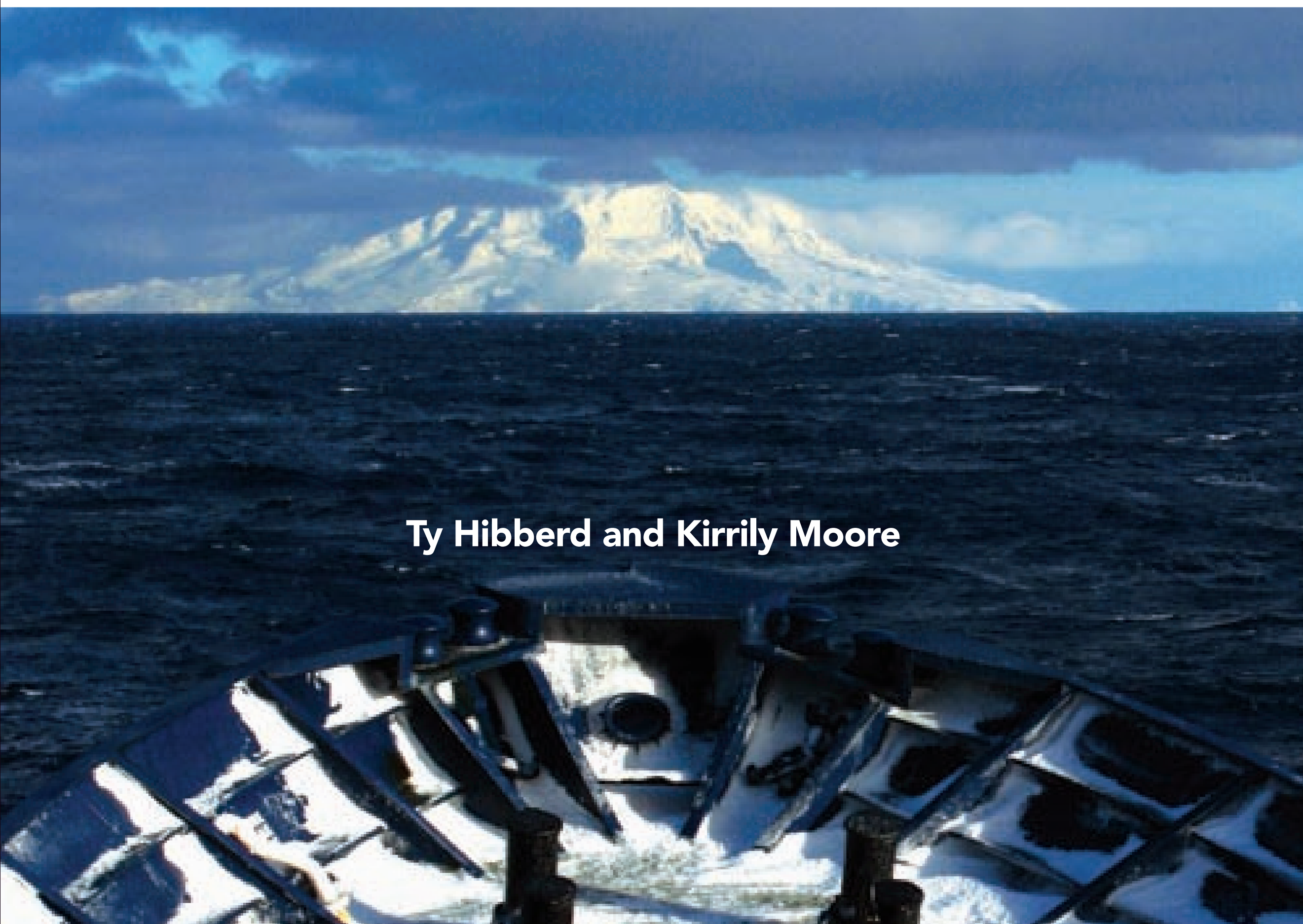
Field Identification Guide to Heard Island and McDonald Islands Benthic Invertebrates

A guide for scientific observers aboard fishing vessels



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Author:	Hibberd, Ty.
Title:	Field identification guide to Heard Island and McDonald Islands benthic invertebrates : a guide for scientific observers aboard fishing vessels / Ty Hibberd, Kirrily Moore.
Edition:	1st ed.
ISBN:	9781876934156 (pbk.)
Notes:	Bibliography.
Subjects:	Benthic animals—Heard Island (Heard and McDonald Islands)--Identification. Invertebrates—Heard Island (Heard and McDonald Islands)--Identification.
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Dewey Number:	591.77091675

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Australian Government
Australian Antarctic Division
Fisheries Research and Development Corporation

Funding for the production of this guide was provided by the
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Front cover photographs (clockwise from top left):
sea spider *Collossendeis* sp., heart urchin *Brisaster antarcticus*, sun star *Labidiaster annulatus*, bellator lobster *Thymopides grobovi* and Heard Island taken from the fishing vessel *Southern Champion*.

Back cover photographs (from left to right):
polychaete worm *Neanthes kerguelensis*, basket star *Gorgoncephalus chilensis*, acorn barnacle and sea snail.

