (sea urchins) and Holothuroidea (sea cucumbers).

Echinodermata means 'spiny skin', a conspicuous feature in many echinoderm species, though not all have obvious spines. The basic body plan of adult echinoderms is composed of pentaradial or five-part symmetry around a calcium carbonate (calcite) skeleton, lacking a head as would be found in a bilateral animal, although they may have light sensing organs. They possess a water vascular system, usually with tube feet, which helps them with breathing, feeding and movement in their habitat. Within the Echinodermata there are filter feeders, deposit feeders, scavengers, and predators. With few exceptions the echinoderms have separate sexes and breed by fertilisation to create an embryo, but the sexes are usually very difficult to tell apart. Echinoderms are mostly preyed upon by fish, crustaceans, other echinoderms, and humans. The most well-known species that make up part of the human diet in New Zealand are the common green sea urchin (kina), *Evechinus chloroticus* (Valenciennes, 1846), and the sea cucumber, *Australostichopus mollis* (Hutton, 1872). Some echinoderms have the remarkable ability to self-regenerate lost body parts. Sea cucumbers are able to eviscerate or spew out their internal organs and regrow a new set, while some sea stars and brittle stars can drop an arm (or several) and regenerate it.

The Asteroidea (known as starfish or sea stars) are perhaps the most familiar group of the Echinodermata. There are over 1900 species known globally, and they occur from the intertidal to great depths. This class comprises eight extant orders, including the Brisingida, Forcipulatida, Notomyotida, Paxillosida, Peripodida, Spinulosida, Valvatida, and Velatida; all of which are found in New Zealand waters except the Notomyotida. Many are star-shaped with a central disc and five arms; however, there are many species with more than five arms. Arms may be long or short and the relationship between the sizes of the disc and the arms can be different between species. The bodies of starfish are made up of calcified plates which are either obvious (like paving) or are partially or totally covered in skin, spines, and granules. Starfish can be distinguished from Ophiuroidea (brittle stars, etc.) by the presence of a canal or furrow on the underside of arms radiating from their mouths. These furrows contain the tube feet which are usually in two or four rows and are involved in locomotion, respiration, and feeding. Most starfish are opportunistic feeders, and this group uses several methods to obtain their food, including active predation and suspension feeding. Although the majority of starfish species are found in deeper waters, intertidal

Table 20.1. Summary of Echinodermata diversity in the Aotearoa New Zealand region, expressed as total numbers and percentage change. Data for 2009 are derived from Mah *et al.* (2009: p. 372, 386). OTU = Operational Taxonomic Unit.

	Asteroidea		Ophiuroidea		Echinoidea		Crinoidea		Holothuroidea		Stylophora		Total		% change
	2009	2023	2009	2023	2009	2023	2009	2023	2009	2023	2009	2023	2009	2023	
Total species diversity	215	235	177	309	172	182	136	129	98	108	1	1	799	964	21
Described extant species	170	188[1]	164	257	91	105	53	49	79	91	0	0	557	690	24
Undescribed extant species (OTU)	18	19[3]	6	45	9	5	14	11	19	17	0	0	66	97	45
Described & undescribed fossil species[4]	27	28	7	7	72	72	69	69	0	0	1	1	176	177	1
Described endemic genera	10	6	2	2	5	6	1	1	0	0	0	0	18	15	–17
Described endemic species	113	69[2]	48	49	33	35	17	16	27	36	0	0	238	205	–14

[1]Includes six species found on New Zealand's extended continental shelf, but not in the EEZ.

[2]Includes one species found in the wider Endemic 2 area as defined by Roberts *et al.* (2015), i.e., occurring between 25° S and 56° 30' S, and 158° E and 170° W.

[3]Includes four species found in the wider Endemic 2 area as defined by Roberts *et al.* (2015).

[4]Fossil species were not assessed in 2023; therefore the 2009 totals have been used, except for the addition of one new fossil Asteroidea, *Paragonaster felli* Stevens, 2020. Note that the 2009 fossil species totals are derived from the fossil checklist itself, as there was a discrepancy between the checklist and table published on page 386 of Mah *et al.* 2009.

species are some of the most well-known taxa and are familiar to rock pool explorers, snorkelers, and scuba divers around New Zealand.

The Ophiuroidea are the largest extant group in the phylum, with over 2,100 species globally, found in all oceans from the intertidal to deep hadal trenches (O'Hara *et al.* 2014; Stöhr *et al.* 2022). They are star-shaped echinoderms with a distinct central disc and five slender arms, though there are some species with six, seven, or even up to, eleven arms. Ophiuroids can be distinguished from Asteroidea by the underside of their arms, which lack a grooved canal. Their tube feet emerge from small tentacle pores in the underside of their arms, which are sometimes covered by calcareous plates (tentacle scales).

The Ophiuroidea comprise six extant orders based on the recent classification by O'Hara *et al.* (2017, 2018): Amphilepidida; Ophioleucida; Ophiacanthida; Ophioscolecida; Ophiurida and Euryalida. The arms of Euryalida (basket stars and snake stars) coil vertically like a monkey tail and both sides of the disc and arms are covered in skin, sometimes with granules or small spines. The arms usually number five at the base, but in basket stars the arms branch several times to form a coiled basket (e.g., McKnight 2000). Basket stars occur in two families, Gorgonocephalidae and Euryalidae, so arm branching has appeared at least twice in the evolution of the order Euryalida (Thuy & Stohr 2018; Turner & O'Neill 2023). Snake stars have unbranched arms and occur in all three currently accepted euryalid families. These animals are quite often associated with corals or sponges that they cling to as a perch to reach up into the water column to catch food. The other five orders are brittle stars with simple, unbranching arms, and individual disc and arm plates that are usually obvious, with a few exceptions. The arm spines can be relatively spiny or smooth, very long, or very short and inconspicuous, and similarly the disc plates can be unadorned, forming a simple rosette pattern, or they can be covered in spines or granules obscuring some, or all, of the plates.

Crinoids are the most ancient of the extant classes of echinoderms. They are split into two groups: stalked crinoids (sea lilies), many of which are permanently attached to rock and live exclusively in the deep sea (> 100 m); and the mobile and more diverse feather stars, which occur in all depths. These groups were once considered taxonomically distinct, but recent research has determined that this is not the case, with the loss of the stalk from the primitive sea lilies having evolved in more than one evolutionary line. The main body of the crinoid is called the crown and consists of a calyx (cup) housing the internal organs and numerous upward-pointing feather-like arms. These arms are composed of many small, jointed segments, used to filter small organic particles from the passing currents. The anus and mouth lie adjacent to each other on the upper surface of the calyx, leaving the underside free to bear the numerous slender jointed cirri used to grip the substrate.

The Echinoidea, commonly known as sea urchins, heart urchins, and sand dollars, are generally circular or oval-shaped echinoderms and come in two main forms: the more or less spherical and radially symmetrical 'regular' echinoids such as the common kina, and the more variable and bilateral symmetrical 'irregular' forms including heart urchins and sand dollars. Regular species usually occur on rocky reefs and harder substrates, while irregular species live almost exclusively on, or within, soft substrates. All New Zealand echinoids are native (i.e., not introduced), but many also occur in Australia and in other parts of the Pacific, while a few species display a worldwide distribution. Although there are over 100 extant echinoid species recorded from New Zealand, many either live deeper than 150 m or are tropical species found only in the far north of the country. Regular echinoids are arranged into 12 orders in which, all species, apart from a few not

present in New Zealand, have a basically spherical body composed of 20 columns of calcium carbonate plates arranged in a tightly articulated skeleton or test, with spines projecting outward. Shape varies among species, with some spherical, and others flattened to a discus-shape. The spines which project from the main body are used mainly for defence, with numerous tube feet used for movement, respiration, feeding, and defence. The five teeth visible on the lower surface are the sharp end of a complex feeding apparatus unique to echinoids called Aristotle's lantern.

Irregular echinoids are also composed of 20 columns of calcium carbonate plates, but they are easily distinguished from regular echinoids by their bilateral symmetry and tendency to live on, or buried in, soft sediment. They are mainly deposit feeders, either ingesting large amounts of sediment rich in organic material and excreting the inorganic component (cassiduloids), or selectively plucking organic particles and transporting them to the mouth with their tube feet via ciliated food-grooves (clypeasteroids) or a funnel to the surface (spatangoids). In most groups, the ambulacral columns (those bearing the tube feet) form distinctive petals, and the spatangoids have bands of ciliated spines (fascioles) which create currents to aid respiration and waste management. The strongly flattened clypeasteroids (sand dollars) have several specialisations including internal buttresses for added strength and much widened ambulacra to accommodate additional tube feet for food collecting and other tasks.

There are seven extant orders of Holothuroidea as reviewed and updated by Miller *et al.* (2017): Apodida; Dendrochirotida; Elasipodida; Holothurida; Molpadida; Persiculida; and Synallactida. The Holothuroidea differ more than superficially from other echinoderms as they do not possess the conspicuous 'spiny skeleton'; their body walls are usually soft or leathery, with only a few species possessing exterior plates. They are generally slow-moving or sedentary, often causing them to be targeted as food by fish and crustaceans. However, toxic compounds in the body wall and a well-known ability to eviscerate (discharge interior organs) and regenerate gives them quite a survival advantage. Their skeleton is made up of microscopic ossicles embedded in the body wall. These ossicles are often unique in shape and are used to distinguish species. Holothuroids have a water vascular system which consists of anterior circum-oral feeding tentacles, which are actually modified tube feet, and also true tube feet (Orders Molpadida and Apodida do not have these). Holothuroids are often common and conspicuous in New Zealand waters, but they live mostly in offshore continental shelf habitats to abyssal depths. *Australostichopus mollis* is common in rockpools in the intertidal zone, and in the shallow subtidal zone.

The first Catalogue of Marine Life for New Zealand was compiled in three volumes (Gordon (Ed.) (2009, 2010, 2012) that was initiated as a project for the global Species 2000 project. Twenty years have passed since the inventory started and over a decade since the Echinodermata chapter was published (Mah *et al.* 2009). Here, we update the inventory of New Zealand echinoderm taxa, and summarise the state of knowledge of this important group. Echinoderms are ubiquitous on the seafloor and key components of ecological and biogeographical studies. Good taxonomic research underpins all such research, and studies on the spiny-skinned stars, urchins, lilies, and cucumbers have marched on a few hundred tiny tube feet.

Status of New Zealand Echinodermata

Summary of extant Echinodermata biodiversity. The total number of described, and known but undescribed, extant marine Echinodermata species from the New Zealand region is 787 (Table 20.1). Of this total, 302 are Ophiuroidea, the most diverse and abundant of the Echinodermata, 207 are Asteroidea, 110 Echinoidea, 60 Crinoidea, and 108 Holothuroidea. The New Zealand species totals are 14%, 10%, 10%, 8%, and 6% of the global totals for Ophiuroidea, Asteroidea, Echinoidea, Crinoidea, and Holothuroidea, respectively. The changes in global numbers of echinoderm species since Mah *et al.* (2009) are mainly due to using more comprehensive sources of data, rather than a true reflection of change in the numbers of species (Table 20.1). World lists of echinoderm taxa are available through data indexed by the Catalogue of Life and via the World Register of Marine Species (WoRMS) (https://www.marinespecies.org/). Since 2000, 20 new Echinodermata species have been described, which, along with the 113 new records for the region, represents a 24% increase in the number of described species known for the New Zealand region. Table 20.2 notes species that have been removed from the checklist since Mah *et al.* (2009) with reasons for their removal. Table 20.3 highlights the taxonomic revisions and name changes to species in the checklist,

Figure 20.1. (*opposite*) Echinoderms from the New Zealand region: **A.** Sea star, *Hippasteria mcknighti* Mah, Neill, Eleaume & Foltz, 2014, Bounty Plateau, 720–741 m, named for New Zealand echinoderm researcher, Don McKnight, scale bar = 1 cm; **B.** The large-toothed pedicellariae of the sea star, *Hippasteria muscipula* Mah, Neill, Eleaume & Foltz, 2014. **C.** Brittle star, *Amphilepis neozelanica* Mills & O'Hara, 2010, northern slope of Chatham Rise, 1404–1414 m, scale bar = 1 mm; **D.** Brittle star, *Ophionereis novaezelandiae* Mortensen, 1936, Bay of Islands, image taken by Peter Marriott, scale bar = 5 mm; **E.** Scanning electron microscope (SEM) image of an ossicle from a sea cucumber species in the genus *Psolidium*; **F.** Sea cucumber, *Psolus antarcticus* (Philippi, 1857), Chatham Rise, 1110–1119 m, image taken by Peter Marriott, scale bar = 4 mm; **G.** Sea urchin, *Araeosoma migratum* Anderson, 2013, Matatara Knoll, Bay of Plenty, 715–740 m, scale bar = 2 cm; **H.** SEM image of a 1.5 mm long valve from a tridentate pedicellaria found in the sea urchin, *Sperosoma nudum* Shigei, 1978. The variability in these minute test-cleaning appendages are important diagnostic features in echinoids. All images reproduced with permission from the original NIWA photographers.

