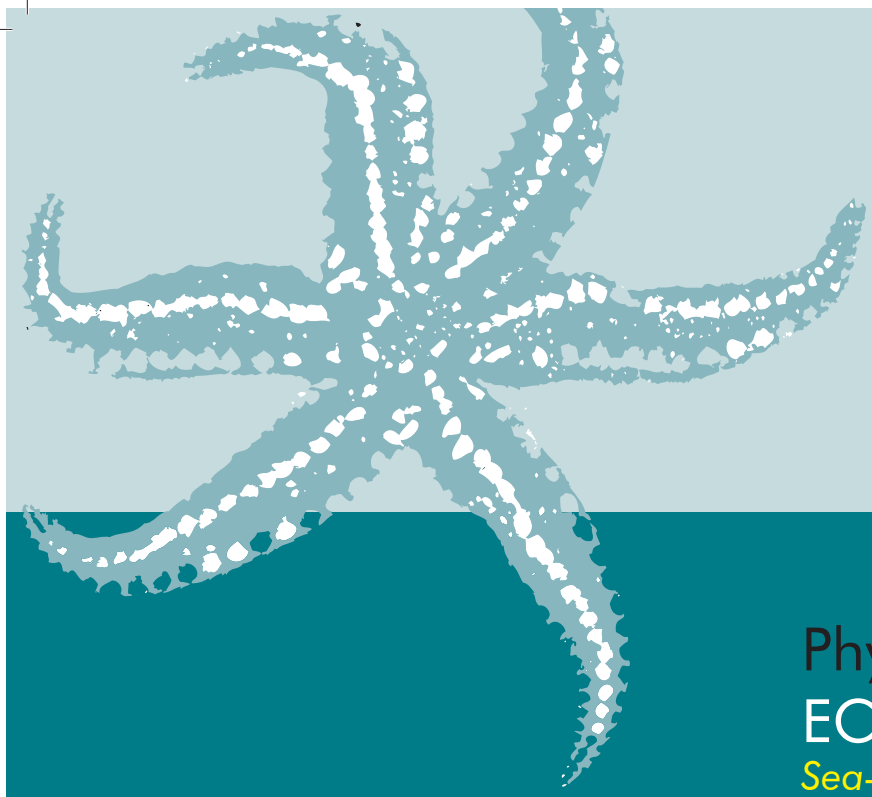
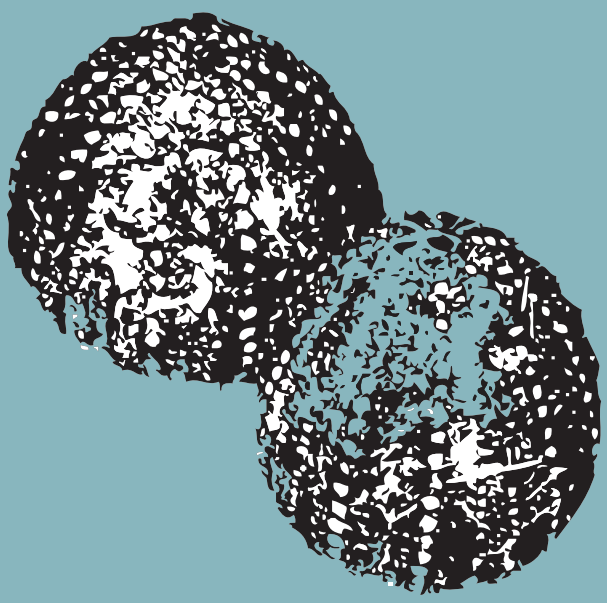


Phylum
ECHINODERMATA

Sea-stars, brittle stars, sea urchins, sea cucumbers, feather stars, sea lilies

Owen Anderson, Niki Davey, Don McKnight, Kate Neill



Phylum

ECHINODERMATA

Sea-stars, brittle stars, sea urchins, sea cucumbers, feather stars, sea lilies

The **Echinodermata** is a group of animals with spiny skins and tube-feet, showing a great variety of shapes and sizes; members of the commoner classes are generally recognisable as starfish or sea-stars, brittle stars, or sea urchins. Less well known are the feather stars, sea lilies, and sea cucumbers. All common extant forms have a basic pentaradial symmetry with tube-feet present, and an endoskeleton of calcitic plates or ossicles, these ranging from microscopic to conspicuous. Echinoderms have an extensive fossil history, but only five classes are likely to be collected in commercial trawling operations.

Asteroids (sea stars or starfish) are among the most familiar echinoderms. The central disc merges with the arms, and on the underside the tube-feet are placed in a groove. Extensions of the gut extend into the arms, and in a few species the gonads may similarly extend or are limited to the arms. Sea stars show a great variety of shapes, from pentagonal to those with elongate arms and a small disc. There are usually five arms but several species have more. The more unusual types occur in the Order Brisingida, where the disc is small and the deciduous arms appear distinct from the disc.

Ophiuroids (brittle stars) differ from sea stars in lacking the distinct groove on the underside of the arms, with the tube-feet piercing the ventral arm plates. The arms are distinctly separated from the disc. Most species have only five arms, though a few have six or more. Brittle-stars are generally small and fragile, and the arms are often broken when captured. Most brittle-stars (**Order Ophiurida**) have arms usually coiling horizontally (though in some they coil vertically) and the armspines are placed on the sides of the arms, either erect or pressed against the side. Brittle-stars of the Order Euryalinida, known as basket-stars or snake-stars, differ from the typical forms in having arms coiling vertically, with the armspines pointing downward; the larger basket-stars have the arms branching, usually from close to the edge of the disc, while the snake-stars have simple arms.

Echinoids (sea urchins or sea eggs) lack arms, and have a variety of forms. The commoner type is spherical or globose, but discoidal or heart-shaped forms also occur. The body or test is composed of distinct plates, in 20 columns, 10 of which are pierced by the tube-feet. Conspicuous spines, sometimes modified, are present, and in the spherical and discoidal species a complex jaw apparatus (Aristotle's lantern) is present on the underside; this is absent in the heart-shaped species.

Holothurians (sea cucumbers) generally have a soft, usually cylindrical, body with microscopic plates or ossicles embedded in the body wall, though a few species are more or less rigid, with small overlapping plates present. Five rows of tube-feet are usually present, though they are absent in one order. Although most species are small to medium in size, some tropical and deepsea species can be quite large. Identification of species usually requires laboratory examination of the ossicles embedded in the skin.

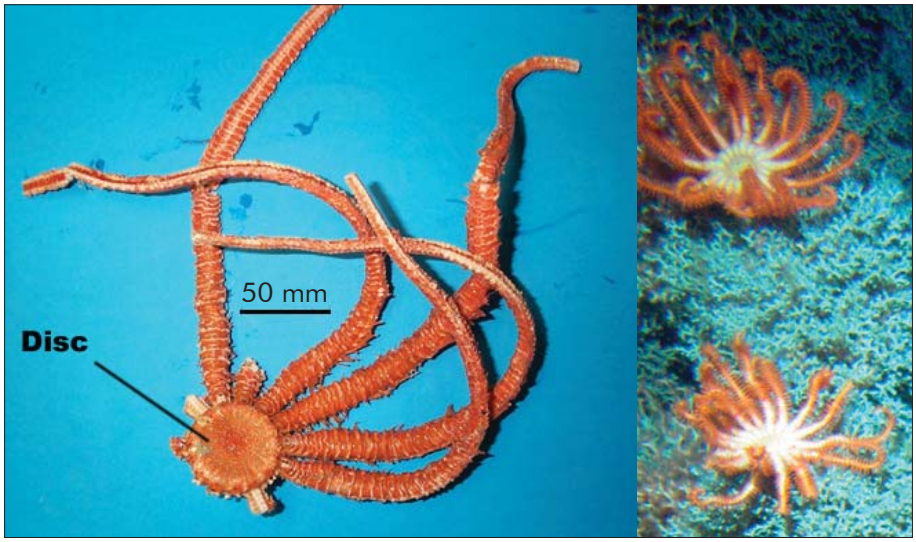
Crinoids are stalked (sea lilies) or unstalked (feather stars) with a small cup-like body, or calyx, composed of plates in cycles of five. This body is roofed by a membrane that may have immersed plates; moveable arms, usually branched, extend from the margin of the calyx, and are made up of small subcircular plates united by muscles. The arms contain extensions of the viscera, gonads, nerves, and water vascular systems. The tube-feet are inconspicuous, and extend to the arm tips. Sea lilies have a stem made up of discoidal plates, and attach to the seafloor by terminal roots, or a flattened basal piece; others have thin-jointed cirri along the stem, each with a terminal hook, to enable temporary attachment.