Contents

Contents

Acknowledgements

Funding to produce the guide was provided by the Fisheries Research and Development Cooperation (FRDC) and industry partners under research project number 2006/042. We wish to thank Australian Antarctic Division staff Dirk Welsford and Keith Martin-Smith (comments and review), Tim Lamb and Troy Robertson (database and logistics); Gabrielle Nowara (mapping), David McLeod, Danora Buschkens and Samya Jabbour (sorting assistance and photography). Australian Fisheries Management Authority (AFMA) and Fisheries Audit Services (FAS) observers Jason Hamill, Keryn O'Regan, Stephanie Davenport, Carol Sutherland and Toby Cantell. Finally we wish to thank all those taxonomists who provided their expertise, Austral Fisheries Pty Ltd, and the skippers and crew of the *'FV Southern Champion'* for their patience and expertise in collecting benthic samples.

The majority of the images provided in this guide have been taken by the Authors and fellow AAD staff members David McLeod and Danora Buschkens. Schematics by Ty Hibberd, Dirk Welsford and Danora Buschkens. I am also delighted to include image contributions from a number of external photographers who are attributed throughout the book. Although we wish to give special mention to Nicolas Gasco, Muséum national d'Histoire naturelle, for his photographic expertise.

The authors welcome notification of any errors or possible improvement to this publication.

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Individual	Organisation	Area of Expertise
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Gary Poore	Museum Victoria	Crustacea
Robin Wilson	Museum Victoria	Polychaeta
Phillip Bock	Museum Victoria	Bryozoa
Mark Norman	Museum Victoria	Cephalopoda
Elizabeth Turner	Tasmanian Museum & Art Gallery	Bivalvia & Gastropoda
Daphne Fautin	University of Kansas, US	Actinaria
Andrea Crowther	University of Kansas, US	Actinaria
Carden Wallace	Queensland Museum	Actinaria
Jan Watson	Museum Victoria	Hydrozoa
Igor Smirnov	Zoological institute of RAS	Ophuroidea
Richard Willan	NT Museum & Art Gallery	Nudibranchia

Introduction

At the 2007 Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR-XXVI) the Working Group on Fish Stock Assessment (WG-FSA) noted a lack of reference material for the identification of benthic invertebrates in areas specific to which observers carry out their activities (SC-CAMLR-XXVI: Annex 5, paragraph 6.32). To improve the standard of observer identifications and also to assist in the identification of vulnerable areas, the Scientific Committee requested that guides be prepared for the identification of benthic organisms (SC-CAMLR-XXVI: paragraph 4.190). In response to this recommendation Australia has developed the *"Field identification guide to Heard Island and McDonald Islands (HIMI) benthic invertebrates"*. This Fisheries Research and Development Corporation (FRDC), Australian Fisheries Management Authority (AFMA) and industry funded production is first of its kind for the region, and is intended to be used as both a training tool prior to deployment at-sea, as well as for use by trained observers to make accurate identifications of invertebrate by-catch when operating in the HIMI region.

The Heard Island & McDonald Islands (HIMI) region

Heard Island and McDonald Islands (HIMI) form Australia's most remote sovereign territory, and one of two Australian Exclusive Economic Zones (EEZ) distant from the continental EEZ in temperate and sub-Antarctic waters (Figure 1 and 2). They are situated in the south Indian Ocean, about 4100 km southwest from the coast of Western Australia, a similar distance southeast of South Africa and 1700 km north of Antarctica. The closest land is the French territory of Îles Kerguelen, situated about 380 km to the northwest. Arising from the northern half of the Kerguelen Plateau, Heard Island, McDonald Islands and Îles Kerguelen form the only exposed peaks of the plateau. The plateau forms one of the largest oceanic ridges, extending 2100 km in a north-westerly direction from continental Antarctica into the Indian Ocean. These islands have severe climates. They lie directly in the path of a convergence zone where cold-temperate oceans meet polar waters. Heard Island is directly in the path of the Antarctic Circumpolar Current (ACC) and is in close proximity to, and south of, the Polar Front. A more detailed description of the region's physical and biological environments is provided in Meyer *et al.* (2000).

Human activities in the region are generally restricted to scientific based research expeditions and commercial fishing operations. The Australian Antarctic Division (AAD) coordinates scientific research programs in the HIMI region that address sustainable use of resources and ecosystem dynamics and contribute directly to management measures developed by CCAMLR: the assessment of benthic habitats and species constitutes part of this program.