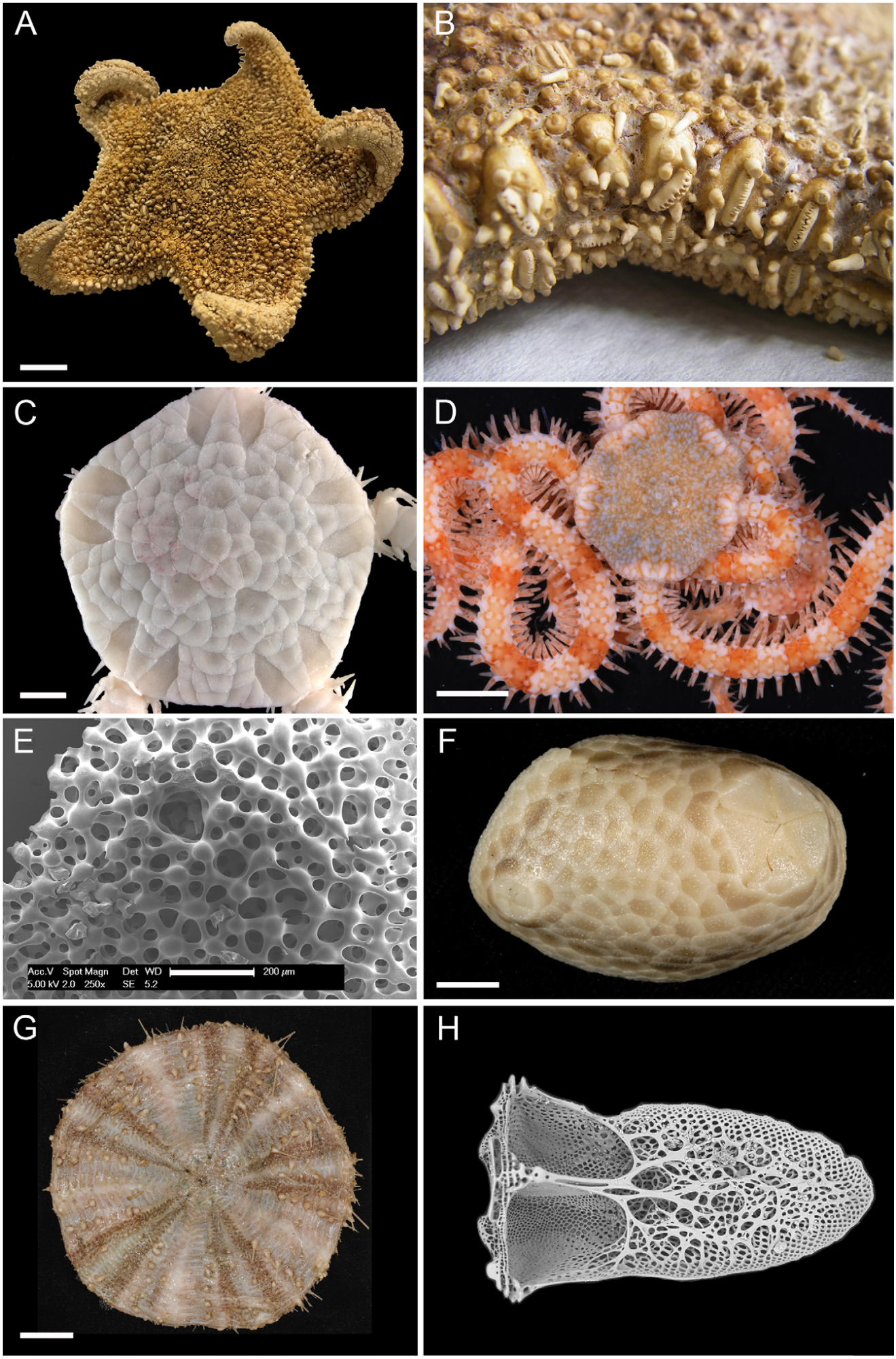
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Table 20.2. Extant species deleted from the New Zealand record. Species cited in Mah *et al.* (2009) that are no longer considered to be valid for the New Zealand region, because they were added in error (as a historical mistake) or because their global taxonomic distribution has been updated, or they require renaming. All are deleted from the New Zealand record.

Taxon name in Mah *et al.* (2009)	Comment & reference
ASTEROIDEA	
Plutonaster sp. B. H.E.S. Clark, 2000	This publication
Hippasteria falklandica Fisher, 1940	This publication: No records in NZ EEZ or ECS
OPHIUROIDEA	
Amphiura (*A.*) *lymani* Studer, 1885	This publication: This species was first described from South Georgia. It has also been recorded from off Norfolk Island, Tasman Sea, and south-eastern Australia (Mortensen 1936; Baker 1979; Rowe & Gates 1995). No records in NZ collections
Ophiozonoida sp. indet.	This publication: No reference to any voucher specimens, not able to reconcile from NZ collection material
Ophioplinthaca chelys (C.W. Thomson, 1877)	This publication: Misidentification of specimen (NIWA 4543) by Don McKnight; Tim O'Hara has re-identified this specimen as *O. bythiaspsis*
CRINOIDEA	
Aplectrophorum sp. [J679]	This publication: No species ever assigned to this genus and not found in WoRMS
Cenolia sp. Améziane pers. comm.	This publication: Not useful in the list, especially with the confusion in *Cenolia*/*Comanthus*
Comanthus parvicirrus (Müller, 1841)	This publication: Norfolk Island only, not from the NZ region
Endoxocrinus (Diplocrinus) alternicirrus (Carpenter, 1882)	This publication: This record could not be located or verified
Saracrinus varians (P. H. Carpenter, 1884)	This publication: This record could not be located or verified
Nanometra clymene AH Clark, 1912	This publication: This record could not be located or verified
Glyptometra tuberosa (Carpenter, 1888)	This publication: This record could not be located or verified
Comatella nigra (Carpenter, 1888)	This publication: Not found in the NZ region
Pentametrocrinus sp. [E880]	This publication: This record could not be located or verified
Cosmiometra dasybrachia HL Clark, 1916	This publication: This record could not be located or verified
Stiremetra spinicirra (Carpenter, 1888)	This publication: This record could not be located or verified
Thalassometra gracilis (Carpenter, 1888)	This publication: This record could not be located or verified
ECHINOIDEA	
Pericosmus McKnight, 1977	This publication: Unsure what specimen this related to
Histocidaris variabilis (A. Agassiz & H.L. Clark, 1907)	This publication: This record could not be located or verified
Pseudechinus grossularia (Studer, 1880)	This publication: This record could not be located or verified
Echinoneus cyclostomus Leske, 1778	This publication: Norfolk Island only, not from the NZ region
Urechinus naresianus A. Agassiz, 1879	This publication: An Atlantic species, no reference to this species being in this region

and Table 20.4 provides a list of species that have been relegated into synonymy since Mah *et al.* (2009).

Ophiuroidea. In 2010, *Amphilepis neozelandica* Mills & O'Hara, 2010 was described. This represented the first record of the family Ampilepididae in New Zealand waters. Two species were resurrected from synonymy after the examination of a large number of samples collected from the New Zealand continental shelf in 2009–2011: the beautiful *Ophionereis novaezelandiae* Mortensen, 1936 (Fig. 20.1D); and the abundant *Ophiacantha otagoensis* Fell, 1958 (Mills & O'Hara 2013). In the same paper, Mills & O'Hara (2013) synonymised *Amphioplus* (*Amphioplus*) *longirima* Fell, 1952 with *Amphiura latisquama* Mortensen, 1924 (Table 20.4), and transferred *Ophiothrix* (*Ophiothrix*) *oliveri* Benham, 1911 to *Macrophiothrix* H.L. Clark, 1938. Other taxonomic revisions of the Ophiuroidea are associated with international work on the group (Table 20.3). This includes a recently described ophiacanthid genus *Ophiosabine* O'Hara & Thuy, 2022 and several New Zealand species, *Ophiacantha rosea* Lyman, 1878, *O. densispina* Mortensen, 1936 and *O. vivipara* Ljungman, 1871, which have been transferred to *Ophiosabine* (O'Hara & Thuy 2022).

Asteroidea. Two new species of *Hippasteria* were described from samples collected by fisheries observers in the southern New Zealand EEZ. One (*Hippasteria mcknighti* Mah, Neill, Eleaume & Foltz, 2014) (Fig. 20.1A) was named after the late Don McKnight, a prolific New Zealand Oceanographic Institute (NZOI)/National Institute of Water and Atmospheric Research (NIWA) echinoderm researcher and publisher. The other had large, distinctive toothed pedicellariae that look like traps of the venus flytrap and resulted in it being named *Hippasteria muscipula* Mah, Neill, Eleaume & Foltz, 2014 (Fig. 20.1B). Muscipula is Latin for 'mouse trap'. Other revisions to the New Zealand fauna have been the result of work based overseas (Tables 20.3, 20.4).

Crinoidea. While no new crinoid species were described during the last 20 years, visits by expert taxonomists led to a number of revisions to the identification of the known fauna. Thus, the identification of a few specimens known otherwise only from beyond New Zealand waters was corrected, resulting in a small decrease in the number of crinoid species known to be present in New Zealand.

Echinoidea. A review of the New Zealand species in the order Echinothurioida (Tam O'Shanters) (Anderson 2013, 2016) provided descriptions of eight new species in three genera, published the first ever *in situ* image of the abyssal echinothurioid *Kamptosoma asterias* (A. Agassiz, 1881) (from 3543 m deep), and reported the rediscovery of *Tromikosoma australe* (Koehler, 1926), not seen since it was first described over 100 years ago. A new species of regular urchin,

Table 20.3. Revised extant species in the New Zealand record. Species cited in Mah *et al.* (2009) that have been revised taxonomically, had their spelling updated, or had nomenclatural changes and updates. Updates follow the World Register of Marine Species (WoRMS) (https://www.marinespecies.org/).