Feather stars have the stem reduced to a plate at the base of the calyx, to which the cirri are attached.

Crinoids are generally fragile, and often only fragments are found in samples. Entire specimens will often fragment when exposed on deck.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Brisingida
Family Brisingidae, Hymenodiscidae, Novodiniidae, Freyellidae

(Armless stars) (BRG)



Distinguishing features: All species in this order have at least 6 arms, usually over 10, with a small, rounded disc. The arms, constructed from tiny plates immersed in skin, are long, often higher than wide, and are quite deciduous and often all that is taken. Arms have transverse rows of plates the largest of which, at the ventro-lateral margin, bearing one or more long spines. All spines have a thick coating of skin. Tube feet in 2 rows, with sucking-discs.

Colour: Various.

Size: Total width up to 260 mm.

Distribution: Throughout New Zealand.

Depth: 150 to 6000 m.

Similar species: There are at least 14 local species in this order, all with a small disc and at least 6 fragile arms. A detailed examination is necessary to accurately identify them. Pictured is *Brisinga chathamica*.

References: McKnight, D.G. (in press). The marine fauna of New Zealand. Echinodermata: Asteroidea (sea-stars). Orders Velatida, Spinulosida, Forcipulatida and Brisingida. *NIWA Biodiversity Memoir.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Forcipulatida
Family Asteriidae

Cosmasterias dyscrita (Cat's-foot star) (CDY)

Distinguishing features: Disc small with 5 long rounded arms. Marginal plates inconspicuous. Plates of upper surface in fairly regular longitudinal rows, generally wider than long, and each with 2 to 4 short, blunt spines. Pedicellariae scattered over surface of body. Tube-feet with sucking-discs, in 4 rows. Often the arms break from the disc.

Colour: Pale orange.

Size: Total width up to 260 mm.

Distribution: Widespread throughout the New Zealand region and also present in Australia.

Depth: 50 to 1200 m.

Similar species: *Pseudechinaster rubens*, which has a mainly transverse arrangement of the plates on the upper surface.

References: McKnight, D.G. (in press). The marine fauna of New Zealand. Echinodermata: Asteroidea (sea-stars). Orders Velatida, Spinulosida, Forcipulatida and Brisingida. *NIWA Biodiversity Memoir.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Forcipulatida
Family Asteriidae

Pseudechinaster rubens (PRU)

Distinguishing features: Disc small, with 5 gently tapering arms, rounded above. Plates on upper surface of arms form transverse arcs, and also longitudinal series. Arms are often broken. Plates of upper and lower surfaces with 1-2 short spines. Mouth sunken and inconspicuous.

Colour: Reddish

Size: Total width up to 340 mm.

Distribution: East coast of New Zealand, more common on the Chatham Rise.

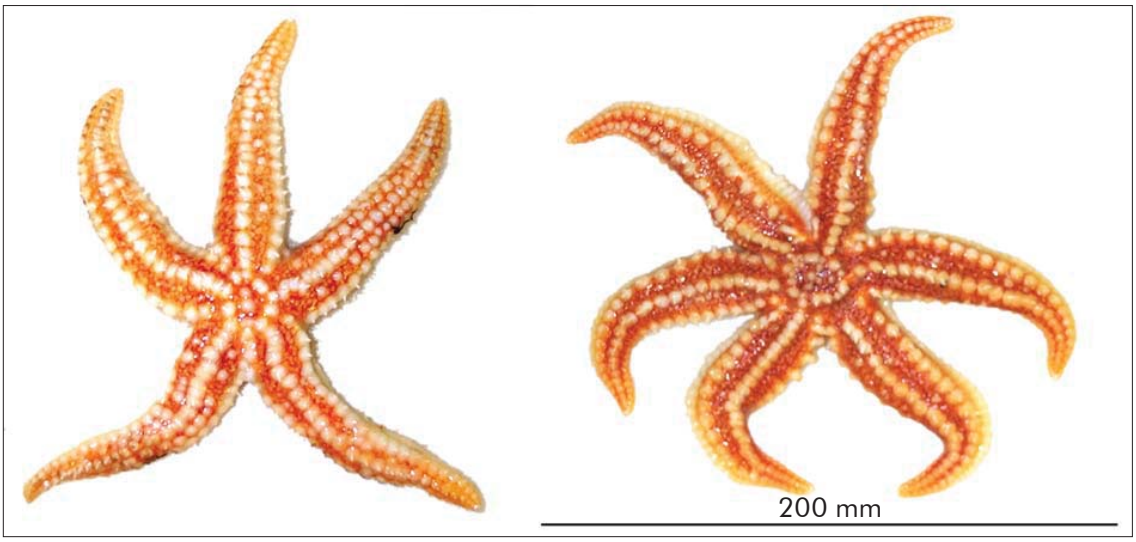
Depth: 75 to 400 m.

Similar species: *Cosmasterias dyscrita* is similar in appearance but lacks the transverse arcs of plates on he upper surface.

References: McKnight, D.G. (in press): The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Orders Spinulosida, Forcipulatida and Brisingida. *NIWA Biodiversity Memoir.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Forcipulatida
Family Asteriidae

Sclerasterias mollis (Cross-fish) (SMO)



Distinguishing features: Disc small, with 5 rounded or 5-sided arms; plates of upper surface in longitudinal rows, most with one spine, with a wreath of tiny pedicellariae (jaw-like appendages) around the base which may appear as a gelatinous sheath. Marginal plates inconspicuous. Tube feet in 4 rows, each with a distinct sucking-disc.

Colour: Orange to brick-red, arms with spines in 5 rows of whitish, cream, or yellow.

Size: Total width up to 400 mm.

Distribution: Widespread throughout the New Zealand region, from the Kermadec Islands to the Auckland Islands, including the Chatham Islands; common south of Cook Strait.

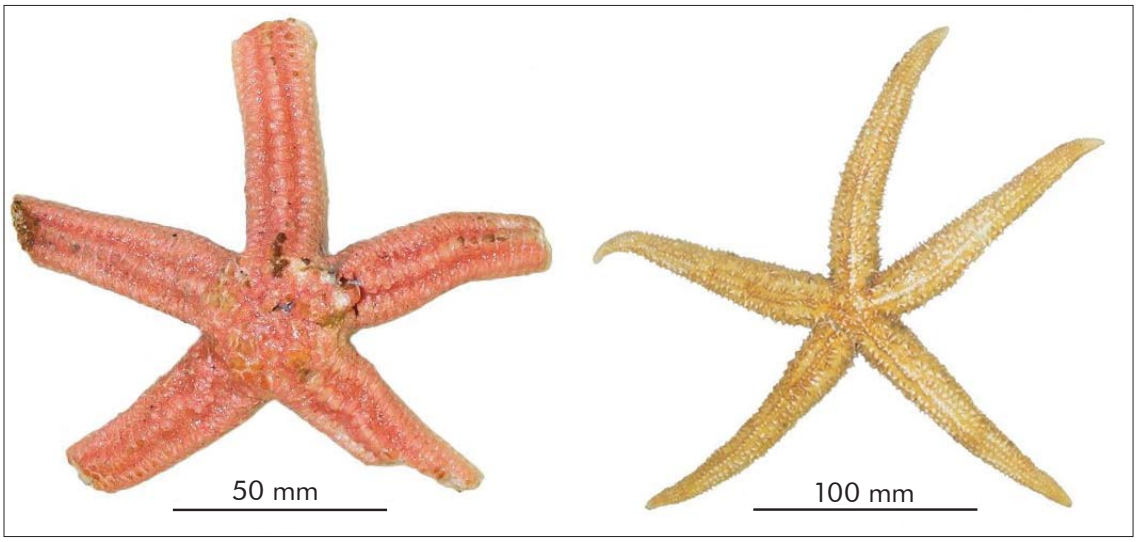
Depth: 0 to 660 m.

Similar species: The wreaths around the spines of the upper surface differentiate this species from *Cosmasterias* and *Pseudechinaster*. Two rarer species in genera *Perissasterias* and *Taranuiaster* lack the orange mottling. One other species, apparently new to New Zealand, is known only from active submarine volcanoes north of the Bay of Plenty. It differs in being uniformly very dark red to almost black.

References: McKnight, D.G. (in press). The marine fauna of New Zealand. Echinodermata: Asteroidea (sea-stars). Orders Velatida, Spinulosida, Forcipulatida and Brisingida. *NIWA Biodiversity Memoir.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Forcipulatida
Family Zoroasteridae

Zoroaster spp. (Rat-tail stars) (ZOR)



Distinguishing features: Five long, rounded, rigid, and slowly tapering arms and a small disc; plates regularly arranged, marginal plates not conspicuous. Upper surface with small spines, becoming larger down sides of rounded arms. Tube-feet in 4 rows, sometimes 2 rows near arm tip.