HIMI benthic invertebrate habitats and species

The Territory of Heard Island and McDonald Islands (HIMI) was added to the World Heritage List in 1997 for its outstanding universal natural values and conservation significance. The environmental values of the region were recognised in the listing, although at that stage, little was known of the marine benthic habitats. In response to this, Meyer *et al.* (2000) reported on the status of information pertaining to the conservation values of HIMI region, with specific reference to benthic habitats. They identified several key habitats of outstanding conservation significance, many of which were subsequently protected by the HIMI Marine Reserve, declared under the Australian Environment Protection

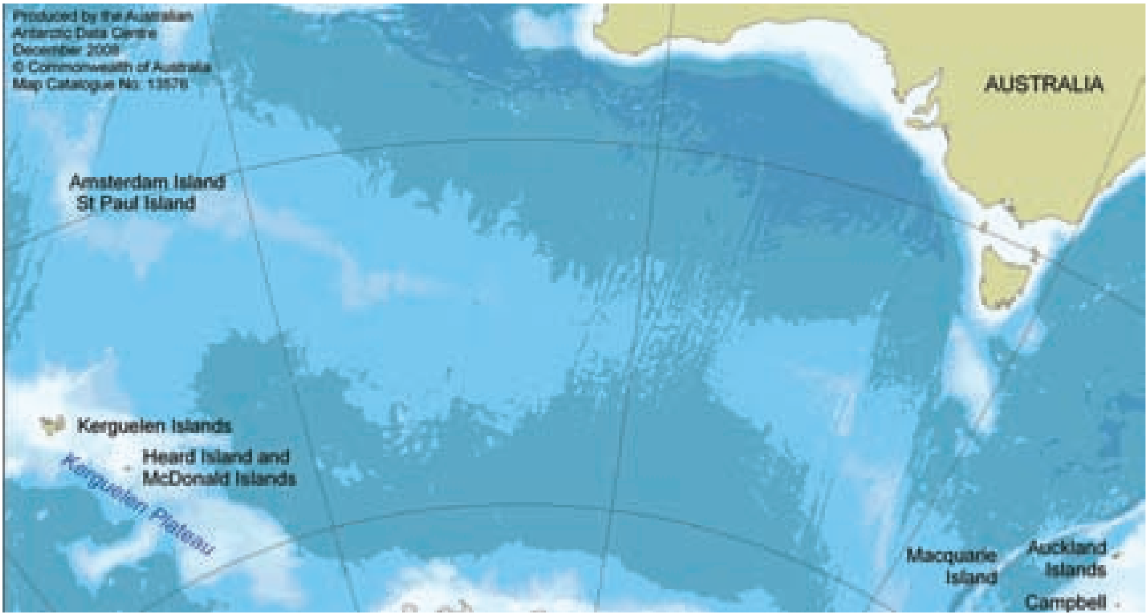


Figure 1 – Map of the Southern Ocean region showing location of Heard Island and McDonald Islands in relation to Australia and similar Subantarctic islands.

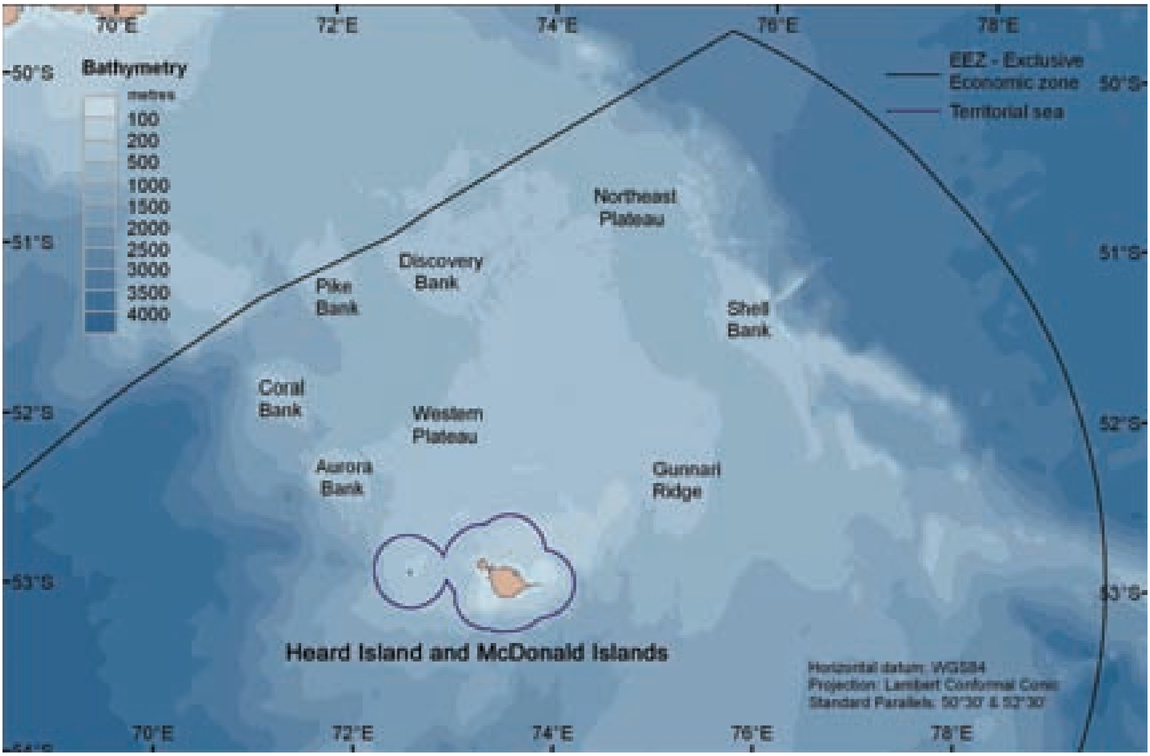


Figure 2 – Bathymetric map of HIMI and the surrounding region showing the territorial sea surrounding Heard Island and McDonald Islands and the EEZ boundary. Data provided by the Australian Antarctic Data Centre. The bathymetric grid was created by Geoscience Australia <http://www.ga.gov.au/meta/ANZCW0703009248.html>. The EEZ and territorial sea limits are from "Australian Maritime Boundaries" published by Geoscience Australia, 2006. <http://www.ga.gov.au/nmd/products/thematic/ambis.jsp>