Taxon name in Mah et al. (2009)	Revised name in checklist	Comment & reference for name change
ASTEROIDEA		
Asterostephane moluccana	*Astrostephane moluccana* (Fisher, 1916)	Orthographic
Hymenodiscus sp. A McKnight in press	*Hymenodiscus* sp. A McKnight, 2006	McKnight (2006)
Hymenodiscus sp. B McKnight in press	*Hymenodiscus* sp. B McKnight, 2006	McKnight (2006)
Ceramaster patagonicus australis	*Ceramaster australis* H.E.S. Clark, 2001	Mah (2011)
Ceramaster patagonicus patagonicus	*Ceramaster patagonicus* (Sladen, 1889)	Mah (2011)
Marginaster sp.	*Marginaster* cf. *paucispinus*	McKnight (2006)
Pteraster (*Apterodon*) *bathamae*	*Pteraster bathami* Fell, 1958	Alternate representation
Pteraster (*Apterodon*) *obesus*	*Pteraster obesus* H.L. Clark, 1908	Alternate representation
Pteraster (*Pteraster*) *robertsoni*	*Pteraster robertsoni* McKnight, 1973	Alternate representation
Pteraster (*Retaster*) sp.	*Pteraster* sp. McKnight, 2006	McKnight (2006)
OPHIUROIDEA		
Amphioplus (*Amphioplus*) *ctenacantha*	*Amphiura ctenacantha* (Baker, 1977)	O'Hara & Thuy (2022)
Amphioplus (*Unioplus*) *cipus*	*Amphiura cipa* (Baker, 1977)	O'Hara & Thuy (2022)
Amphioplus (*U.*) *daleus*	*Silax daleus* (Lyman, 1879)	Stöhr & O'Hara (2021)
Amphiodia joubini	*Amphiura* cf. *joubini* (NIWA 31007, O'Hara)	This publication: Antarctic spp., NZ specimen likely new
Amphiura (*A.*) *eugeniae*	*Amphiura latisquama* Mortensen, 1924	Mills & O'Hara (2013)
Ophiactis abyssicola cuspidata	*Ophiactis cuspidata* Lyman, 1879	O'Hara & Thuy (2022)
Ophioplax sp.	*Ophioplax lamellosa* Matsumoto, 1915	This publication: Identification of NZ collections improved
Ophiothrix (*O.*) *oliveri*	*Macrophiothrix oliveri* (Benham, 1911)	Mills & O'Hara (2013)
Renetheo felli	*Ophiocanops felli* (McKnight, 2003)	Stöhr *et al.* (2008)
Ophiacantha rosea	*Ophiosabine rosea* (Lyman, 1878)	O'Hara & Thuy (2022)
Ophiacantha vivipara	*Ophiosabine vivipara* (Ljungman, 1871)	O'Hara & Thuy (2022)
Ophiacantha yaldwyni	*Ophiolebes yaldwyni* (Fell, 1958)	O'Hara & Thuy (2022)
Ophioscolex sp.	*Ophioscolex* sp. MoV 2721	This publication: Improved voucher specimen numbering
Ophiomusium lymani	*Ophiomusa lymani* (Wyville Thomson, 1873)	O'Hara *et al.* (2018)
Ophiomusium scalare	*Ophiomusa scalare* (Lyman, 1878)	O'Hara *et al.* (2018)
Amphiophiura improba	*Amphiophiura* cf. *improba* (NIWA 50497, O'Hara)	This publication: Uncertainty in identification of NZ collection material
Ophiurolepis accomodata	*Ophioplinthus accomodata* (Koehler, 1922)	Martynov & Litvinova (2008)
Ophiurolepis inornata	*Ophioplinthus inornata* (Lyman, 1878)	Martynov & Litvinova (2008)
Ophiura (*O.*) *irrorata irrorata*	*Ophiuroglypha irrorata irrorata* (Lyman, 1878)	O'Hara *et al.* (2018)
Ophiura (*O.*) *rugosa*	*Ophiuroglypha rugosa* (Lyman, 1878)	O'Hara *et al.* (2018)
Stegophiura sterilis	*Stegophiura lapidaria* (Lyman, 1878)	Unpubl. Comb.
Ophiosphalma sp. 1 & 2 indet.	*Ophiosphalma* sp. (NIWA 3489)	This publication: Improved understanding and voucher specimen numbering
Ophiura (*Dictenophiura*) *spinicantha*	*Ophiura spinicantha* McKnight, 2003	McKnight (2003)
Ophiura (*O.*) *kinbergi*	*Ophiura kinbergi* Ljungman, 1866	Alternate representation
Ophiura (*O.*) *micracantha*	*Ophiura micracantha* H.L. Clark, 1911	Alternate representation
Ophiura (*O.*) *ooplax*	*Ophiura ooplax* (H.L. Clark, 1911)	Alternate representation
CRINOIDEA		
Alloeocomatella pectinifera	*Alloeocomatella* sp. (NIWA 93372)	This publication: No sign of this species in NZ collections
Cenolia benhami	*Anneissia benhami* (A.H. Clark, 1916)	Summers *et al.* (2014)
Cenolia ?spanochistum	*Cenolia novaezealandiae* A.H. Clark, 1918	Naughton *et al.* (2014)
Crotalometra? sp.	*Crotalometra magnicirra* (Bell, 1905)	Messing (2022)
ECHINOIDEA		
Orechinus monolini	*Trigonocidaris monolini* A. Agassiz, 1879	Kroh & Mooi (2022)
Poriocidaris purpurata	*Histocidaris purpurata* (Thomson, 1872)	Kroh & Mooi (2022)
Clypeaster (Anomalanthus) tumidus	*Clypeaster tumidus* (Tenison-Woods, 1878)	Kroh & Mooi (2022)
Echinocyamus polyporus	*Mortonia polyporus* (Mortensen, 1921)	Kroh & Mooi (2022)
Laganum depressum	*Jacksonaster depressum* (L. Agassiz, 1841)	Kroh & Mooi (2022)
Araeosoma coriaceum	*Araeosoma bakeri* Anderson, 2013	Anderson (2013)
Hygrosoma lucentulum	*Hygrosoma hoplacantha* (Thomson, 1877)	Anderson (2013)
Tromikosoma sp.	*Tromikosoma australe* (Koehler, 1922)	Anderson (2013)
Urechinus aoteanus	*Plexechinus aoteanus* (McKnight, 1974)	Mooi & David (1996)
Spatangus lutkeni	*Spatangus luetkeni* A. Agassiz, 1872	Kroh & Mooi (2022)
Hemiaster expergitus	*Holanthus expergitus* (Lovén, 1871)	Smith & Kroh (2011)
HOLOTHUROIDEA		
Psolus squamatus	*Psolus segregatus* Perrier, 1905	Davey & Whitfield (2013); WoRMS Editorial Board (2022)
Heteromolpadia joycei	*Heteromolpadia joyceae* Pawson & Vance, 2007	Pawson & Vance (2007) (incorrect spelling in Mah *et al.* (2009))
Mesothuria lactea	*Zygothuria lactea* (Théel, 1886)	WoRMS Editorial Board (2022)
Mesothuria marginata	*Zygothuria marginata* (Sluiter, 1901)	WoRMS Editorial Board (2022)
Mesothuria sp. nov.	*Zygothuria* sp. nov. (NIWA 139145)	This publication

Table 20.4. Synonymised species in the New Zealand record. Species cited in Mah *et al.* (2009) that have been relegated in synonymy.

Taxon name	Relegation in synonymy with	Reference
ASTEROIDEA		
Philonaster sp. H. E. S. Clark, 2001	*Ceramaster*	Fisher (1919)
Ceramaster cognatus	*Ceramaster australis*	Mah (2011)
Cladaster latus	*Cladaster analogus*	Mah (2011)
Crossaster multispinus	*Crossaster penicillatus*	Mah (2023)
Patiriella mortenseni	*Meridiastra mortenseni*	O'Loughlin & Waters (2004)
Nepanthia grangei	*Hyalinothrix grangei*	Mah & Fujita (2020)
Nepanthia reinga	*Pseudonepanthia reinga*	Mah & Fujita (2020)
Rumbleaster eructans	*Sclerasterias eructans*	Mah & Foltz (2011)
OPHIUROIDEA		
Amphioplus (*A.*) *longirima*	*Amphiura latisquama*	Mills & O'Hara (2013)
Ophiocamax rugosa	*Ophiocamax vitrea*	Stöhr *et al.* (2022)
Ophiomoeris projecta	*Ophiomoeris obstricta*	Stöhr *et al.* (2022)
CRINOIDEA		
Comanthus trichoptera benhami	*Anneissia benhami*	Summers *et al.* (2014)
Comatulides dawsoni	*Comissia dawsoni*	Messing (2022)
Comatulides decumatilos	*Comissia decumatilos*	Messing (2022)
Comissia mathesoni	*Anneissia plectrophorum*	Summers *et al.* (2014)
Aglaometra incerta	*Aglaometra valida*	Messing (2022)
ECHINOIDEA		
Phormosoma rigidum	*Phormosoma bursarium*	Anderson (2016)
HOLOTHUROIDEA		
Psolus neozelanicus	*Psolus antarcticus*	Davey & Whitfield (2013)

Tripneustes kermadecensis Bronstein, Kroh, Tautscher, Liggins & Haring, 2017 was recently described from material collected from the Kermadec Islands.

Holothuroidea. A total of 16 species have been added to the species list since 2000. Some were new descriptions and others were just first recorded occurrences in New Zealand waters. This included a systematic review of the Psolidae by Davey & Whitfield (2013). Mah *et al.* (2009) had listed only three species of Psolidae that were of dubious identification. An update of Davey & Whifield's (2013) review of New Zealand Psolidae brings the total number of species up to eight. Four of these *Psolidium* species were new, and the other four were a new occurrence record.

Davey & O'Loughlin (2013) undertook a systematic review of the Caudinidae, which brought the list of Caudinidae in New Zealand waters up to five. This included two new species (*Paracaudina alta* Davey & O'Loughlin, 2013 and *Paracaudina reductia* Davey & O'Loughlin, 2013), one new occurrence record, and one species was raised out of synonymy and the variety elevated to *Hedingia glabra* (Théel, 1886).

A newly described species, *Paradota plentyensis* Davey, 2014, described from New Zealand waters further adds to the biodiversity list since 2009. The remaining additions to the 2009 list were new record occurrences.

Summary of fossil echinoderm biodiversity. The total number of described and undescribed fossil echinoderm species from the New Zealand region has not been assessed since Mah *et al.* (2009), but we know of one new crinoid genus, *Rautangaroa*, established for the Oligocene species, *Cypelometra aotearoa* Eagle, 2007, and a new fossil pseudarchasterid from the Early Cretaceous, *Paragonaster felli* Stevens, 2020. The fossil checklist compiled by Michael Eagle in Mah *et al.* (2009) has not been revised and has not been included here. The total number still stands at 180 taxa (Table 20.1).

Major gains in knowledge of New Zealand Echinodermata

Asteroidea. The number of described and known undescribed species summarised here has increased by 19 from 188 (Mah *et al.* 2009) to 207. Three were newly described species, *Hippasteria mcknighti, H. muscipula* (Mah *et al.* 2014), and *Crossaster taitai* (Mah 2023), with several more apparent new species identified by McKnight (2006). With no asteroid taxonomist in New Zealand, the description of new species, and any changes to taxonomy are reliant on the work of overseas experts, and predominantly has been as a result of work carried out independently by, or collaboratively with, Dr Christopher Mah, a taxonomic expert based at the Smithsonian Institution in the USA. At present, material from several New Zealand species is included in molecular investigations being undertaken by researchers in Europe and Australia, and this work may lead to future discoveries.

Ophiuroidea. Knowledge of ophiuroid diversity in New Zealand has greatly improved over this period due to the work of Dr Tim O'Hara, who has spent time visiting both NIWA and Te Papa collections identifying a large proportion of samples collected from the region, collecting tissue samples for genetic studies, and training Sadie Mills in the taxonomy of the group resulting in several collaborative publications (Mills & O'Hara 2010; 2013; O'Hara *et al.* 2012). O'Hara has identified 45 undescribed morphospecies of ophiuroids from the region (unpubl. NIWA database records, see checklist). Through next generation molecular techniques, the arrangement of the higher taxonomy of the Ophiuroidea has been completely revised in a landmark phylogeny (O'Hara *et al.* 2017). A new classification has been developed for order and family levels (O'Hara *et al.* 2018), and a new interactive key of the brittle star families with revised morphological descriptions has recently been developed (Goharimanesh *et al.* 2021).