Colour: Brownish or orange or pale, usually a little lighter below.

Size: Total width up to 350 mm. Disc radius to a maximum of 30 mm.

Distribution: Throughout the New Zealand region.

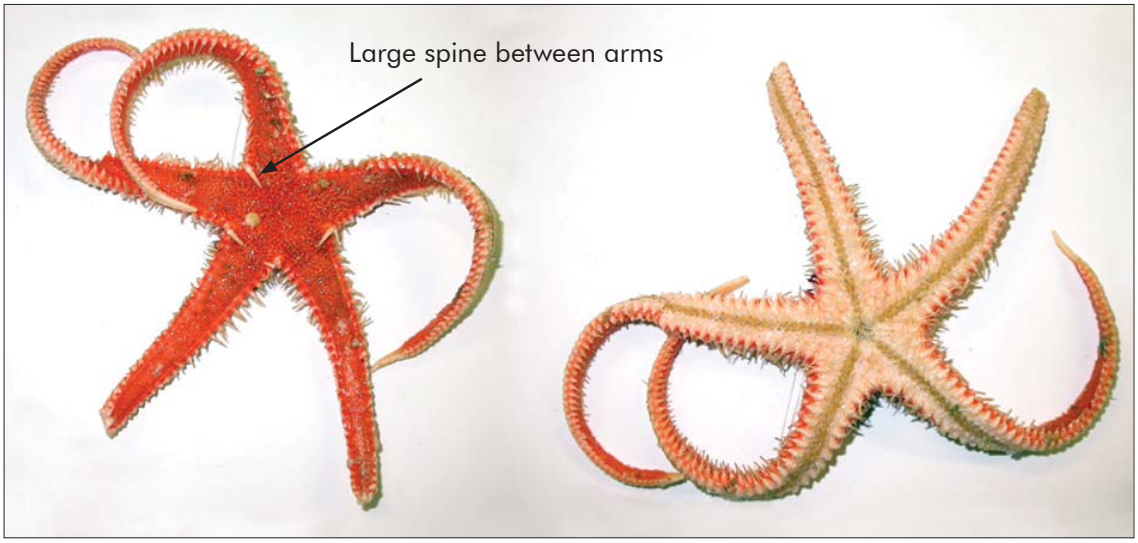
Depth: 300 to 2500 m.

Similar species: Seven species of *Zoroaster* are known from New Zealand waters, all similar in shape, and readily identified to genus; however a detailed examination is necessary to accurately identify the species. Illustrated is *Z. spinulosus*.

References: McKnight, D.G. (in press). The marine fauna of New Zealand. Echinodermata: Asteroidea (sea-stars). Orders Velatida, Spinulosida, Forcipulatida and Brisingida. *NIWA Biodiversity Memoir.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Notomyotida
Family Benthopectinidae

Benthopecten spp. (BES)



Distinguishing features: Disc small the 5 flat arms tapering, often coiled at the tips; lower and upper surfaces flat. Upper surface with numerous small spines and some larger; lower surface with larger spines. Plates at margins wider than long, with conspicuous erect spines, and between arm bases is one enlarged plate with 1 to 2 very large spines.

Colour: Upper surface often scarlet or reddish becoming pink distally; underside pale pink then whitish towards tip; larger spines red or white.

Size: Total width up to 220 mm.

Distribution: Throughout New Zealand, as far south as the Campbell Plateau.

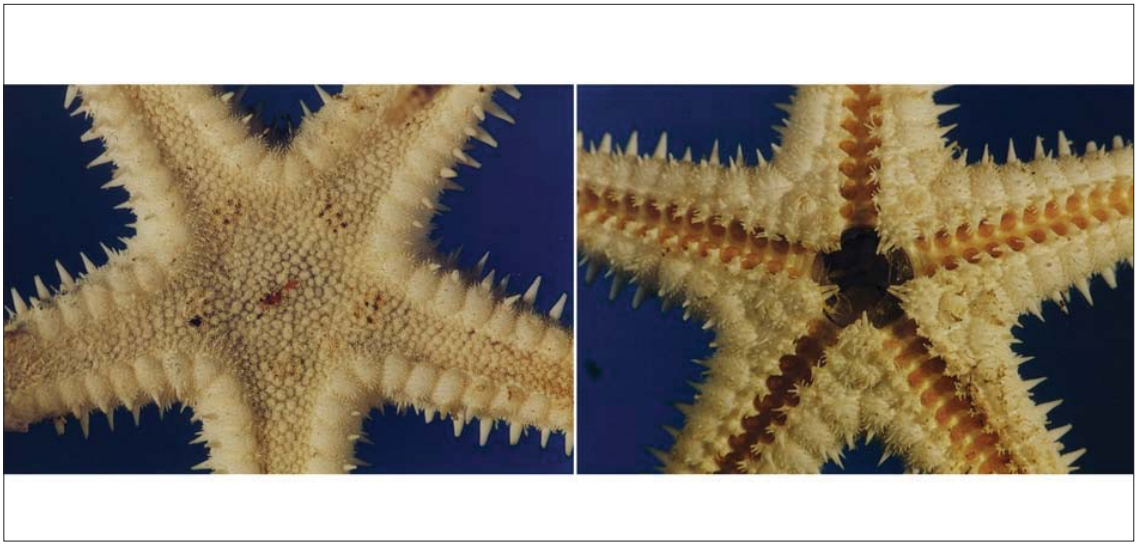
Depth: 200 to 620 m.

Similar species: Three species of *Benthopecten* have been reported from New Zealand, and are difficult to separate without a detailed examination.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea. Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Notomyotida
Family Benthopectinidae

Cheiraster monopedicellaris (CMP)



Distinguishing features: Disc and arms flat, upper and lower surfaces with numerous short spines, plates at margin conspicuous and swollen, each with 1 to 3 larger stubby spines. On lower surface behind mouth are two opposing combs of short curved spines which interlock, with one structure between each pair of arms.

Colour: Pink or gray on upper surface, cream below.

Size: Total width up to 80 mm.

Distribution: East coast of northern and central New Zealand.

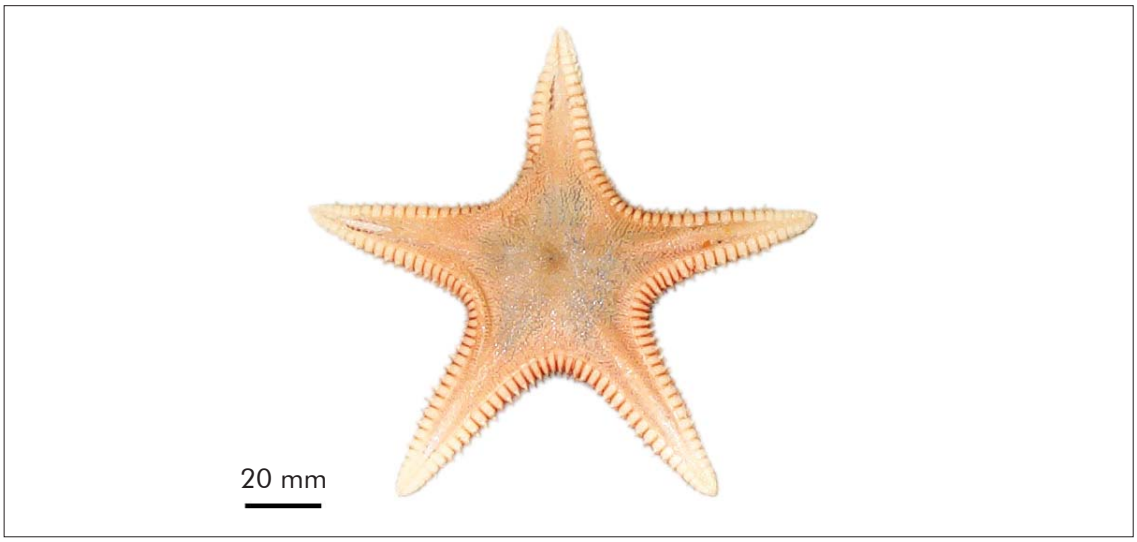
Depth: 600 to 900 m.

Similar species: There are six other species of *Cheiraster* recorded locally, and a detailed examination is needed to separate them; however this is the only species with the single comb-like structure behind the mouth.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea. Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Paxillosida
Family Astropectinidae

Dipsacaster magnificus (Magnificent sea-star) (DMG)



Distinguishing features: Large, with large, 5-armed flat disc. Arms broad at the base, tapering rapidly and evenly to a sharp tip. Plates of upper surface with clusters of short spinelets. Madreporite large, obscured by spinelets in a slightly depressed area near the marginal plates. Lower marginal plates project beyond upper plates to form a very distinct edge to disc and arms; both series of marginal plates bearing spinelets. Tube-feet pointed, in 2 rows and pointed, the sucking disc scarcely apparent.