and Biodiversity Conservation Act 1999 (EPBC Act) in October 2002. The reserve covers an area of 65,000 square kilometres (of which 64,630 square kilometres are marine) (see Figure 3) and includes the World Heritage listed islands and territorial sea, plus an additional marine area extending in parts to the 200 nautical mile Exclusive Economic Zone (EEZ) boundary. The declaration of a Conservation Zone (CZ) within the reserve under the EPBC Act was also initiated in October 2002 for identified MPA (Marine Protected Area) candidate areas to provide protection from threat of disturbance or damage (see Figure 3). The management objectives for the reserve are described in the Heard Island and McDonald Islands Marine Reserve Management Plan (AAD, 2005).

However, information pertaining to the distribution of benthic invertebrates in the HIMI region used by Meyer *et al.* (2000) was primarily qualitative, obtained from ad-hoc sampling of invertebrates collected in trawl surveys of fish in the early 1990s. Hence to further the understanding of the conservation values identified by Meyer *et al.* (2000), and to inform decisions regarding the effectiveness of the HIMI Marine Reserve and status of the Conservation Zones, the AAD undertook a quantitative assessment of benthic habitats throughout the region as part its HIMI Marine Research Program. This study collected 79 benthic samples from both research and commercial fishing vessels, and from these, 430 taxa were identified, including a range of slow growing and vulnerable benthos such as corals and sponges (Hibberd *et al.* 2008).

Additional information for this guide was also drawn from a subsequent assessment as part of a Fisheries Research and Development Corporation (FRDC) and industry funded project entitled “Demersal fishing interactions with marine benthos in the Southern Ocean: an assessment of the vulnerability of benthic habitats by demersal gears” (project no. 2006/042). This project was initiated in response to the lack of quantitative information on the impacts of bottom fishing on the benthic habitat, and aims to assess the vulnerability of and risks to benthic habitats in Australian fisheries in the Australian Exclusive Economic Zone (EEZ)/Australian Fishing Zone (AFZ) of the Southern Ocean to impacts by different demersal gears – trawl, longline and traps (Constable *et al.* 2007). In particular, this study is an initiative to help further our understanding of benthic habitats in the HIMI region, and their vulnerability to disturbance. To date an additional 67 quantitative samples have been collected under this FRDC project, all of which have been analysed to family level or better. Combined with the data collected in earlier research by the AAD (Hibberd *et al.* 2008), more than 500 taxa from 14 phyla have now been identified from the HIMI benthic community, the majority of which are represented in this guide. The areas from which quantitative benthic samples have been collected in the HIMI region are shown in Figure 3.

Objective of the guide

As a result of these surveys, we now possess a better understanding of the community structure of benthic habitats throughout the HIMI region. However, in order to obtain additional data of benthos and benthic habitats, observers aboard commercial and research vessels are required to identify and weigh all invertebrate by-catch within the HIMI region. However invertebrate diversity is broad in the area and identification requires at least some form of training to competently identify these organisms; particularly to family, genus or species level. This guide will enable observers and researchers to identify the more common organisms while at sea or in the lab, thereby improving the reliability of by-catch data from the HIMI fishery.

Based on available data, this publication includes instructions to observers for collection of benthic organisms at sea, quick-reference pictorial guides to invertebrate phyla, common species and CCAMLR identification codes, and detailed identification notes for each phylum including representative images for more than