Echinoidea. There have been 15 echinoid species added to the New Zealand fauna listed in Mah *et al.* (2009). These include eight newly described echinothurioid species and one toxopneustid. The remaining six species were known from the region but not listed in Mah *et al.* (2009). Other than this, little taxonomic work on New Zealand echinoids has been carried out in recent years.

Crinoidea. Reassessment of the New Zealand crinoid fauna, in particular by Marc Eleaume of

Muséum national d'Histoire naturelle in Paris, has substantially improved the taxonomic status of the specimens in the only major collection in the country (the NIWA Invertebrate Collection, NIC), but no new species have been described since the last review.

Holothuroidea. There have been two new records of genera in New Zealand waters since Mah *et al.* (2009): *Paradota* and *Psolidium*. There have also been other occurrences or first records of genera that have not been published elsewhere, which include *Prototrochus* sp., *Labidoplax* sp., and *Gephyrothuria* sp. (N. Davey, pers. comm. 2021).

Endemism. All new holothuroid and ophiuroid species described since 2009 (plus most of the echinoid species) are endemic, but no new endemic genera have been described.

Invasive species. There are no known invasive echinoderms in New Zealand, although there is a risk posed by the Northern Pacific sea star, *Asterias amurensis* Lutken, 1871, which has spread to parts of Australia and could establish in our temperate waters, should they arrive here (Ministry for Primary Industries 2020). The Australian echinoid *Centrostephanus rodgersii* (A. Agassiz, 1864) is thought to have arrived in New Zealand naturally in the 1960s (Choat & Schiel 1982), spreading from the Bay of Islands to shallow waters in other northern localities on the mainland to as far south as East Cape (Kerr 2016). This species is likely to increase in density and spread southwards as water temperatures continue to rise.

Ecological importance & biological associations. The Echinodermata are well represented in most marine environments and the study of their systematics is crucial to understanding of ecology and ecosystems, particularly in the deep sea where the fauna is less well known. The echinoderms include species that are commercially valuable (e.g., echinoids and holothuroids), and species (i.e., basket and snake stars and cidaroid urchins) that are vulnerable marine ecosystem indicator species that trigger 'move on' fishing rules for the high seas (South Pacific Regional Fisheries Management Organisation (SPRFMO) and Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)) fishing vessels (Parker *et al.* 2010). Echinoderm diversity data are regularly incorporated into biodiversity, biosecurity, conservation planning and modelling research projects (e.g., Clark *et al.* 2019; O'Hara *et al.* 2011; Woolley *et al.* 2016).

Relevant to the Asteroidea is the recent report by Hewson *et al.* (2019), who have reported recent signs of unidentified wasting symptoms in New Zealand species, including *Stichaster australis* (Verrill, 1871) and *Patiriella regularis* (Verrill, 1867). These could be indicative of potentially significant wasting events that have occurred in other parts of the world over recent years (Hewson *et al.* 2014). In order to anticipate such events, more observation and understanding of baseline species and understanding of their diversity and ecology is desirable.

For holothuroids, co-culture is also an ongoing area of research as aquaculture grows and ocean space is sought after. Growing sea cucumbers under existing marine farms provides a clean-up aspect (bioturbation), as well as providing a secondary species for food (*Australostichopus mollis*) (Zamora *et al.* 2014). Holothuroids are also important to study systematically as they are a dominant part of the bioturbation of the ocean floor, are harvested for food (fisheries and coculture), and are incorporated into biodiversity, biosecurity, and modelling research projects.

An issue of increasing concern for coastal ecosystems and recreational fisheries is an increase in sea urchin "barrens", areas of shallow rocky substrate where macroalgae densities have decreased and densities of kina (*Evechinus chloroticus*) have increased such that broad areas of seafloor in many areas of New Zealand are now denuded of algae and dominated by kina (Shears & Babcock 2003), with a marked decrease in overall biodiversity. The reasons for this are likely to include a decrease in the natural predators of kina (especially snapper and rock lobster), and deterioration of environmental conditions (turbidity, sedimentation, water temperature increases) affecting algae growth. Research on this topic is ongoing.

Fossil fauna. Michael Eagle in Mah *et al.* (2009), provided a comprehensive summary of the status of our knowledge of the fossil echinoderm fauna of New Zealand. While no attempt has been made to revise Eagle's work, a literature search revealed the establishment of a new genus for the Oligocene crinoid species, *Cypelometra aotearoa* (*Rautangaroa*), and a new fossil pseudarchasterid from the Early Cretaceous was described: *Paragonaster felli*

Knowledge gaps, research progress and future priorities

There was good progress in descriptions of Echinodermata up to 2015. After that, the number of descriptions has dropped considerably. This reflects funding availability and paucity of researchers employed full-time to work on these groups. There is a large backlog of taxonomic description work to be completed on the 97 known but undescribed echinoderms (45 Ophiuroidea, 19 Asteroidea, 17 Holothuroidea, 11 Crinoidea and 5 Echinoidea), which represents a 47% increase since 2000. Additional material will be required in order to achieve this for some species, especially those known from single specimens and those that are often heavily damaged on capture. We rely heavily on the continued collection of specimens from commercial fishery by-catch and dwindling research survey sampling to provide us with more material.

Echinoderm systematics and genetic analysis based solely on New Zealand taxa are rarely funded, but New Zealand species are still incorporated into global

distribution and systematic studies (e.g., Mah *et al.* 2014; Mah 2015; O'Hara *et al.* 2017, 2018; Mah & Fujita 2020). As the deep sea continues to be explored further from land and at greater depths, other new species are likely to be discovered; their formal description will rely on the future availability of appropriately trained and funded experts – a rapidly diminishing resource in New Zealand.

New Zealand has no full-time, professional, Echinodermata taxonomist, hence any advances in the current state of our knowledge is considered positive. Four NIWA staff (Anderson, Davey, Mills and Neill) work part-time on small identification projects that come their way, and any further taxonomic work by these researchers is usually voluntary. Over the last 20 years, newly collected research or fisheries trawl survey specimens have been identified, but deeper investigation into the taxonomy of interesting specimens has not been possible with a large backlog of known, but undescribed, taxa awaiting description. Some groups have had international attention and descriptions made by overseas taxonomists.

The primary impediments to knowledge expansion are funding the training of additional taxonomists, particularly those with expertise in molecular research. There is an ongoing need for taxonomists to identify specimens from images as surveys turn to these less destructive sampling methods. This can be particularly difficult for species requiring microscopy for identification, such as ossicles for Holothuroidea, and minute disc, mouth and arm features on other echinoderm orders that are not visible from seafloor images.

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Checklist of extant Echinodermata known from the New Zealand EEZ

The checklist is arranged according to the currently accepted systematics and classificatory scheme of Kroh & Mooi (2022), Mah (2022), Messing (2022), Stöhr *et al*. (2022) and the World Register of Marine Species, Echinodermata (https://www.marinespecies.org/aphia.php?p=taxdetails&id=1806). More than two taxonomic authorities have been abbreviated to 'first author *et al.*' in the checklist. Endemic taxa are indicated by 'E' for those found within the New Zealand EEZ, or 'E2' for taxa endemic to the wider New Zealand region encompassing the New Zealand EEZ and surrounding international waters. Non-indigenous species are indicated by 'NI'. All other taxa are considered native by default, i.e., naturally occurring in New Zealand and elsewhere. MoV = Museums Victoria undescribed taxon reference number.

Phylum ECHINODERMATA
Subphylum ASTEROZOA
Class ASTEROIDEA
Order BRISINGIDA
Family BRISINGIDAE
Astrostephane moluccana Fisher, 1916
Brisinga chathamica (McKnight, 1973) E
Brisinga tasmani H.E.S. Clark, 1970 E
Hymenodiscus aotearoa (McKnight, 1973)
Hymenodiscus sp. A McKnight, 2006
Hymenodiscus sp. B McKnight, 2006
Hymenodiscus sp. C McKnight, 2006
Novodinia novaezealandiae (H.E.S. Clark, 1962)
Stegnobrisinga/Astrolirus sp. H.E.S. Clark, 1970 E
Family FREYELLIDAE
Freyastera mortenseni (Madsen, 1956) E
Freyella echinata Sladen, 1889
Freyellaster polycnema (Sladen, 1889)

Order FORCIPULATIDA
Family ASTERIIDAE
Anasterias laevigata (Hutton, 1879) E
Anasterias suteri (de Loriol, 1894) E
Astrostole rodolphi (Perrier, 1875)
Astrostole scabra (Hutton, 1872)
Coronaster halicepus Fisher, 1917
Coronaster reticulatus (H.L. Clark, 1916)
Coscinasterias muricata Verrill, 1867
Perissasterias monacantha McKnight, 1973
Psalidaster fisheri McKnight, 2006 E
Sclerasterias eructans McKnight, 2006
Sclerasterias mollis (Hutton, 1872) E2
Stolasterias "*edmondi*" Benham, 1911 E
Taranuiaster novaezealandiae McKnight, 1973 E
Family PEDICELLASTERIDAE
Hydrasterias sacculata McKnight, 2006
Hydrasterias tasmanica McKnight, 2006 E
Family STICHASTERIDAE
Allostichaster farquhari McKnight, 2006
Allostichaster insignis (Farquhar, 1895) E
Allostichaster polyplax (Müller & Troschel, 1844)
Cosmasterias dyscrita H.L. Clark, 1916
Cosmasterias sp. 2 (NIWA 2369)
Pseudechinaster rubens H.E.S. Clark, 1962 E
Smilasterias actinata McKnight, 2006
Smilasterias clarkailsa O'Loughlin & O'Hara, 1990
Stichaster australis (Verrill, 1871) E
Family ZOROASTERIDAE
Zoroaster alternicanthus McKnight, 2006
Zoroaster carinatus Alcock, 1893
Zoroaster planus Alcock, 1893
Zoroaster singletoni McKnight, 2006
Zoroaster spinulosus Fisher, 1906
Zoroaster sp. McKnight, 2006 E
Zoroaster variacanthus McKnight, 2006 E

Order PAXILLOSIDA
Family ASTROPECTINIDAE
Astromesites compactus Fisher, 1913
Astromesites primigenius (Mortensen, 1925) E
Astromesites regis H.E.S. Clark, 2000 E
Astropecten dubiosus Mortensen, 1925 E
Astropecten polyacanthus Müller & Troschel, 1842
Astropecten tasmanicus H.E.S. Clark, 2000 E
Astropecten sp. H.E.S. Clark, 2000 E
Dipsacaster magnificus (H.L. Clark, 1916)
Dytaster felli H.E.S. Clark, 2000 E
Dytaster pedicellaris H.E.S. Clark, 2000
Patagiaster granulatus McKnight, 2006 E
Plutonaster complexus H.E.S. Clark, 2000
Plutonaster fragilis H.E.S. Clark, 1970
Plutonaster hikurangi H.E.S. Clark, 2000 E
Plutonaster jonathani H.E.S. Clark, 2000
Plutonaster knoxi Fell, 1958
Proserpinaster neozelanicus (Mortensen, 1925)
Proserpinaster? sp. H.E.S. Clark, 2000 E
Psilaster acuminatus Sladen, 1889
Family BENTHOPECTINIDAE
Benthopecten munidae H.E.S. Clark, 1969
Benthopecten pentacanthus Fell, 1958 E
Benthopecten pikei H.E.S. Clark, 1969
Cheiraster (*Cheiraster*) *ludwigi* Fisher, 1913
Cheiraster (*Cheiraster*) *otagoensis* McKnight, 1973
Cheiraster (*Cheiraster*) *triplacanthus* Fisher, 1913
Cheiraster monopedicellaris McKnight, 1973
Cheiraster richardsoni Fell, 1958
Cheiraster subtuberculatus (Sladen, 1889)
Cheiraster (*Luidiaster*) sp. McKnight, 2000
Pectinaster mimicus (Sladen, 1889)
Family LUIDIIDAE
Luidia hardwicki (Gray, 1840)
Luidia maculata Müller & Troschel, 1842
Luidia neozelanica Mortensen, 1925
Luidia prionota Fisher, 1914
Family PORCELLANASTERIDAE
Damnaster tasmani H.E.S. Clark & McKnight, 1994