Colour: Usually orange, but also recorded as light dirty grey with patches of yellow and salmon pink above, cream below.

Size: Total width up to 360 mm.

Distribution: Widespread around New Zealand, from Lord Howe Rise in the north to Campbell Plateau in the south, including the Chatham Rise and Louisville Ridge. Also widespread in Australian waters.

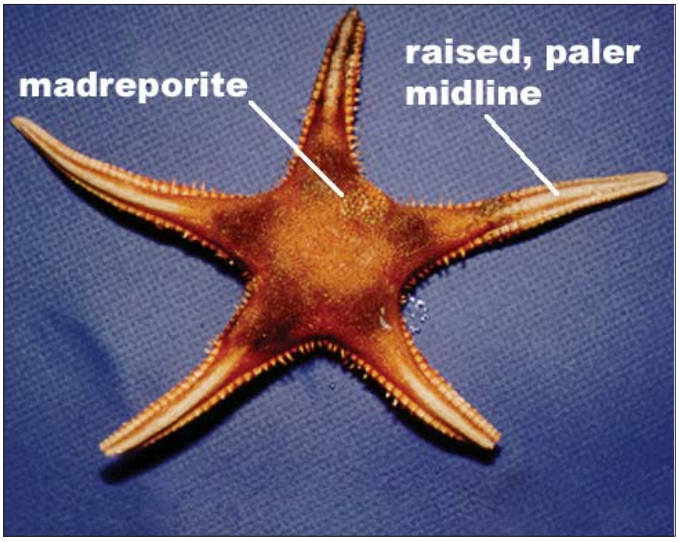
Depth: 100 to 1100 m.

Similar species: The only member of this genus found in New Zealand, D. magnificus is broadly similar to species of *Plutonaster*, *Proserpinaster*, and *Psilaster* but is larger, with broader arms and more regular rows of plates on both upper and lower surfaces.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Paxillosida
Family Astropectinidae

Plutonaster knoxi (Abyssal star) (PKN)



Distinguishing features: Disc large and flat, or slightly raised centrally and along midline of the 5, long, slender, arms. Plates of upper surface with short spines. Marginal plates separated by grooves lined with small spinelets, plates covered with granules, and usually each with an erect spine. Madreporite very large, intricately patterned, and covered by bushy clumps of spines. Tube-feet pointed, in 2 rows.

Colour: Generally orange, orange/red, with pale yellow. Often a paler orange/yellow stripe along midline of arms.

Size: Total width up to 260 mm.

Distribution: Widespread around the New Zealand region, especially common on the Chatham Rise.

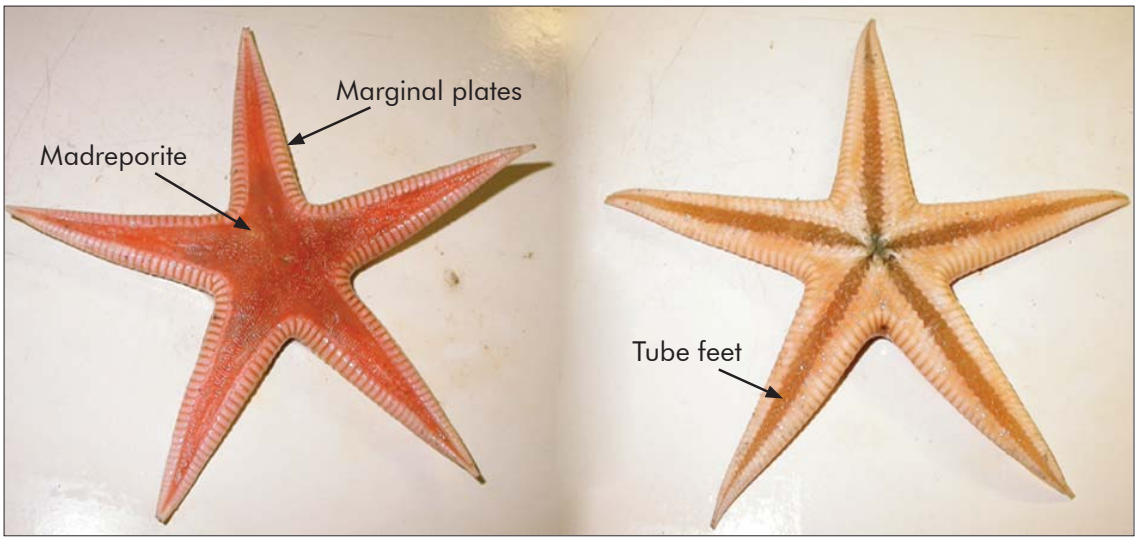
Depth: 500 to 2000 m.

Similar species: Seven species of *Plutonaster* are recorded from the New Zealand region, but *P. knoxi* is the most common; it also could be confused with *Dipsacaster*, *Psilaster*, and *Proserpinaster*.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*: 82–87.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Paxillosida
Family Astropectinidae

Psilaster acuminatus (Geometric star) (PSI)



Distinguishing features: Outline strongly star-shaped; disc and 5 arms flat although slightly raised near arm bases and slightly depressed centrally. Conspicuous madreporite located between arms and nearer to marginal plates than disc centre. Plates of upper surface with short spines. Marginal plates conspicuous, those of the upper series slightly raised and separated from each other by deep grooves, forming a distinct edge to the disc and arms. Lower marginal plates with short spines. Tube-feet pointed, in 2 rows.

Colour: Usually uniformly orange above, with much paler marginal plates. Upper surface also described as dark-pink, orange-pink, and bright-salmon. Creamy yellow below with delicate pink tube-feet.

Size: Total width from 10 to 240 mm.

Distribution: Very common in the New Zealand region, from Lord Howe Island in the north to Campbell Island in the south, including the Chatham Islands, but no records from Foveaux Strait or Stewart Island. Also known from Australia and South Africa.

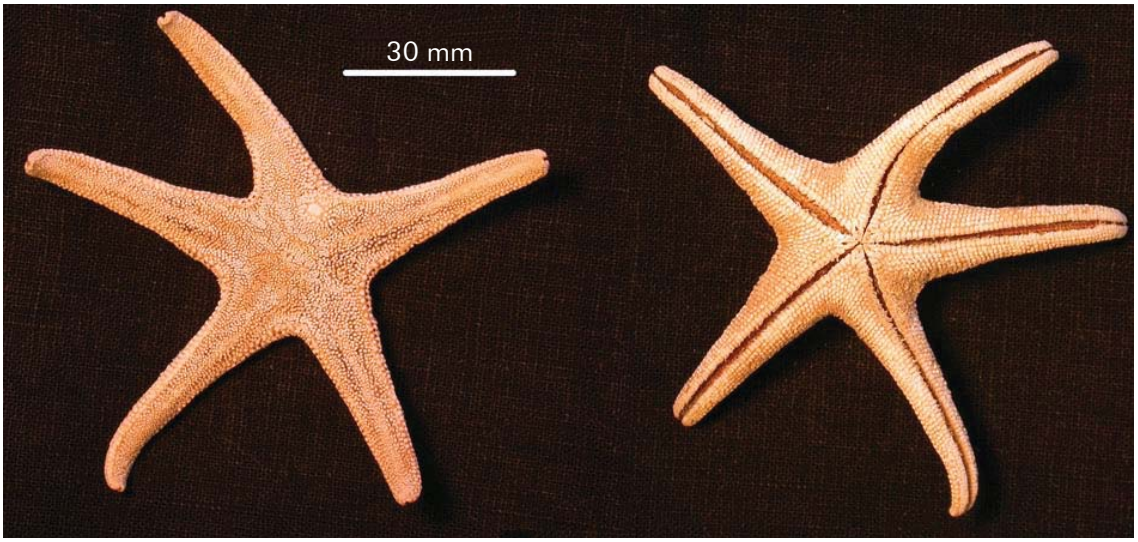
Depth: 30 to 2500 m. Most common from 200 to 600 m.

Similar species: Could be confused with species of *Plutonaster*, *Dipsacaster,* and *Proserpinaster*, but can be distinguished by its distinctive marginal plates.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*: 99–104.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Paxillosida
Family Radiasteridae

Radiaster gracilis (RGR)



Distinguishing features: Disc flat with 5 tapering arms. Upper surface covered with short spines; lower surface plates with a slight ridge covered with small spines separated by narrow bare areas; plates at margin inconspicuous.