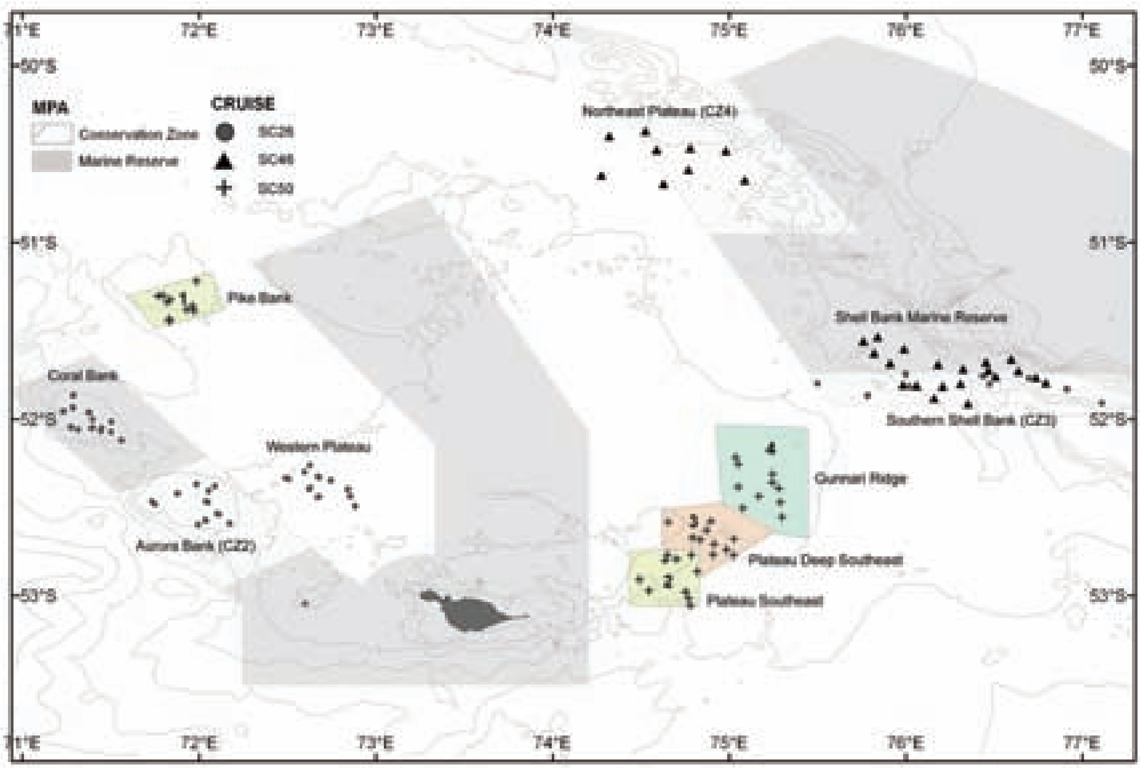


Figure 3 – Location of sampling areas and stations within the HIMI AEEZ showing the HIMI Marine Reserve and Conservation Zone boundaries. Data provided by the Australian Antarctic Data Centre.

The bathymetric contour data is from "Centenary Edition of the GEBCO Digital Atlas", 2003, published on behalf of the Intergovernmental Oceanographic Commission and the International Hydrographic Organization as part of the General Bathymetric Chart of the Oceans; British Oceanographic Data Centre, Liverpool. <http://www.gebco.net>

The Heard Island and McDonald Islands Marine Reserve boundaries were created by The Australian Government Department of the Environment, Water, Heritage and the Arts. <http://www.environment.gov.au/coasts/mpa>

400 benthic organisms identified from the HIMI region thus far. At this stage, taxa include echinoderms, molluscs, crustaceans, cnidarians, pycnogonids, ascidians, bryozoans, porifera, brachiopods, polychaetes and more.

A summary of the taxa included in this guide and the region in which they were recorded is given in the appendix.

Subsequent editions will be developed as we continue to find new species and obtain more accurate identifications of organisms in the collection which have yet to be identified to species level.

How to use this guide

Benthic organisms throughout this guide are arranged in conventional phylogenetic order, from structurally and anatomically less advanced groups (sponges), to the more advanced (echinoderms and tunicates). Each phylum is colour coded to assist with finding the appropriate sheets.

The **Pictorial guide to invertebrate groups and CCAMLR codes** can be used quickly and reliably to distinguish a particular phylum or family. It provides key identifying features, group name, representative images and a three-letter CCAMLR code. At this stage, several groups lack CCAMLR codes (i.e. barnacles, bryozoans, etc.); once allocated, these codes shall be added in subsequent editions. In the meantime, the CCAMLR code of the nearest taxonomic rank is to be used (e.g. the group code for crustaceans (FCX) is to be used for barnacles). The index to this guide may be useful to promptly locate the appropriate CCAMLR codes for benthic invertebrate phyla. The majority of taxa do not possess individual identification codes, and instead are grouped under family, or at least phylum. It is not imperative you identify each organism to species level; but do try to identify to the lowest level possible (i.e. family or genus). For further information on the phyla or for representative benthos images, from this guide, you may navigate to the appropriate pages under **Species identification documents**. Alternatively, if you are confident with your identification to group/family level, navigate through the **Pictorial guide to common HIMI taxa**.

The **Pictorial guide to common HIMI taxa** provides an overview of individual benthic organisms you are most likely to encounter (i.e. individual seastar species). Although still under construction, we hope to allocate individual CCAMLR codes to these common taxa as opposed to the group codes provided in other sections. Then, if you feel confident on the identification of an organism to species or genus level, we will encourage you to use these individual codes as this may provide a higher resolution of bycatch composition and taxa distribution. See pages 31 to 43.

Species identification documents provide a more detailed guide to each group/phylum. Each description provides a basic introduction to the group including descriptive features, classification, distribution and ecology. For each group, representative images of each species/taxon found in the region is provided. Each photo is accompanied with a species/taxon name and a several digit code that is used by the Australian Antarctic Division to store data on individual taxon in a relational species database – these AAD codes may be added in the comments section of your catch composition sheets but *are not* CCAMLR codes. This shall assist in identification to at least the phylum level, and further where possible. See pages 45 to 128.