Eremicaster crassus (Sladen, 1883)
Eremicaster vicinus (Ludwig, 1907)
Hyphalaster inermis Sladen, 1883
Porcellanaster ceruleus Wyville Thomson, 1877
Styracaster chuni Ludwig, 1907
Styracaster horridus Sladen, 1883
Family PSEUDARCHASTERIDAE
Paragonaster ridgwayi McKnight, 1973
Paragonaster stenostichus Fisher, 1913
Pseudarchaster garricki Fell, 1958
Pseudarchaster jordani Fisher, 1906
Pseudarchaster macdougalli McKnight, 1973 E
Family RADIASTERIDAE
Radiaster gracilis (H.L. Clark, 1916)
Radiaster rowei H.E.S. Clark, 2000 E

Order PERIPODIDA
Family XYLOPLACIDAE
Xyloplax medusiformis Baker, Rowe & Clark, 1986 E

Order SPINULOSIDA
Family ECHINASTERIDAE
Echinaster farquhari Benham, 1909
Henricia aucklandiae Mortensen, 1925 E
Henricia compacta (Sladen, 1889)
Henricia kapalae Rowe & Albertson, 1987
Henricia lukinsii (Farquhar, 1898) E
Henricia obesa (Sladen, 1889)
Henricia ralphae Fell, 1952 E
Henricia studeri (Perrier, 1891)
Henricia sufflata (Sladen, 1889)
Odontohenricia anarea O'Hara, 1998
Odontohenricia endeavouri Rowe & Albertson, 1988

Order VALVATIDA
Family ACANTHASTERIDAE
Acanthaster planci (Linnaeus, 1758)
Family ASTERINIDAE
Anseropoda aotearoa McKnight, 1973
Hyalinothrix grangei (Clark & McKnight, 2001)
Hyalinothrix millespina Fisher, 1911
Knightaster bakeri H.E.S. Clark, 1972 E
Meridiastra mortenseni (O'Loughlin, Waters & Roy, 2002) E
Paranepanthia aucklandensis (Koehler, 1920) E
Parvulastra exigua (Lamarck, 1816)
Patiriella oliveri (Benham, 1911)
Patiriella regularis (Verrill, 1867)
Pseudonepanthia reinga (McKnight, 2001) E
Stegnaster inflatus (Hutton, 1872) E
Tarachaster australis McKnight, 1973 E
Tremaster mirabilis Jangoux, 1982
Family ASTERODISCIDIDAE
Asterodiscides grayi Rowe, 1977
Asterodiscides truncatus (Coleman, 1911
Family ASTEROPSEIDAE
Asteropsis carinifera (Lamarck, 1816)
Petricia imperialis (Farquhar, 1897) E
Petricia vernicina (Lamarck, 1816)
Family GONIASTERIDAE
Anthenoides cristatus (Sladen, 1889)
Anthenoides epixanthus (Fisher, 1906)
Anthenoides granulosus Fisher, 1913
Astroceramus denticulatus McKnight, 2006 E
Astropatricia marita McKnight, 2006 E
Calliaster thompsonae H.E.S. Clark, 2001
Calliaster wanganellensis H.E.S. Clark, 1982
Calliaster sp. McKnight, 2006 E
Ceramaster australis H.E.S. Clark, 2001
Ceramaster glasbyi McKnight, 1993
Ceramaster patagonicus (Sladen, 1889)
Ceramaster sp. A McKnight, 2006 E
Ceramaster sp. B McKnight, 2006
Circeaster sp. nov. (NIWA 15472; det. K. Neill & C. Mah) E
Cladaster analogus Fisher, 1940
Eknomiaster macauleyensis H.E.S. Clark, 2001
Enigmaster scalaris McKnight & H.E.S. Clark, 1996 E
Evoplosoma tasmanica (McKnight, 2006)
Gilbertaster anacanthus Fisher, 1906
Hippasteria mcknighti Mah, Neill, Eleaume & Foltz, 2014
Hippasteria muscipula Mah, Neill, Eleaume & Foltz, 2014
Hippasteria phrygiana (Parelius, 1768)
Kermitaster pacificus H.E.S. Clark, 2001
Lithosoma novaezealandiae McKnight, 1973 E
Mediaster arcuatus (Sladen, 1889)
Mediaster australiensis H.L. Clark, 1916
Mediaster gartrelli H.E.S. Clark, 2001 E
Mediaster sladeni Benham, 1909
Mediaster sp. McKnight, 2006 E
Nectria pedicelligera Mortensen, 1925
Pentagonaster pulchellus Gray, 1840
Pillsburiaster aoteanus McKnight, 1973
Pillsburiaster indutilis McKnight, 2006 E
Pillsburiaster maini McKnight, 1973 E
Pillsburiaster sp. H.E.S. Clark, 2001 E
Plinthaster dentatus (Perrier, 1884)
Pseudoceramaster hunti McKnight, 1993 E
Rosaster endilius McKnight, 1975
Rosaster mimicus Fisher, 1913
Sphaeriodiscus irritatus H.E.S. Clark, 2001
Sphaeriodiscus maui McKnight, 1973
Family LEILASTERIDAE
Leilaster spinulosus Aziz & Jangoux, 1985
Family ODONTASTERIDAE
Diabocilla clarki McKnight, 2006
Diplodontias dilatatus (Perrier, 1875) E
Diplodontias miliaris (Gray, 1847) E
Diplodontias robustus (Fell, 1953) E
Eurygonias hyalacanthus Farquhar, 1913 E
Hoplaster kupe McKnight, 1973
Odontaster aucklandensis McKnight, 1973 E
Odontaster benhami Mortensen, 1925
Odontaster penicillatus (Philippi, 1870)
Odontaster rosagemmae McKnight, 2001 E
Family OPHIDIASTERIDAE
Dissogenes petersi Jangoux, 1981
Heteronardoa carinata (Koehler, 1910)
Leiaster speciosus von Martens, 1866
Linckia guildingi Gray, 1840
Ophidiaster kermadecensis Benham, 1911 E
Ophidiaster macknighti H.E.S. Clark, 1962
Tamaria tenella (Fisher, 1906)
Family OREASTERIDAE
Acheronaster tumidus H.E.S. Clark, 1982
Family PODOSPHAERASTERIDAE
Podosphaeraster somnambulator McKnight, 2006 E
Family PORANIIDAE
Marginaster cf. *paucispinus* (NIWA 26671) E
Marginaster patriciae McKnight, 2006
Family SOLASTERIDAE
Crossaster cambellicus McKnight, 1973
Crossaster penicillatus Sladen, 1889
Crossaster taitai Mah, 2023
Lophaster suluensis Fisher, 1913
Paralophaster hyalinus H.E.S. Clark, 1970
Solaster torulatus Sladen, 1889

Order VELATIDA
Family CAYMANOSTELLIDAE
Caymanostella phorcynis Rowe, 1989
Family KORETHRASTERIDAE
Peribolaster lictor Fell, 1958 E
Family MYXASTERIDAE
Asthenactis australis McKnight, 2006
Myxaster sp. nov. (NIWA 33407; det. C. Mah)
Family PTERASTERIDAE
Diplopteraster hurleyi McKnight, 1973 E
Diplopteraster otagoensis McKnight, 2006 E
Hymenaster blegvadi Madsen, 1956 E
Hymenaster carnosus Sladen, 1882
Hymenaster estcourti McKnight, 1973 E
Hymenaster pullatus Sladen, 1882
Hymenaster sp. A McKnight, 2006 E
Hymenaster sp. B McKnight, 2006
Pteraster bathami Fell, 1958
Pteraster obesus H.L. Clark, 1908
Pteraster robertsoni McKnight, 1973 E
Pteraster sp. McKnight, 2006 E

Class OPHIUROIDEA
Order AMPHILEPIDIDA
Family AMPHILEPIDIDAE
Amphilepis neozelandica Mills & O'Hara, 2010 E
Family AMPHIURIDAE
Amphioplus (*Amphioplus*) *basilicus* (Koehler, 1907) E
Amphioplus (*Amphioplus*) *stewartensis* Mortensen, 1924 E
Amphioplus (*Unioplus*) *pegasus* Baker, 1977 E
Amphioplus sp. (e.g., NIWA 15001, MoV 2722, O'Hara) E
Amphioplus sp. (e.g., NIWA 64503, MoV 4892, O'Hara) E
Amphioplus sp. (e.g., NIWA 72026, MoV 4890, O'Hara) E
Amphioplus sp. (NIWA 79821, puffy disc, Mills & O'Hara)
Amphipholis misera (Koehler, 1899)
Amphipholis squamata (Delle Chiaje, 1828)
Amphipholis sp. 1 (Kermadec, AM J 24958) E
Amphipholis sp. 2 (Kermadec, AM J 24944) E
Amphiura (*Amphiura*) *alba* Mortensen, 1924 E
Amphiura (*Amphiura*) *amokurae* Mortensen, 1924 E
Amphiura (*Amphiura*) *annulifera* Mortensen, 1924 E
Amphiura (*Amphiura*) *angularis* Lyman, 1879
Amphiura (*Amphiura*) *argentea* Lyman, 1879 E
Amphiura (*Amphiura*) *aster* Farquhar, 1901 E
Amphiura (*Amphiura*) *correcta* (Koehler, 1907) E
Amphiura (*Amphiura*) *dawbini* Fell, 1952 E
Amphiura (*Amphiura*) *heraldica* Fell, 1952 E
Amphiura (*Amphiura*) *hinemoae* Mortensen, 1924 E
Amphiura (*Amphiura*) *lanceolata* Lyman, 1879 E
Amphiura (*Amphiura*) *magellanica* Ljungman, 1867
Amphiura (*Amphiura*) *micra* H.L. Clark, 1938
Amphiura (*Amphiura*) *praefecta* Koehler, 1907 E
Amphiura (*Amphiura*) *psilopora* H.L. Clark, 1911
Amphiura (*Amphiura*) *pusilla* Farquhar, 1897 E
Amphiura (*Amphiura*) *rosea* Farquhar, 1894 E
Amphiura (*Amphiura*) *spinipes* Mortensen, 1924 E
Amphiura (*Amphiura*) *tutanekai* Baker, 1974 E
Amphiura (*Amphiura*) cf. *constricta* (NIWA 125292, Mills)
Amphiura (*Amphiura*) cf. *magellanica* (NIWA 77777, O'Hara & Mills)
Amphiura (*Fellaria*) *octacantha* (H.L. Clark, 1915)
Amphiura (*Ophiopeltis*) *dikellacantha* Baker, 1974 E
Amphiura cipa (Baker, 1977) E
Amphiura ctenacantha (Baker, 1977) E
Amphiura latisquama (Mortensen, 1924)
Amphiura modesta Studer, 1882
Amphiura cf. *deficiens* (NIWA 30947, O'Hara & Mills)
Amphiura cf. *joubini* (NIWA 31007, O'Hara)
Amphiura sp. (NIWA 41364, hollow arm spine, O'Hara)
Ophiocentrus novaezealandiae Gislen, 1926 E
Ophiodaphne scripta (Koehler, 1904)
Silax daleus (Lyman, 1879)
Family HEMIEURYALIDAE
Actinozonella texturata (Lyman, 1883)
Astrogymnotes hamishia Baker, Clark & McKnight, 2001
Astrogymnotes thomasinae Baker, Clark & McKnight, 2001 E
Ophioplocus huttoni Farquhar, 1899 E
Ophioplocus imbricatus (Muller & Troschel, 1842)
Ophioplocus marginata (Fell, 1953) E
Ophiozonella bispinosa (Koehler, 1897)
Ophiozonella depressa (Lyman, 1878)
Ophiozonella longispina (Clark, 1908)
Ophiozonella media Koehler, 1904
Ophiozonella stellamaris Fell, 1952 E2
Ophiozonella stellata (Lyman, 1878) E2
Ophiozonoida parva McKnight, 1975 E2
Ophiozonoida picta H. L. Clark, 1915
Family OPHIACTIDAE
Ophiactis amator Koehler, 1922
Ophiactis cuspidata Lyman, 1879
Ophiactis flexuosa Lyman, 1879
Ophiactis hirta Lyman, 1879
Ophiactis macrolepidota Marktanner-Turneretscher, 1887
Ophiactis nama Lyman, 1879
Ophiactis profundi novaezelandiae Mortensen, 1924 E
Ophiactis resiliens Lyman, 1879
Family OPHIOLEPIDIDAE
Ophiolepis biscalata McKnight, 2003
Ophiotypa simplex Koehler, 1897
Family OPHIOPSILIDAE
Ophiopsila novaezealandiae Baker, 1974 E
Family OPHIOTHAMNIDAE
Histampica canescens (Lyman, 1879) E
Histampica duplicata (Lyman, 1875)
Family OPHIONEREIDIDAE
Ophiochiton fastigatus Lyman, 1878
Ophiochiton lentus Lyman, 1879
Ophiochiton triphylax (Baker, 1977) E
Ophionereis fasciata Hutton, 1872 E
Ophionereis fusca Brock, 1888
Ophionereis novaezelandiae Mortensen, 1936
Ophionereis cf. *schayeri* (NIWA 112482, Kermadec, O'Hara) E
Ophioplax lamellosa Matsumoto, 1915
Family OPHIOTRICHIDAE
Macrophiothrix oliveri (Benham, 1911) E
Macrophiothrix propinqua (Lyman, 1861)
Ophiothela mirabilis Verrill, 1867
Ophiothrix (*Acanthophiothrix*) *lepidus* de Loriol, 1893
Ophiothrix (*Acanthophiothrix*) *purpurea* von Martens, 1867
Ophiothrix (*Ophiothrix*) *aristulata* Lyman, 1879
Ophiothrix (*Ophiothrix*) *ciliaris* (Lamarck, 1816)