Colour: Bright orange

Size: Total width up to 240 mm.

Distribution: Widespread throughout New Zealand, also south-eastern Australia and Tasmania.

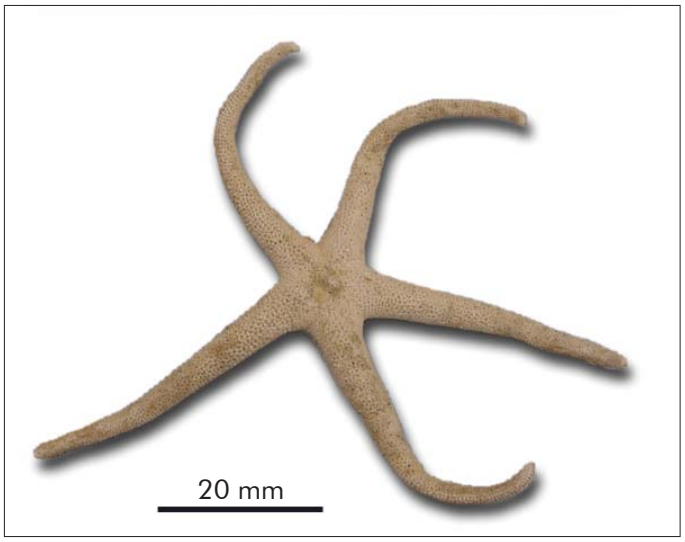
Depth: 30 to 2400 m.

Similar species: *Psilaster acuminatus* though similar has more prominent plates at the margin.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*: 92-96.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Spinulosida
Family Echinasteridae

Henricia compacta (HEC)



Distinguishing features: Disc small with 5 tapering, rounded, rigid arms. Entire surface densely covered with small erect spines, the underlying plates rounded and irregularly arranged, with small skin-covered areas between; short finger-like papillae project through the skin.

Colour: Usually cream or very light brown.

Size: Total width up to 140 mm. Generally small

Distribution: Widespread throughout the New Zealand region, the Tasman Sea and south-eastern Australia. In New Zealand common on seamounts.

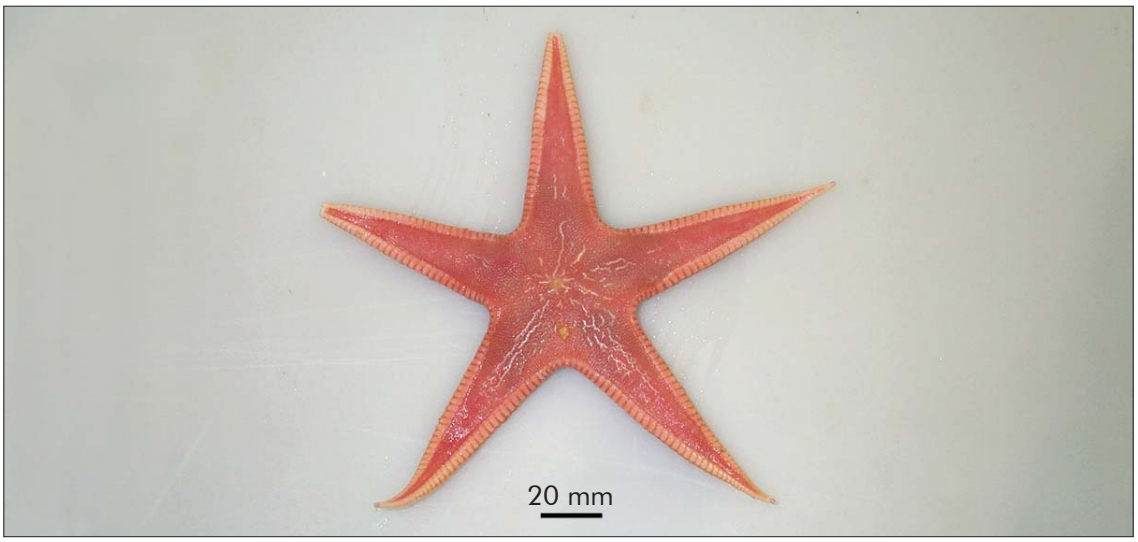
Depth: 100 to 1500 m.

Similar species: There are several species of *Henricia* known locally as well as a few in the related genera *Odontohenricia* and *Echinaster*. While none of these are as densely spined as *H. compacta*, separation of species in this family usually requires examination under a microscope.

References: McKnight, D.G. (2006): The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Orders Velatida, Spinulosida, Forcipulatida, Brisingida with addenda to Paxillosida, Valvatida. *NIWA Biodiversity Memoir, 120*.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Astropectinidae

Proserpinaster neozelanicus (PNE)



Distinguishing features: Disc large and flat, with 5 tapering arms. Plates of upper surface regularly arranged, covered with short spines; underside similar, but plates less regular in arrangement and often also with a larger spine. The upper plates of the marginal rows are broad, and both rows bear 1 to several larger spines.

Colour: Reddish or salmon-pink above, cream below.

Size: Total width up to 260 mm.

Distribution: New Zealand, from near the Three Kings Islands to the southern shelf; common on the Chatham Rise.

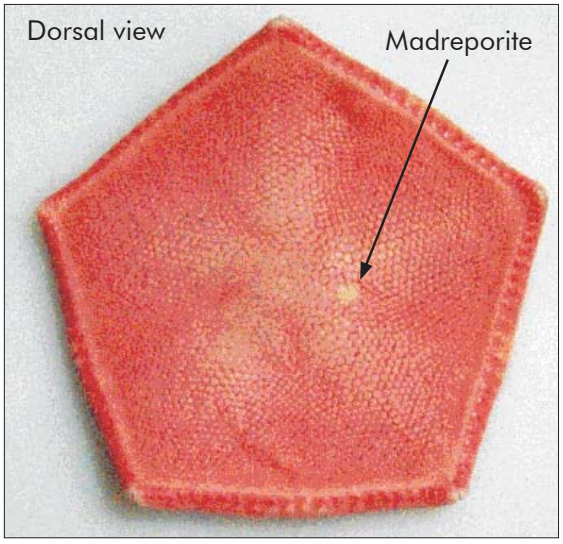
Depth: 90 to 1700 m.

Similar species: *Psilaster acuminatus* and *Plutonaster* spp. are similar but have narrower arms, with the upper marginal plates much narrower.

References: Clark, H.E.S.; McKnight, D.G. (2000). The marine fauna of New Zealand: Echinodermata: Asteroidea. Orders Paxillosida and Notomyotida. *NIWA Biodiversity Memoir 116*.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Goniasteridae

Ceramaster patagonicus (Pentagon star) (CPA)



Distinguishing features: Strongly and distinctively pentagonal and flat. Arms very short, tips gently upturned. Upper surface with regularly arranged, 4 to 6 sided plates, covered in granules. Madreporite small, naked, 5-sided, slightly raised, and near disc centre. Upper marginal plates form a definite, bevelled edge to the disc and arms, and number 26 from arm tip to arm tip. Tube-feet with sucking discs, in two rows.

Colour: Bright red or reddish-orange above, cream below.

Size: Total width up to 200 mm.

Distribution: Widespread in the Pacific, South Atlantic, and southern Indian Ocean. Found throughout much of southern New Zealand, but more common south of the Chatham Rise, including the Bounty Islands and Macquarie Island. Not recorded north of the Bay of Plenty.

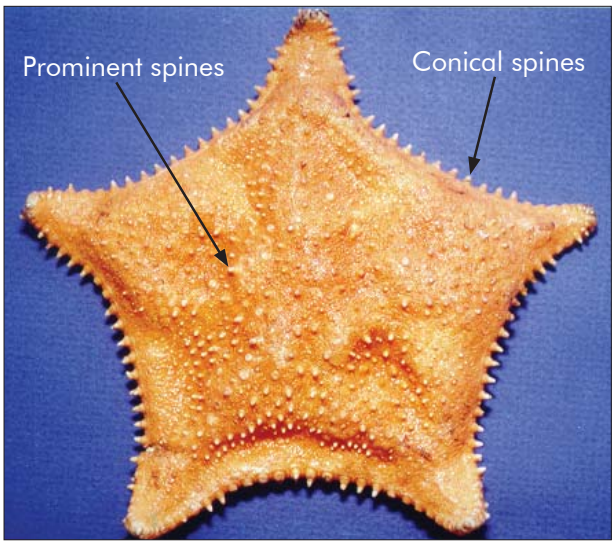
Depth: 200 to 1200 m.

Similar species: There are two subspecies. *Ceramaster. p. australis* (known only from the Macquarie Ridge) lacks the pedicellariae (jaw-like appendages) present on the upper marginal plates of *Ceramaster. p. patagonicus*. Small specimens from seamounts may represent different species. Species of *Pillsburiaster* differ in having rounded plates on the upper surface, and those of *Sphaeriodiscus* have scattered granules over the marginal plates.