For each group description in the **Species identification documents** there is a colour coded box with the appropriate CCAMLR code, providing characteristic features of the group. These features may be used quickly and reliably to distinguish a particular phyla or family.

A guide to the collection, photography, preservation and sorting of benthos samples is provided on pages 15 to 18.

Guide to taxonomic levels

In biology, Taxonomy is defined as the science of naming, describing, and classifying organisms. When classifying organisms biologists follow a hierarchical tree structure to group and categorize species of organisms. At the top of this structure is a single classification, the root node, that applies to all objects (i.e. the root node for all living creatures is called 'Organism'). Nodes below this root are more specific classifications that apply to subsets of the total set of classified objects. (i.e. 'organism' would be separated into animals, plants, fungi, bacteria, etc.). So for example, in common schemes of scientific classification, the primary node for all echinoderms (i.e. sea stars, urchins, feather stars, sea cucumbers, etc.) is called 'Phylum' followed by nodes for the taxonomic ranks: class, order, etc. By comparing characteristics of individual organisms within a common node, biologists can distinguish one organism from another, allowing each organism to be classified as individual 'Species'. For instance, if you had two sea stars that share a common node at family level but physically or morphologically differ from one another; these two organisms will be placed on separate nodes at genus level (Figure 4). See example of the Sunstar, *Labidiaster annulatus*. Note that there are taxonomic ranks above phylum (i.e. Domain and Kingdom), but the only rank prominent to this guide is Kingdom Animalia; the classification for all living animals.

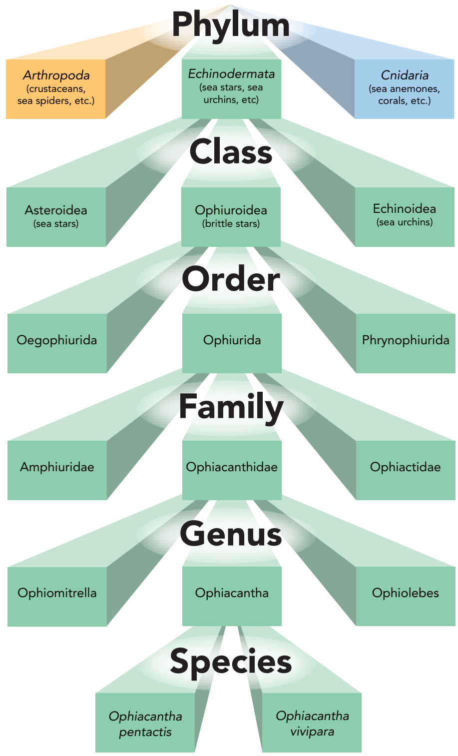


Figure 4 – The hierarchy of biological classification's major taxonomic ranks from Phylum to Species. Intermediate minor rankings are not shown.

Taxonomic levels in hierarchical order

Phylum – In biological taxonomy, a phylum is a taxonomic rank at the level below Kingdom and above Class. Phyla represent the largest generally accepted groupings of animals and other living things with certain evolutionary traits.

Class – A class is the taxonomic rank in the biological classification of organisms below phylum and above order. For example, Mammalia is the class used in the classification of dogs, whose phylum is Chordata (animals with notochords or backbones) and order is Carnivora (mammals that eat meat).

Order – The order is a taxonomic rank between class and family.

Family – Family is a rank intermediate between order and genus. Almost all families are named for a type genus, and are formed by adding the ending -idae (animals) or -aceae (plants) to the stem of the genus name.

Genus – A genus is a low-level taxonomic rank between family and species.

Species/taxa – In biology, a species is one of the basic units of biological classification and a taxonomic rank. A species is often defined as a group of organisms capable of interbreeding and producing fertile offspring.

Subphylum, subclass, subspecies, etc – These are intermediate minor rankings between the major taxonomic rankings described above.

Phylum:	Echinodermata
Subphylum:	Asterozoa
Class:	Stelleroidea
Subclass:	Asteroidea
Order:	Forcipulatida
Family:	Labidiasteridae
Genus:	Labidiaster
Species:	annulatus
Species name:	*Labidiaster annulatus*
Common name:	Sun star

Example of species classification: The Sunstar, *Labidiaster annulatus.*

Instructions for collection and processing at-sea

The intention of this guide is to assist you in the identification of deep-sea benthic fauna in the HIMI region. If you encounter an organism that you are unable to identify confidently to species, genus or family level, then we encourage you to retain the specimen for identification ashore.

Specimens should be retained only when they:

- cannot be identified confidently,
- have never been seen before and are not included in this guide,
- in exceptional condition (i.e. feather star with all its arms)
- listed under **Species of interest.**

Any specimen retained should be placed in a plastic zip-lock bag with a label clearly stating the **trip number, haul number** and **fishing ground**. Freeze immediately. For delicate specimens (e.g. urchins which might be smashed or feather stars that easily loose their legs), if possible, freeze in a container of seawater or at least half fill a zip-lock bag with water to give the specimen some protection. Place these 'unique' samples in a yellow sample bag.