Order EURYALIDA
Family ASTERONYCHIDAE
Asteronyx loveni Müller & Troschel, 1842
Astrodia tenuispina (Verrill, 1884)
Family EURYALIDAE
Asteroschema ajax A.H. Clark, 1949
Asteroschema bidwillae McKnight, 2000
Asteroschema horridum Lyman, 1879
Asteroschema igloo Baker, 1980
Asteroschema migrator Koehler, 1904
Asteroschema salix Lyman, 1879
Asteroschema tubiferum Matsumoto, 1911
Asteroschema wrighti McKnight, 2000 E
Astrobrachion adhearans (Studer, 1884)
Astrobrachion constrictum (Farquhar, 1900)
Astroceras elegans (Bell, 1917)
Astroceras kermadecensis Baker, 1980
Ophiocreas caudatus Lyman, 1879
Ophiocreas japonicus Koehler, 1907
Ophiocreas mortenseni Koehler, 1930
Ophiocreas oedipus Lyman, 1879
Ophiocreas sibogae Koehler, 1904
Ophiocreas spinulosus Lyman, 1883
Ophiocreas willsi McKnight, 2000 E2
Family GORGONOCEPHALIDAE
Asteroporpa (*Asteroporpa*) *australiensis* H.L. Clark, 1909
Asteroporpa (*Astromoana*) *reticulata* Baker, 1980
Astroboa granulatus (H.L. Clark, 1938)
Astrocladus tonganus Döderlein, 1911
Astrodendrum elingamita Baker, 1974
Astroniwa nukurangi McKnight, 2000 E
Astrothorax waitei (Benham, 1909)
Astrothrombus rugosus H.L. Clark, 1909
Astrothrombus vecors (Koehler, 1904)
Astrotoma drachi Guille, 1979
Gorgonocephalus chilensis (Philippi, 1858)
Gorgonocephalus dolichodactylus Döderlein, 1911
Gorgonocephalus pustulatum (H.L. Clark, 1916)
Gorgonocephalus sundanus Döderlein, 1927

Order OPHIACANTHIDA
Family CLARKCOMIDAE
Clarkcoma bollonsi (Farquhar, 1908)
Clarkcoma cf. *bollonsi* (NIWA 105779, Kermadec, O'Hara) E
Family OPHIOCAMACIDAE
Ophiocamax applicatus Koehler, 1922
Ophiocamax brevicetra Baker, 1974 E
Ophiocamax vitrea Lyman, 1878
Family OPHIACANTHIDAE
Ophiomoeris nodosa (Koehler, 1905)
Ophiomoeris obstricta (Lyman, 1878)
Ophiacantha antarctica Koehler, 1900
Ophiacantha brachygnatha H.L. Clark, 1928
Ophiacantha composita Koehler, 1897
Ophiacantha cornuta Lyman, 1878
Ophiacantha duplex Koehler, 1897
Ophiacantha fidelis (Koehler, 1930)
Ophiacantha funebris (Koehler, 1930)

Ophiacantha fuscina O'Hara & Stöhr, 2006
Ophiacantha imago Lyman, 1878
Ophiacantha levispina Lyman, 1878
Ophiacantha longidens Lyman, 1878
Ophiacantha otagoensis Fell, 1958
Ophiacantha pacata Koehler, 1922
Ophiacantha pentagona Koehler, 1897
Ophiacantha richeri O'Hara & Stöhr, 2006
Ophiacantha serrata Lyman, 1878
Ophiacantha sollicita Koehler, 1922
Ophiacantha vepratica Lyman, 1878
Ophiacantha vilis Mortensen, 1924
Ophiacantha vorax Koehler, 1897
Ophiacantha sp. (NIWA 42271, MoV 2780, O'Hara) E
Ophiacantha sp. (NIWA 15034, MoV 4533, O'Hara) E
Ophiacantha sp. (NIWA 42230, MoV 4537, O'Hara) E
Ophientrema scolopendrica (Lyman, 1883)
Ophiocanops felli (McKnight, 2003) E2
Ophiolebes comatulina McKnight, 2003
Ophiolebes tuberosus Matsumoto, 1915
Ophiolebes yaldwyni (Fell, 1958)
Ophiolimna antarctica (Lyman, 1879)
Ophiolimna bairdi (Lyman, 1883)
Ophiolimna perfida (Koehler, 1904)
Ophiolimna cf. *placentigera* (NIWA 64371, Mills)
Ophiomitrella granulosa (Lyman, 1878)
Ophiomitrella mensa O'Hara & Stöhr, 2006
Ophiomitrella parviglobosa O'Hara & Stöhr, 2006
Ophiomitrella stellifera Matsumoto, 1917
Ophiomitrella sp. (NIWA 81191, MoV 5488, O'Hara)
Ophiomoeris nodosa (Koehler, 1905)
Ophiomoeris obstricta (Lyman, 1878)
Ophiophthalmus relictus (Koehler, 1904)
Ophioplinthaca amezianeae O'Hara & Stöhr, 2006
Ophioplinthaca bythiapsis (H.L. Clark, 1911)
Ophioplinthaca defensor Koehler, 1930
Ophioplinthaca miranda Koehler, 1904
Ophioplinthaca plicata (Lyman, 1878)
Ophioplinthaca pulchra Koehler, 1904
Ophioplinthaca cf. *weberi* (NIWA 86223, O'Hara)
Ophioplinthaca sp. nov. (NIWA 13699, O'Hara, Naughton & Mills in prep) E
Ophiosabine densispina (Mortensen, 1936)
Ophiosabine rosea (Lyman, 1878)
Ophiosabine cf. *rosea* (NIWA 3508, O'Hara) E2
Ophiosabine vivipara (Ljungman, 1870)
Ophiosemnotes conferta (Koehler,1922)
Ophiurothamnus clausa (Lyman, 1878)
Ophiurothamnus eleaumei O'Hara & Stöhr, 2006
Family OPHIOBYRSIDAE
Ophiobyrsa intorta Koehler, 1922
Ophiophrixus confinis Koehler, 1922
Family OPHIODERMATIDAE
Bathypectinura heros (Lyman, 1878)
Cryptopelta granulifera H.L. Clark, 1909
Cryptopelta tarltoni Baker, 1974 E
Ophiarachnella infernalis (Müller & Troschel, 1842)
Ophiocypris megaloplax (Mortensen, 1936)
Ophiocypris tuberculosus Koehler, 1930
Ophiomidas aurum McKnight, 2003 E
Ophiopeza cylindrica (Hutton, 1872)
Ophiopsammus assimilis (Bell, 1888)
Ophiopsammus angusta Vail & Rowe, 1989
Ophiopsammus maculata (Verrill, 1869)
Ophiocormus notabilis H. L. Clark, 1915 E
Family OPHIOMYXIDAE
Ophiomyxa australis Lütken, 1869
Ophiomyxa brevirima H.L. Clark, 1915
Ophiomyxa duskiensis Fell, 1946 E
Ophiomyxa sp. (NIWA 82722, MoV 5486, O'Hara)
Family OPHIOPTERIDAE
Ophiopteris antipodum E.A. Smith, 1877 E
Family OPHIOTOMIDAE
Ophiocopa spatula Lyman, 1883
Ophiopristis dissidens (Koehler, 1905)
Ophiopristis sp. (NIWA 45894; det. T. O'Hara)
Ophiotoma megatreta (H.L. Clark, 1911)
Ophiotreta sp. (NIWA 41256, O'Hara)
Ophiotreta eximia (Koehler, 1904)
Ophiotreta larissae (Baker, 1979)
Ophiotreta matura (Koehler, 1904)
Ophiotreta spectabilis (G.O. Sars, 1871)
Ophiotreta stimulea (Lyman, 1878)
Ophiotreta valenciennesi (Lyman, 1879)
Ophiotreta cf. *valenciennesi* (NIWA 82337, O'Hara)
Family INCERTAE SEDIS
Ophiambix aculeatus Lyman, 1880
Ophiambix epicopus Paterson & Baker, 1988 E
Ophiodictys pectorale (Lyman, 1880)

Order OPHIOLEUCIDA
Family OPHIERNIDAE
Ophiernus vallincola Lyman, 1878
Family OPHIOLEUCIDAE
Ophioleuce brevispinum (H.L. Clark, 1911)
Ophioleuce seminudum Koehler, 1904
Ophioleuce regulare (Koehler, 1901)
Ophiopallas paradoxa Koehler, 1904

Order OPHIOSCOLECIDA
Family OPHIOHELIDAE
Ophiomyces delata Koehler, 1904
Ophiomyces grandis Lyman, 1879
Ophiotholia spathifer (Lyman, 1879)
Family OPHIOSCOLECIDAE
Ophiogeron edentulus Lyman, 1878
Ophiologimus farquhari (McKnight, 2003)
Ophiologimus prolifer (Studer, 1882)
Ophiologimus quadrispinus H.L. Clark, 1925
Ophiolycus nutrix (Mortensen, 1936)
Ophiophrura liodisca H.L. Clark, 1911
Ophiophrura sp. (NIWA 11520, O'Hara)
Ophiorupta sp. (NIWA 4599, O'Hara)
Ophioscolex glacialis Müller & Troschel, 1842
Ophioscolex sp. (NIWA 15026, MoV 2721, O'Hara)