References: Clark, H.E.S.; McKnight, D.G. (2001). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Order Valvatida. *NIWA Biodiversity Memoir 117*: 33–36.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Goniasteridae

Hippasteria phrygiana (Trojan star) (HTR)



Distinguishing features: Five short arms, disc large, near pentagonal, and usually inflated. Sturdy, blunt, conical spines form 2 rows on marginal plates (1 to 3 spines per plate). Large and small plates of the upper surface rounded, both with granules, the larger often with an erect spine. Tube-feet with sucking discs, in 2 rows.

Colour: Pale orange above, paler cream below.

Size: Total width up to 320 mm.

Distribution: Widely distributed in the northern hemisphere and in Australia (New South Wales and Victoria). In New Zealand it occurs from the Bay of Plenty south. Common on the Chatham Rise.

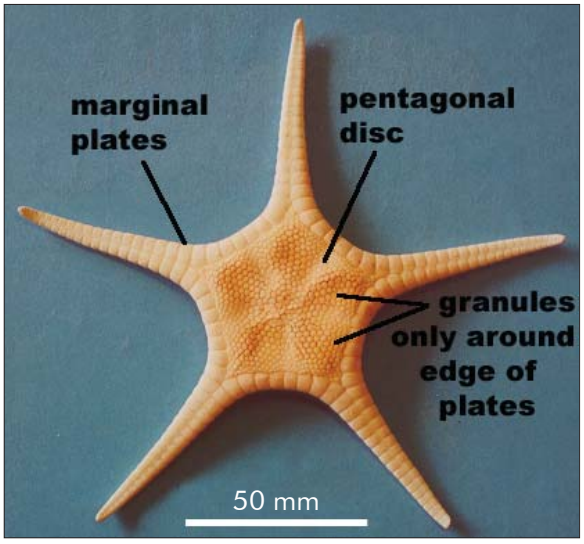
Depth: 20 to 1300 m. Most records from deeper than 500 m.

Similar species: The strong spines on the margins help to distinguish this species from similar shaped goniasterids such as *Mediaster* spp. and *Gilbertaster anacanthus*, which lack these spines, as does a rare species of *Hippasteria* from south of Tasmania.

References: Clark, H.E.S.; McKnight, D.G. (2001). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Order Valvatida. *NIWA Biodiversity Memoir 117*: 54–59.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Goniasteridae

Lithosoma novaezelandiae (Rock star) (LNV)



Distinguishing features: Disc pentagonal, bordered by conspicuous upper marginal plates which completely encase the arms from base to tip. Plates of the upper surface naked, ringed with small granules, close-fitting, mostly hexagonal, and very regularly arranged into rows. Madreporite small, naked, between arms, and nearer centre than edge of disc. Marginal plates relatively much larger in juveniles. Tube-feet with terminal sucking discs, in 2 rows.

Colour: Pale brown-cream above, light fawn below.

Size: Total width up to 320 mm.

Distribution: Widespread around New Zealand from north of the North Island to the Campbell Rise, but not known from the east coast between East Cape and Christchurch or from the west coast between North Cape and Cape Farewell.

Depth: 120 to 1200 m. Most common at 600 to 800 m.

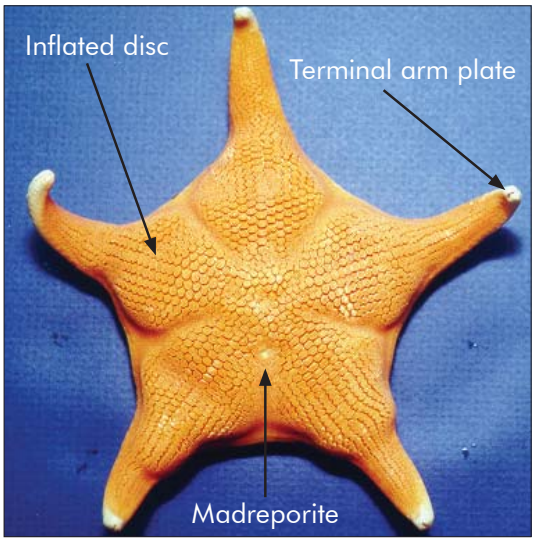
Similar species: *Glyphodiscus mcknighti*, from near Norfolk Island, is very similar. Two species of Rosaster also have the upper surface of the arms composed only of marginal plates, but plates of the upper surface are covered with granules.

References: Clark, H.E.S.; McKnight, D.G. (2001). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Order Valvatida. *NIWA Biodiversity Memoir 117*: 63–69.

McKnight, D.G. (1973). Additions to the asteroid fauna of New Zealand: Family Goniasteridae. *NZOI Records 1(13)*: 172–195.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Goniasteridae

Mediaster sladeni (Sladen's star) (MSL)



Distinguishing features: Disc large, irregularly inflated centrally and at arm bases. The 5 arms slender, evenly tapering to oval terminal plates. Plates on upper surface are regular in shape (having an oval, enlarged, flattened head) and form a close cover. Some plates bear in their centre relatively conspicuous pedicellariae (jawlike appendages) with 2 to 3 jaws. Madreporite hexagonal, between arms, and nearer to disc than to marginal plates.

Colour: Orange.

Size: Total width up to 230 mm. Average width about 120 mm.

Distribution: From Three Kings Islands in the north to south of The Snares. Many records from the Chatham Rise.

Depth: 40 to 1000 m.

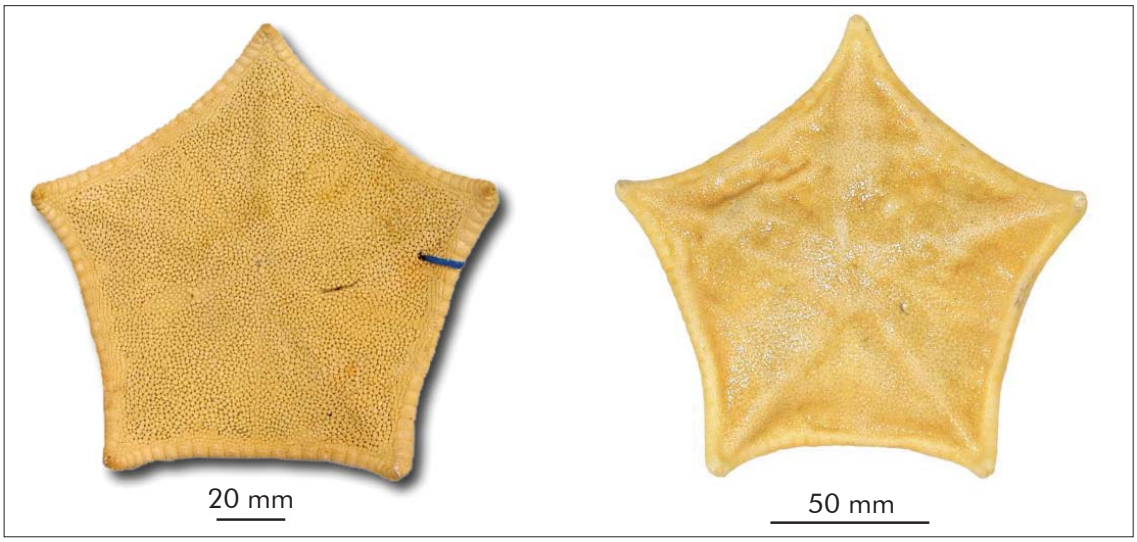
Similar species: *Mediaster gartrelli*, known from similar depths, but only from off Taranaki and the Kermadec Islands, has shorter arms; *M. arcuatus*, widespread at 600 to 1300 m, has shorter arms.

References: Clark, H.E.S.; McKnight, D.G. (2001). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Order Valvatida. *NIWA Biodiversity Memoir 117*: pp. 78–82.

McKnight, D.G. (1973). Additions to the asteroid fauna of New Zealand: Family Goniasteridae. *NZOI Records 1(13)*: 172–195.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Goniasteridae

Pillsburiaster aoteanus (PAO)



Distinguishing features: Outline almost pentagonal, the sides slightly concave. Upper surface covered with small granules, the plates round or ovoid in outline, and not in regular rows. Lower surface covered with similar small granules, plates at the margins often with a bare patch, which may become larger towards the arm tip.

Colour: Yellow to light brown.

Size: Total width up to 250 mm.

Distribution: Widespread throughout New Zealand and moderately common on seamounts.

Depth: 120 to 1600 m.