Aside from identifying by-catch; observers are often required to collect benthic samples for research purposes using either a beam trawl or benthic sled. Instructions on how to deal with such samples follow.

Handling benthic samples: observers

Benthic samples collected using beam trawls or benthic sleds are often quite large and may need to be subsampled. The following instructions offer a step by step guide to dealing with research samples.

Whole catch

1. First weigh the whole catch including rocks.
2. If whole catch is less than 10kg retain it all. If whole sample is greater than 10kg take a straight simple subsample of the whole catch – aim for approximately 10kg for a subsample and maintain consistency between samples.
3. When taking a subsample, be as consistent as possible, don't pick out spectacular specimens from the main catch, and don't subsample large groups (i.e. sponges) separately. Just do a simple subsample from the whole catch so the proportions can be extrapolated reliably (i.e. take handfuls of benthos from the whole catch, paying no particular attention to any one organism, until you have your 10kg subsample)
4. However, once you have collected your subsample, scout through the remaining benthos for any unique specimens that are not included in the subsample. The same rational as above should be used when determining whether a specimen is unique and whether it should be retained for identification ashore. Freeze these specimens separately; maybe have one yellow sample bag labeled 'Unique Specimens'. Trash the remainder of the whole catch.

Subsample (or whole catch if catch is less than 10kg)

1. Large rocks can be weighed, recorded and trashed.
2. Separate the subsample to the best possible level – this may be simply putting all seastars together, all sponges together etc. or maybe right down to species level if time allows (i.e. distinguishing between two types of seastar). Freezing the sample as one mixed lump is a last resort only.
3. Do not worry about weighing groups of specimens or trying to label them 'Seastar 1'; it will be worked out later in the lab.
4. Common fish and rays that can be reliably identified should be counted, weighed (data recorded on the catch composition sheet) and released/mealed. Only retain fish that you are unable to confidently identify.
5. Put sorted specimens into zip-lock bags and then into a sack per haul for the freezer. If possible, place the more delicate specimens in containers of seawater or at least place water within the zip-lock bag to provide protection. Ensure there is adequate labeling. Place a label inside the sack and scribe the haul details on the bag. Clearly state the trip number, haul number and fishing ground and be as consistent as possible – the haul number is crucial.

Group	Fixation	Preservation
Annelida (Polychaetes)	10% formalin	70% ethanol
Crustacea	10% formalin	70% ethanol
Brachiopoda (lamp shells)	10% formalin	70% ethanol
Bryozoa (sea mosses)	70% ethanol	70% ethanol
Cnidaria Octocorallia (gorgonians & soft corals)	70% ethanol	70% ethanol
Cnidaria Scyphozoa (jellyfish)	10% formalin	10% formalin
Cnidaria (others)	10% formalin	70% ethanol
Echinodermata	70% ethanol	70% ethanol
Mollusca	10% formalin	70% ethanol
Platyhelminthes (flatworms)	10% formalin	70% ethanol
Porifera (sponges)	70% ethanol	70% ethanol
Pycnogonida (sea spiders)	70% ethanol	70% ethanol
Sipuncula (peanut worms)	10% formalin	70% ethanol
Urochordata (sea squirts & salps)	10% formalin	70% ethanol
All others ("default method")	10% formalin	70% ethanol

Table 1 – Preferred fixation and preservation methods for major groups of marine invertebrates as per Wilson (2005).

Handling benthic samples: researchers

Freeze benthic organisms as above, or if chemicals are available, preserve different groups as described in Table 1.

Sponges, bryozoa, echinoderms (sea stars, sea cucumbers, etc), octocorals (soft corals) and sea spiders *must not* be preserved in formalin, otherwise most groups can be placed in Steedmans Solution (10% buffered formalin). However, if DNA analysis is likely or necessary Steedmans solution must not be used – place specimens straight into ethanol at 70% or preferably higher. Large bodied specimens (anemones, octopuses, ascidians, and fish) may need to be preserved in formalin to ensure proper preservation. In this case, small pieces should be cut off and preserved in high percentage ethanol (100% if possible) for DNA analysis before the main body is preserved in Steedmans (ensure labeling is consistent; i.e. haul number).

Remove specimens from Steedmans Solution after one month and transfer to 70% ethanol for long term storage. Some 'wet' specimens like sponges require a higher percentage of ethanol to allow for the dilution of the solution by the water in the body of the animal.

Some phyla are damaged by the freezing process making identification impossible; seastars in particular. There is probably limited, if any, formalin/ethanol on board which will mean not all specimens of those groups listed will be able to be fixed/preserved rather than frozen. Use your best judgment to pick out good specimens for the ethanol and try to ensure at least one of every 'type' or 'taxon' is preserved. When the ethanol is exhausted revert to freezing everything.