Order OPHIURIDA
Family ASTROPHIURIDAE
Astrophiura kohurangi McKnight, 1975
Ophiomisidium irene Fell, 1952
Ophiophycis johni McKnight, 2003
Ophiophycis richardi McKnight, 2003
Family OPHIOMUSAIDAE
Ophiomusa facunda (Koehler, 1922)
Ophiomusa lymani (Wyville-Thomson, 1873)
Ophiomusa relicta (Koehler, 1904)
Ophiomusa scalare (Lyman, 1878)
Ophiomusa cf. *simplex* (NIWA 14137, O'Hara)
Ophiomusa sp. (NIWA 13768, O'Hara)
Family OPHIOPYRGIDAE
Amphiophiura bakeri McKnight, 2003
Amphiophiura bullata convexa (Lyman, 1878)
Amphiophiura confecta (Koehler, 1930)
Amphiophiura fisheri (Clark, 1949)
Amphiophiura cf. *improba* (NIWA 50497, O'Hara)
Amphiophiura insolita (Koehler, 1904)
Amphiophiura kermadecensis (Benham, 1911) E
Amphiophiura laudata (Koehler, 1904)
Amphiophiura ?ornata (Lyman, 1878)
Amphiophiura pertusa Koehler, 1930
Amphiophiura prisca (Koehler, 1904)
Amphiophiura radiata (Lyman, 1878)
Amphiophiura sordida (Koehler, 1897)
Amphiophiura spatulifera Koehler, 1922
Amphiophiura turgida Koehler, 1930
Amphiophiura urbana (Koehler, 1904)
Amphiophiura sp. (NIWA 66624, O'Hara)
Ophiogona doederleini (Koehler, 1901)
Ophioperla koehleri (Bell, 1908)
Ophiophyllum petilum Lyman, 1878
Ophiophyllum teplium McKnight, 2003 E
Ophiopleura inermis (Lyman, 1878)
Ophioplinthus accomodata (Koehler, 1922)
Ophioplinthus inornata (Lyman, 1878)
Ophioplinthus mordax (Koehler, 1922)
Ophioplinthus sp. 1 (NIWA 39572, O'Hara)
Ophiopyrgus trispinosus Koehler, 1904
Ophiuroglypha cf. *carinifera* (NIWA 7314, O'Hara)
Ophiuroglypha irrorata concreta (Koehler, 1901)
Ophiuroglypha irrorata irrorata (Lyman, 1878)
Ophiuroglypha cf. *irrorata* (NIWA 4604, O'Hara)
Ophiuroglypha rugosa (Lyman, 1878)
Ophiuroglypha cf. *rugosa* (NIWA 3482, O'Hara)
Ophiuroglypha verrucosa McKnight, 2003 E2
Ophiuroglypha sp. (NIWA 7337, MoV 2728, O'Hara)
Stegophiura lapidaria (Lyman, 1878)
Stegophiura singletoni McKnight, 1975
Aspidophiura forbesi (Duncan, 1879)
Aspidophiura sp. (NIWA 14125, O'Hara)
Family OPHIOSPHALMIDAE
Ophiosphalma cf. *armatum* (NIWA 64928, Mills)
Ophiosphalma elegans (Koehler, 1897)
Ophiosphalma sp. (NIWA 3489, O'Hara)
Family OPHIURIDAE
Ophiocten cryptum McKnight, 2003
Ophiocten hastatum Lyman, 1878
Ophiocten megaloplax Koehler, 1900
Ophiocten sp. (NIWA 43120, MoV 5674, O'Hara)
Ophiura kinbergi Ljungman, 1866
Ophiura cf. *lenticularis* (NIWA 90006, Mills)
Ophiura micracantha H.L. Clark, 1911
Ophiura ooplax (H.L. Clark, 1911)
Ophiura cf. *ooplax* (NIWA 14173, O'Hara)
Ophiura spinicantha McKnight, 2003
Family INCERTAE SEDIS
Anthophiura sp. (NIWA 69453, O'Hara)
Ophiomastus meridionalis (Lyman, 1879)
Ophiomastus sp. (NIWA 82242, Mills)
Ophiuraster symmetricus Fell, 1958

Subphylum CRINOZOA
Class CRINOIDEA
Subclass ARTICULATA
Order ISOCRINIDA
Suborder ISOCRININA
Family ISOCRINIDAE
Subfamily ISOCRININAE
Hypalocrinus naresianus (Carpenter, 1884)
Family ISSELICRINIDAE
Subfamily DIPLOCRININAE
Endoxocrinus (*Diplocrinus*) *alternicirrus sibogae* Döderlein, 1907
Endoxocrinus (*Diplocrinus*) sp. (NIWA 42720, 82854) McKnight, 1989 E
Subfamily METACRININAE
Metacrinus levii Améziane-Cominardi, 1990
Metacrinus nodosus Carpenter, 1884
Metacrinus wyvillii Carpenter, 1884
Saracrinus angulatus (Carpenter, 1884) E2
Saracrinus nobilis (Carpenter, 1884)

Order COMATULIDA
Family ANTEDONIDAE
Subfamily BATHYMETRINAE
Argyrometra mortenseni A.H. Clark, 1917
Thaumatometra alternata (Carpenter, 1888)
Tonrometra multicirra A.H. Clark, 1929
Tonrometra spinulifera (John, 1939)
Subfamily HELIOMETRINAE
Florometra austini A.M. Clark, 1967 E
Florometra novaezealandiae McKnight, 1977a
Subfamily ISOMETRAINAE
Isometra sp. (NIWA 95864)
Subfamily PEROMETRINAE
Erythrometra rostrata A.M. Clark, 1966
Helenametra perplexa A.M. Clark, 1966 E
Family CHARITOMETRIDAE
Charitometra basicurva (Carpenter, 1888) E
Charitometra incisa (Carpenter, 1888)
Glyptometra inaequalis (Carpenter, 1888)
Monachometra kermadecensis McKnight, 1977b
Strotometra ornatissimus A.H. Clark, 1912
Family COMATULIDAE
Subfamily COMATELLINAE
Alloeocomatella sp. (NIWA 93372)
Subfamily COMATULINAE
Anneissia benhami (A.H. Clark, 1916) E
Anneissia plectrophorum (H.L. Clark, 1916)
Cenolia novaezealandiae A.H. Clark, 1918 E
Clarkcomanthus sp. (NIWA 108085)
Comissia dawsoni (McKnight, 1977a) E
Comissia decumatilos (McKnight, 1977a) E
Comissia norfolkensis McKnight, 1977 E
Subfamily INCERTAE SEDIS
Palaeocomatella hiwia McKnight, 1977a
Comatulidae incertae sedis *gillstromi* (McKnight, 1977b) E
Comatulidae incertae sedis *imossica* (McKnight, 1975) E2
Family PENTAMETROCRINIDAE
Pentametrocrinus australis McKnight, 1977a E
Pentametrocrinus semperi (Carpenter, 1882)
Thaumatocrinus sp. (NIWA 115321) McKnight, 1977
Family THALASSOMETRIDAE
Aglaometra valida (Carpenter, 1888)
Crotalometra magnicirra (Bell, 1905)
Crotalometra rustica A.H. Clark, 1909
Crotalometra sp. (NIWA 87467)
Oceanometra annandalei (A.H. Clark, 1909)
Stiremetra breviradia (Carpenter, 1888)
Stiremetra sp. (NIWA 25919) McKnight, 1989
Thalassometra echinata (Carpenter, 1888)
Thalassometra tara McKnight, 1977a E
Family TROPIOMETRIDAE
Tropiometra afra (Hartlaub, 1890)
Family ZENOMETRIDAE
Sarametra triserialis (A.H. Clark, 1908)
Pentametrocrinus varians (Carpenter, 1882)
Psathyrometra sp. (NIWA 62517)
Suborder BOURGUETICRININA
Family ATELECRINIDAE
Paratelecrinus sp. (NIWA 72904)
Family BATHYCRINIDAE
Subfamily BATHYCRININAE
Bathycrinus australis A.H. Clark, 1907
Bathycrinus australocrucis McKnight, 1973 E
Monachocrinus aotearoa McKnight, 1973 E
Naumachocrinus hawaiiensis A.H. Clark, 1912
Family RHIZOCRINIDAE
Democrinus aoteanus McKnight, 1973 E
Family PHRYNOCRINIDAE
Subfamily PHRYNOCRININAE
Phrynocrinus nudus A.H. Clark, 1907
Subfamily PORPHYROCRININAE
Porphyrocrinus sp. (NIWA 92467)

Order HYOCRINIDA
Family HYOCRINIDAE
Ptilocrinus (*Ptilocrinus*) *australis* Améziane & Roux, 2011
Thalassocrinus sp. (NIWA 71314)
Gephyrocrinus sp. (NIWA 82157)

Subphylum ECHINOZOA
Class ECHINOIDEA
Subclass CIDAROIDEA
Order CIDAROIDA
Family CIDARIDAE
Subfamily GONIOCIDARINAE
Austrocidaris pawsoni McKnight, 1974 E
Goniocidaris (*Aspidocidaris*) *parasol* Fell, 1958 E2
Goniocidaris (*Discocidaris*) *peltata* Mortensen, 1927
Goniocidaris (*Goniocidaris*) *umbraculum* (Hutton, 1872) E
Goniocidaris (*Petalocidaris*) *florigera* Agassiz, 1879
Goniocidaris corona Baker, 1968 E
Goniocidaris magi Pawson, 1964 E
Ogmocidaris benhami Mortensen, 1921 E
Rhopalocidaris sp. (NIWA 21128)
Subfamily STEREOCIDARINAE
Stereocidaris microtuberculata (Yoshiwara, 1898)
Stereocidaris sceptriferoides (Döderlein, 1887)
Subfamily STYLOCIDARINAE
Prionocidaris australis (Ramsay, 1883)
Prionocidaris callista Rowe & Hoggett, 1980
Prionocidaris sp. (NIWA 46081)
Stylocidaris brevicollis (de Meijere, 1904)
Stylocidaris reini (Döderlein, 1887)
Tribe PHYLLACANTHINA
Phyllacanthus imperialis (Lamarck, 1816)
Phyllacanthus parvispinus Tenison-Woods, 1880
Family CTENOCIDARIDAE
Aporocidaris milleri (Agassiz, 1898)
Ctenocidaris aotearoa McKnight, 1974 E
Notocidaris bakeri McKnight, 1974 E

Family HISTOCIDARIDAE
Histocidaris acutispina Mortensen, 1927
Histocidaris australiae Mortensen, 1928
Histocidaris elegans (A. Agassiz, 1879)
Histocidaris purpurata Wyville Thomson, 1872
Histocidaris recurvata Mortensen, 1928
Subclass EUECHINOIDEA
Family APATOPYGIDAE
Apatopygus recens (Milne-Edwards, 1836) E
Porterpygus kieri Baker, 1983 E

Order ASPIDODIADEMATOIDA
Family ASPIDODIADEMATIDAE
Aspidodiadema tonsum A. Agassiz, 1879

Order CAMARODONTA
Family ECHINIDAE
Dermechinus horridus (A. Agassiz, 1879)
Gracilechinus multidentatus (H.L. Clark, 1925)
Family ECHINOMETRIDAE
Echinometra mathaei (de Blainville, 1825)
Evechinus chloroticus (Valenciennes, 1846) E
Heliocidaris tuberculata (Lamarck, 1816)
Family TEMNOPLEURIDAE
Amblypneustes elevatus (Hutton, 1872)
Pseudechinus albocinctus (Hutton, 1872) E
Pseudechinus flemingi Fell, 1958 E
Pseudechinus huttoni Benham, 1908 E
Pseudechinus magellanicus (Philippi, 1857)
Pseudechinus novaezealandiae (Mortensen, 1921) E
Pseudechinus variegatus Mortensen, 1921 E
Trigonocidaris radiata Mortensen, 1942
Family TOXOPNEUSTIDAE
Pseudoboletia indiana (Michelin, 1862)
Tripneustes gratilla (Linnaeus, 1758)
Tripneustes kermadecensis Bronstein *et al*., 2017 E
Family TRIGONOCIDARIDAE
Trigonocidaris monolini (A. Agassiz, 1879)