Similar species: It is similar to species of *Ceramaster*, but these can be distinguished by their bright red colour and the plates of their upper surface which are rectangular to hexagonal and arranged in regular rows.

References: Clark, H.E.S.; Mcknight, D.G. (2001). The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Order Valvatida. *NIWA Biodiversity Memoir 117.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Valvatida
Family Odontasteridae

Odontaster benhami (Pentagonal tooth-star) (ODT)

Distinguishing features: Outline roughly pentagonal, with a variable degree of arc between arm tips. Marginal plates separated by shallow grooves and slightly larger nearer the disc. On the underside, each of the oral plates (at the side of the mouth) has a larger, usually visible, backward-curving, glassy spine; tube-feet with sucking discs, in 2 rows.

Colour: Dull coloured, mostly light brown, reddish or orange, almost cream below.

Size: Total width up to 80 mm.

Distribution: The species has a generally southern distribution in the New Zealand region, from Cook Strait to near The Snares.

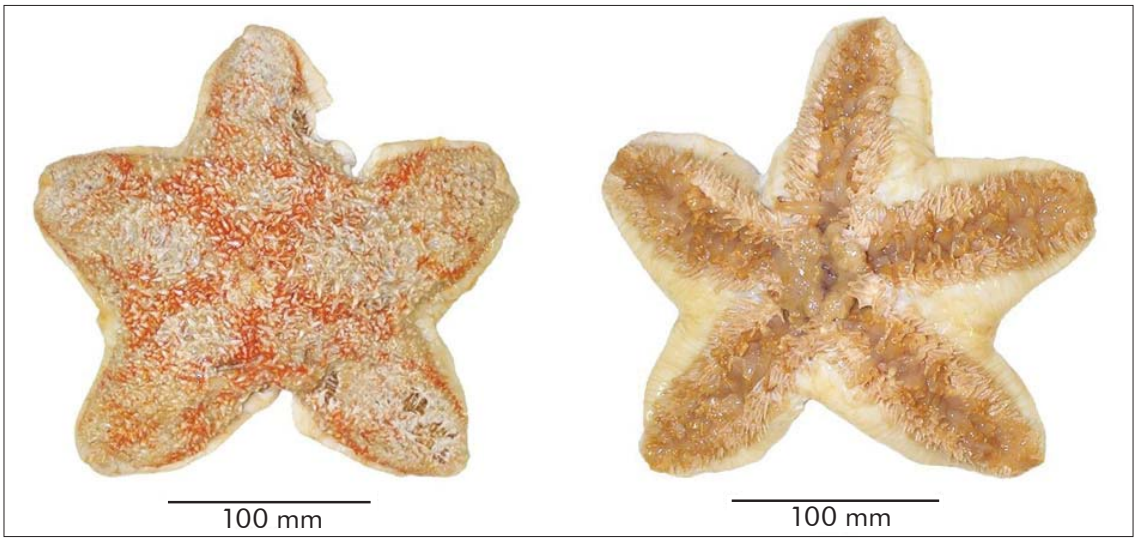
Depth: 0 to 550 m.

Similar species: Two other species occur in the New Zealand region, both superficially similar to *Odontaster benhami*. A lab examination may be necessary to separate them; *O. aucklandensis* is mainly subantarctic, 55 to 350 m, and *O. rosagemmae* occurs off the east coast of North Island and east of the Chatham Islands, 450 to 1200 m. Species of *Diplodontias* (in the same family) are also quite similar.

References: Clark, H.E.S.; McKnight, D.G. (2001). The marine fauna of New Zealand: Echinodermata: Asteroidea (sea-stars). Order Valvatida. *NIWA Biodiversity Memoir 117*: 144–145.

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Velatida
Family Pterasteridae

Diplopteraster sp. (DPP)



Distinguishing features: Disc large, fleshy and inflated, with a cover of skin supported by groups of spines. Plates at margin barely distinguishable. Tubefeet in four rows, small spines form transverse rows from tube feet, are united by a web of skin and alternate in number.

Colour: Grayish or cream.

Size: Total width up to 200 mm.

Distribution: East coast of New Zealand.

Depth: 800 to 1700 m.

Similar species: One other species of *Diplopteraster* is present and a detailed examination is needed to separate them. Other species in this family appear similar but differ in having the tube feet in 2 rows.

References: McKnight, D.G. (2006): The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Orders Velatida, Spinulosida, Forcipulatida, Brisingida with addenda to Paxillosida, Valvatida. *NIWA Biodiversity Memoir, 120.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Velatida
Family Pterasteridae

Hymenaster carnosus (HYC)

Distinguishing features: Disc large, almost pentagonal. Upper surface inflated and covered in skin with the underlying spinelets forming distinct figures on the surface. Lower surface flat. Tubefeet in 2 rows, spines along furrow not linked by skin, 2 spines to each pair of tube feet.

Colour: Light cream, sometimes with a slight purplish tinge.

Size: Total width up to 260 mm.

Distribution: Throughout New Zealand and also reported from off South America.

Depth: 1000 to 2000 m.

Similar species: There are at least 6 other species of *Hymenaster* known from local waters, though all are smaller with total diameter up to about 100 mm.

References: McKnight, D.G. (2006): The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Orders Velatida, Spinulosida, Forcipulatida, Brisingida with addenda to Paxillosida, Valvatida. *NIWA Biodiversity Memoir, 120.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Velatida
Family Solasteridae

Crossaster multispinus (Sun-star) (CJA)

Distinguishing features: Wide, flattened disc, with 11 to 12 arms; plates of upper surface spaced apart, each with a bundle of spinelets up to 5 to 10 mm long. Only lower marginal plates apparent, with short spines and granules; tube-feet with sucking discs, in 2 rows.

Colour: Orange-pink, whitish-pink, or mauve above.

Size: Total width up to 140 mm.

Distribution: Present throughout the New Zealand region, from the Kermadec Islands to the Campbell Plateau.

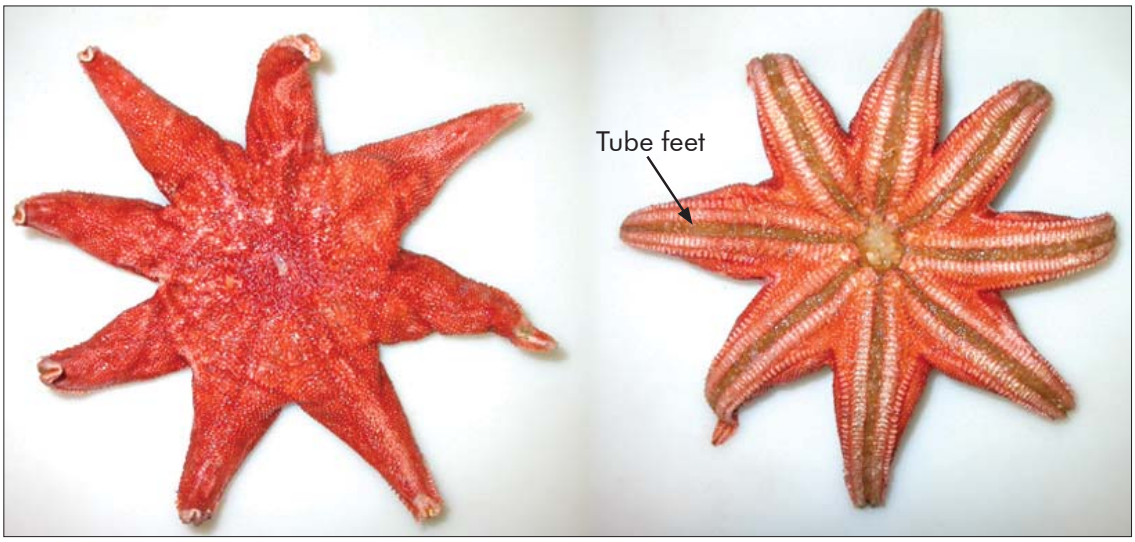
Depth: 90 to 1200 m.

Similar species: One other species, with 10 arms, is known from central and southern New Zealand, 200 to 400 m.

References: McKnight, D.G. (2006): The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Orders Velatida, Spinulosida, Forcipulatida, Brisingida with addenda to Paxillosida, Valvatida. *NIWA Biodiversity Memoir, 120.*

Phylum Echinodermata
Class Asteroidea (sea-stars)
Order Velatida
Family Solasteridae

Solaster torulatus (Chubby sun-star) (SOT)



Distinguishing features: With 7 to 9 arms, usually 8. Disc near flat, arms rounded, plump at the base. Upper marginal plates smaller than lower, which bear spinelets in a transverse row. Groups of 1 to 5 spines present on each plate of the upper surface. Tube-feet with sucking discs, in 2 rows.