Order CASSIDULOIDA
Family NEOLAMPADIDAE
Studeria recens (A. Agassiz, 1879)

Order CLYPEASTEROIDA
Suborder CLYPEASTERINA
Family CLYPEASTERIDAE
Clypeaster australasiae (Gray, 1851)
Clypeaster tumidus (Tenison-Woods, 1878)
Clypeaster virescens Döderlein, 1885
Subfamily ARACHNOIDINAE
Fellaster zelandiae (Gray, 1855) E
Suborder SCUTELLINA
Family FIBULARIIDAE
Mortonia polyporus (Mortensen, 1921)
Family LAGANIDAE
Jacksonaster depressum (L. Agassiz, 1841)
Peronella hinemoae Mortensen, 1921

Order DIADEMATOIDA
Family DIADEMATIDAE
Centrostephanus rodgersii (A. Agassiz, 1863)
Diadema palmeri Baker, 1967

Order ECHINOTHURIOIDA
Family ECHINOTHURIIDAE
Subfamily ECHINOTHURIINAE
Araeosoma alternatum Mortensen, 1934
Araeosoma anatirostrum Anderson, 2013
Araeosoma bakeri Anderson, 2013 E
Araeosoma bidentatum Anderson, 2013
Araeosoma leppienae Anderson, 2013 E
Araeosoma migratum Anderson, 2013
Araeosoma tertii Anderson, 2013 E
Araeosoma thetidis H.L. Clark, 1909
Hapalosoma amynina Anderson, 2013
Subfamily HYGROSOMATINAE
Hygrosoma hoplacantha (Thomson, 1877)
Subfamily SPEROSOMATINAE
Sperosoma nudum Shigei, 1978
Sperosoma obscurum Agassiz & Clark, 1907
Tromikosoma australe (Koehler, 1926)
Tromikosoma rugosum Anderson, 2016 E
Family KAMPTOSOMATIDAE
Kamptosoma asterias (A. Agassiz, 1881)
Family PHORMOSOMATIDAE
Phormosoma bursarium A. Agassiz, 1881

Order HOLASTEROIDA
Suborder MERIDOSTERNATA
Family PLEXECHINIDAE
Plexechinus aoteanus (McKnight, 1974) E
Family POURTALESIIDAE
Echinosigra amphora Mironov, 1974
Pourtalesia hispida A. Agassiz, 1879
Pourtalesia laguncula A. Agassiz, 1879
Family URECHINIDAE
Cystechinus loveni A. Agassiz, 1898
Urechinus antipodeanus McKnight, 1974 E

Order MICROPYGOIDA
Family MICROPYGIDAE
Micropyga tuberculata A. Agassiz, 1879

Order PEDINOIDA
Family PEDINIDAE
Caenopedina hawaiiensis H.L. Clark, 1912
Caenopedina novaezealandiae Pawson, 1964 E
Caenopedina otagoensis McKnight, 1968
Caenopedina porphyrogigas Anderson, 2009
Caenopedina pulchella (Agassiz & Clark, 1907)

Order SALENIOIDA
Family SALENIIDAE
Bathysalenia sp. (NIWA 119143)
Salenocidaris hastigera A. Agassiz, 1879

Order SPATANGOIDA
Family HEMIASTERIDAE
Holanthus expergitus (Loven, 1874)
Kupeia toi McKnight, 1974 E
Suborder BRISSIDINA
Family BRISSIDAE
Brissopsis oldhami Alcock, 1893
Brissopsis sp. (NIWA 58623)
Brissus (*Brissus*) *gigas* Fell, 1947 E
Brissus agassizii Döderlein, 1885
Gymnopatagus magnus A. Agassiz & H.L. Clark, 1907
Gymnopatagus parvipetalus Baker & Rowe, 1990 E
Metalia kermadecensis Baker & Rowe, 1990 E
Family EURYPATAGIDAE
Paramaretia peloria (H.L. Clark, 1916)
Paramaretia tuberculata (A. Agassiz & H.L. Clark, 1907)
Family LOVENIIDAE
Echinocardium cordatum (Pennant, 1777)
Echinocardium lymani (Lambert & Theiry, 1924)
Family PALAEOTROPIDAE
Kermabrissoides siculum (Baker & Rowe, 1990) E
Paleotrema loveni (A. Agassiz, 1879)
Family SPATANGIDAE
Spatangus capensis Döderlein, 1905
Spatangus luetkeni A. Agassiz, 1872
Spatangus mathesoni McKnight, 1968 E
Spatangus multispinus Mortensen, 1925 E
Suborder MICRASTERINA
Family MICRASTERIDAE
Cyclaster regalis Baker, 1969 E
Suborder PALEOPNEUSTINA
Family PALEOPNEUSTIDAE
Peripatagus cinctus Koehler, 1895
Family SCHIZASTERIDAE
Aceste bellidifera Thomson, 1877
Brisaster tasmanicus McKnight, 1974 E
Brisaster sp. (NIWA 83759) Pawson, 1968 E

Class HOLOTHUROIDEA
Order DENDROCHIROTIDA
Family CUCUMARIIDAE
Abyssocucumis abyssorum (Théel, 1886)
Abyssocucumis sp. Mah *et al*., 2009
Amphicyclus thomsoni (Hutton, 1878)
Australocnus calcareus (Dendy, 1896)
Neocucumella bicolumnata (Dendy & Hindle, 1907)
Plesiocolochirus ignava (Ludwig, 1874)
Pseudocnus leoninoides (Mortensen, 1925)
Pseudocnus sentus O'Loughlin & Alcock, 2000 E
Psolidiella nigra Mortensen, 1925
Psolidocnus amokurae (Mortensen, 1925) E
Psolidocnus farquhari Mortensen, 1925 E
Psolidocnus sacculus Pawson, 1983 E
Squamocnus brevidentis (Hutton, 1872) E
Squamocnus niveus O'Loughlin & Alcock, 2000 E
Squamocnus luteus O'Loughlin & Alcock, 2000 E
Family HETEROTHYONIDAE
Heterothyone alba (Hutton, 1872) E
Heterothyone ocnoides (Dendy, 1896) E
Family PHYLLOPHORIDAE
Neothyonidium armatum Pawson, 1965 E
Neothyonidium dearmatum (Dendy & Hindle, 1907)
Pentadactyla longidentis (Hutton, 1878) E
Family PLACOTHURIIDAE
Placothuria huttoni (Dendy, 1896) E
Placothuria squamata Pawson, 1968 E
Family PSOLIDAE
Psolus antarcticus (Philippi, 1857)
Psolus parantarcticus Mackenzie and Whitfield, 2011
Psolus segregatus Perrier, 1905
Psolidium aequm Davey & Whitfield, 2013 E
Psolidium kermadeci Davey & Whitfield, 2013 E
Psolidium marriotti Davey & Whitfield, 2013 E
Psolidium ramum Davey & Whitfield, 2013 E
Psolidium whittakeri O'Loughlin and Ahearn, 2008
Family YPSILOTHURIIDAE
Ypsilothuria bitentaculata (Ludwig, 1893)
Ypsilothuria sp. nov. Mah *et al*., 2009
Echinocucumis hispida (Barrett, 1856)

Order APODIDA
Family CHIRIDOTIDAE
Chiridota carnleyensis Mortensen, 1925 E
Chiridota gigas Dendy & Hindle, 1907
Chiridota nigra Mortensen, 1925 E
Kolostoneura novaezealandiae (Dendy & Hindle, 1907) E
Taeniogyrus dendyi Mortensen, 1925 E
Taeniogyrus dunedinensis (Parker, 1881) E
Paradota plentyensis Davey, 2014 E
Family MYRIOTROCHIDAE
Prototrochus sp. nov. A (NIWA 87167)
Family SYNAPTIDAE
Labidoplax sp. (NIWA 71354)
Protankyra brychia (Verrill, 1885)
Protankyra rigida Pawson, 1965 E
Protankyra sp. nov. (NIWA 139780) Mah *et al*., 2009
Rynkatorpa hickmani Rowe & Pawson, 1967
Rynkatorpa uncinata (Hutton, 1872) E

Order MOLPADIDA
Family CAUDINIDAE
Hedingia glabra (Théel, 1886) E
Paracaudina chilensis (Müller, 1850)
Paracaudina coriacea (Hutton, 1872) E
Paracaudina alta Davey & O'Loughlin, 2013 E
Paracaudina reductia Davey & O'Loughlin, 2013 E
Family MOLPADIIDAE
Heteromolpadia joyceae Pawson & Vance, 2007 E
Heteromolpadia marenzelleri (Théel, 1886) E
Heteromolpadia pikei Pawson, 1965 E
Molpadia abyssicola Pawson, 1977
Molpadia antarctica (Théel, 1886)
Molpadia discors Pawson, 1977
Molpadia ?*dissimilis* Clark, 1907
Molpadia liska Pawson, 1977
Molpadia musculus Risso, 1826
Molpadia sp. nov. A (NIWA 49850) Mah *et al*., 2009
Molpadia sp. nov. B Mah *et al*., 2009

Order PERSICULIDA
Family GEPHYROTHURIIDAE
Gephyrothuria alcocki Koehler & Vaney, 1905
Paroriza sp. Mah *et al*., 2009

Order HOLOTHURIIDA
Family HOLOTHURIIDAE
Holothuria neozelanica (Mortensen, 1925) E
Family MESOTHURIIDAE
Zygothuria lactea (Théel, 1886)
Zygothuria marginata Sluiter, 1901
Zygothuria sp. nov. (NIWA 139145) Mah *et al*., 2009

Order SYNALLACTIDA
Family STICHOPODIDAE
Australostichopus mollis (Hutton, 1872)
Family SYNALLACTIDAE
Bathyplotes natans (Sars, 1868)
Bathyplotes sp. nov. Mah *et al*., 2009
Meseres sp. Mah *et al*., 2009
Paelopatides quadridens Heding, 1940
Synallactes sp. Mah *et al*., 2009
Family DEIMATIDAE
Deima validum Théel, 1879
Oneirophanta mutabilis Théel, 1879
Orphnurgus dorisae Pawson, 2002 E

Order ELASIPODIDA
Family ELPIDIIDAE
Achlyonice ecalcarea Théel, 1879
Achlyonice gilpinbrowni Pawson, 1965 E
Achlyonice monactinica Ohshima, 1915
Achlyonice tui Pawson, 1965 E
Amperima robusta Théel, 1882
Amperima? sp. nov. Mah *et al*., 2009
Ellipinion bucephalum Hansen, 1975
Elpidia glacialis Hansen, 1956
Elpidia theeli Hansen, 1956
Peniagone azorica von Marenzeller, 1893
Peniagone humilis Hansen, 1975
Peniagone sp. Mah *et al*., 2009
Scotoplanes globosa Théel, 1879
Family LAETMOGONIDAE
Benthogone rosea Koehler, 1896
Benthogone sp. Mah *et al*., 2009
Laetmogone fimbriata (Sluiter, 1901)
Laetmogone ijimai Mitsukuri, 1912
Laetmogone maculata (Théel, 1879)
Laetmogone violacea Théel, 1879
Laetmogone wyvillethomsoni Théel, 1879
Laetmogone sp. nov. Mah *et al*., 2009
Pannychia moseleyi Théel, 1882
Family PELAGOTHURIIDAE
Enypniastes eximia Théel, 1882
Family PSYCHROPOTIDAE
Benthodytes lingua R. Perrier, 1896
Benthodytes sanguinolenta Théel, 1882
Benthodytes sibogae Sluiter, 1901
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Psycheotrephes magna Hansen, 1975
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