Colour: Uniform orange (ranging to light brown) above, orange to light brown with paler tube-feet below.

Size: Total width up to 300 mm.

Distribution: Widespread over the Chatham Rise and sub-Antarctic. Also known from the Kermadec Islands and the east coast of the North Island, Australia, and Japan.

Depth: 219 to 1550 m.

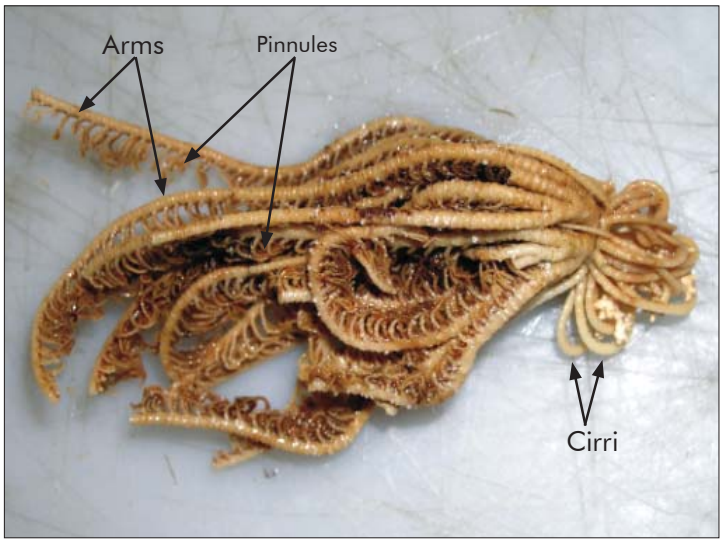
Similar species: Other sun-stars (family Solasteridae), such as *Crossaster japonicus*, which is common. It differs from *S. torulatus* in having finer, longer, and more numerous spines on the more closely spaced plates of the upper surface.

References: McKnight, D.G. (2006): The marine fauna of New Zealand Echinodermata: Asteroidea (Sea-stars). Orders Velatida, Spinulosida, Forcipulatida, Brisingida with addenda to Paxillosida, Valvatida. *NIWA Biodiversity Memoir, 120*.

McKnight, D.G. (1973). Additions to the asteroid fauna of New Zealand: Families Radiasteridae, Solasteridae, Pterasteridae, Asterinidae, Ganeriidae and Echinasteridae. *NZOI Records 2(1)*. 15 p.

Phylum Echinodermata
Class Crinoidea (sea lilies and feather stars)
Order Comatulida (feather stars)
Family

(Feather stars) (CMT)



Distinguishing features: Stalks are vestigial in this modern branch of the crinoids although their cirri remain, encircling the base of the 5–40 arms. The cirri are used for grasping the substrate when the animal is at rest, and are long and slender in soft bottom forms and short and stout in forms that rest on rocks, corals, etc. Each arm bears a row of pinnules producing a feather like appearance. They are fragile, and often only fragments are present in a sample.

Colour: Various, often strikingly coloured, but deepwater species more likely to be yellow or brown.

Size: From 100 to 350 mm (arm length).

Distribution: Widespread, but rare in the New Zealand region. They occur on soft or hard substrates.

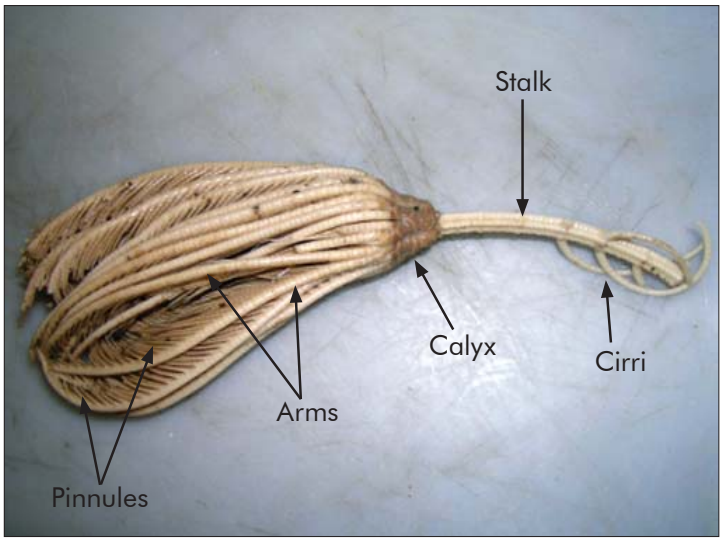
Depth: 50 to 2500 m. Range may be greater.

Similar species: At least 40 species of feather stars are present in the New Zealand region, and a microscopic examination is needed for species determination. Can be distinguished from sea lilies by the absence of a stalk. The photo is of *Oxycomanthus* sp.

References: McKnight, D.G. (1977). Additions to the New Zealand crinoid fauna. *NZOI Records 3 (11)*: 93–112.

Phylum Echinodermata
Class Crinoidea (sea lilies and feather stars)
Order Isocrinida (sea lilies)
Family

(Sea lilies with cirri) (CRN)



Distinguishing features: Sea lilies attach to the substrate with a stalk, up to 1 m long, topped with feathery arms arising from a small body (calyx). In this order small, segmented, cirri are present on the stalks. There are 5 arms at the base but they usually branch several times. A large specimen may have 40 or more arms. Each arm bears a row of small branches (pinnules) which bear the small tube-feet and produce a feather like appearance. Sea lilies are fragile, and often only fragments are salvaged.

Colour: Various. Reported as emerald green, purplish, or grey.

Size: Total length up to 1000 mm.

Distribution: Sea lilies are mostly found in deep water, especially on seamounts and, although rare in collections, are probably widespread in the New Zealand region.

Depth: 100 to 2000 m.

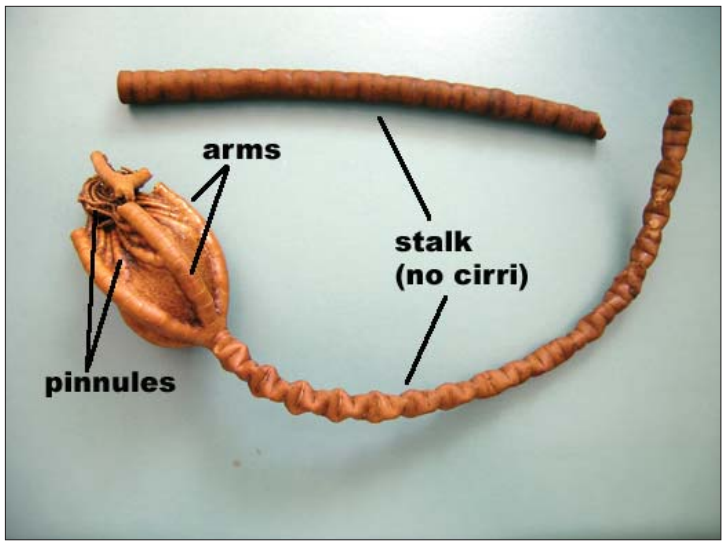
Similar species: Can be distinguished from feather stars (order Comatulida) by the presence of a stalk, and from the other two orders of sea-lilies (Millericrinida and Cyrtocrinida) by the presence of cirri on the stalk. The photo is of *Metacrinus* sp.

References: McKnight, D.G. (1977). Additions to the New Zealand crinoid fauna. *NZOI Records 3* (11): 93–112.

McKnight, D.G. (1973). Stalked crinoids from the New Zealand region. *NZOI Records 1(14)*: 199–210.

Phylum Echinodermata
Class Crinoidea (sea lilies and feather stars)
Order Millericrinida, Cyrtocrinida (sea lilies)
Family

(Sea lilies without cirri) (CRN)



Distinguishing features: Sea lilies attach to the substrate with a stalk, up to 1 m long, topped with feathery arms arising from a small body (calyx). No cirri are present on the stalks in this order. Each arm bears a row of small branches (pinnules) which bear the small tube-feet and produce a feather-like appearance. Sea lilies are fragile, and often only fragments are salvaged.

Colour: Various.

Size: Total length up to 1000 mm.

Distribution: Recorded from seamounts and areas of steep rocky relief throughout the New Zealand region.

Depth: 400 to 1500 m.

Similar species: The only species likely to be present in trawl samples is *Phrynocrinus nudus* (pictured, note: arms missing). It is similar in size to the isocrinid sea-lilies but, like all other members of these two orders, it lacks cirri on the stalk, and the arms branch irregularly.

References: McKnight, D.G. (1977). Additions to the New Zealand crinoid fauna. *NZOI Records 3 (11)*: 93–112.

McKnight, D.G. (1973). Stalked crinoids from the New Zealand region. *NZOI Records 1(14)*: 199–210.