Species of interest – what organisms to retain

Use you best judgment here. If you think it's a unique species and if it's not in this guide; retain it. Look out for fully intact specimens of the more fragile species, like a feather star with arms intact or a large crab with all legs attached. Any species of interest should be preserved in ethanol; or frozen in a container or small zip-lock bag full of sea water to retain their body form. Be sure to label everything consistently and take numerous photographs as colour and structure are often degraded by the freezing process. What to look out for:

Arthropoda

- Crustacea: Take special interest in intact specimens (i.e. large crabs which often have legs missing). Many of the larger deep-sea prawns are common, but look out for unusual specimens as occasionally new species are captured.
- Pycnogonida (sea spiders): There are many common larger pycnogonids like *Ammothea adunca* or *Decolopoda australis* (see 'Pycnogonida' p109). But look out for less common species or those with abnormalities (i.e. with barnacles attached or carrying eggs like *Ammothea* sp1)

Cnidaria

- Scleractina (hard corals): We request you keep all live hard corals like those on page 53 aside from *Flabellum* sp. (CNI7). These live corals are required for DNA analysis so ideally preserve them in ethanol; if not available, freeze immediately.

Echinodermata

- Crinoids (feather stars): Often have no arms attached and only the base remains. Look out for fully intact specimens.

- Asteroids (seastars): Seastars are abundant in the HIMI region but new species are often found. Seastars freeze very badly so preserve in ethanol if available.

Specimen photography

If possible, take photos of good specimens before preservation – set up a space with a black background and a tripod; take special effort with specimens with noteworthy colouring and soft bodied specimens which may be damaged in the freezing process; try to find intact specimens (e.g. crinoids or ophiuroids with arms; urchins with spines; crustaceans with legs). Additionally, try to set up contracted specimens in trays of saltwater, relax them with menthol or tobacco (e.g. anemones will extend tentacles) and then photograph them; take lots of photos – some of them will work! Also be sure to use a scale bar in the photo (i.e. ruler) as it's important that we can judge the size of the animal in frame.

Pictorial guide to Invertebrate groups and CCAMLR codes

This key is designed to assist the user in identifying benthic invertebrates to the group level. Included are basic identifying characteristics, group name and a three-digit CCAMLR code. For further identification see the appropriated information in **Species identification documents** or check the **Pictorial guide to common HIMI taxa** to see whether the organism in question is listed as 'common'.

Table 2 and 3 list the groups represented in this guide. Each phylum is colour coded to assist with finding the appropriate information. Several groups do not possess CCAMLR codes so where possible, try and identify to the nearest level (i.e. barnacles would be FCX – the group code for crustaceans) and make a note of the class/order in the comments section of the catch composition form. For those phylums that do not posess codes use INV (the CCAMLR code for invertebrates in general).

PHYLUM
Porifera (sponges)
Cnidarians (anemones, corals, jellyfish, etc.)
Platyhelminthes (flat worms)
Priapula (penis worms)
Sipunculidae (peanut worms)
Mollusca (clams, snails, slugs, octopus, etc.)
Annelida (marine worms)
Bryozoa (sea mosses)
Brachiopoda (lamp shells)
Arthropoda (crabs, prawns, barnacles, sea spiders, etc.)
Echinodermata (sea stars, urchins, basket stars, etc.)
Hemichordata (pterobranchs)
Urochordata (sea squirts & salps)

Table 2 – Colour codes used in this guide

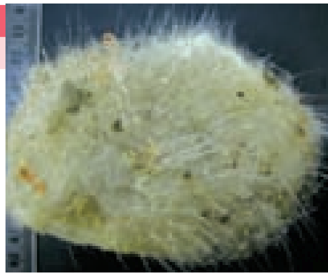
PHYLUM	CLASS/ORDER	ENGLISH NAME	CCAMLR CODE
Porifera		sponges	PFR
Cnidarians (CNI)	Actinaria	sea anemones	ATX
	Scleractinia	hard corals	CSS
	Gorgonacea	horny corals or gorgonians	GGW
	Alcyonacea	soft corals	no code (use AJH)
	Pennatulacea	sea pens	no code (use AJH)
	Scyphozoa	jellyfish	JEL
	Hydrozoa	hydroids and hydrocorals	no code (use CNI)
Platyhelminthes		flat worm	no code (use INV)
Priapula		penis worm	no code (use INV)
Sipunculidae		peanut worm	no code (use INV)
Mollusca (MOL)	Cephalopoda	octopus and squid	OCT & SQQ
	Bivalvia	clams or bivalves	CLX
	Gastropoda	sea snails or univalves	GAS
	Polyplacophora	chitons	no code (use MOL)
	Scaphopoda	tusk shells	no code (use MOL)
Annelida	Polychaeta	marine worms	WOR
Bryozoa		sea mosses	no code (use INV)
Brachiopoda		lamp shells	BRC
Arthropoda			
Crustaceans (FCX)	Decapoda	crabs	Species dependant
	Nephropidae	clawed lobsters	NEX
	Decapoda	prawns and shrimps	DCP
	Euphausiacea	krill	KRX
	Isopoda	sea slaters	ISH
	Amphipoda	sand hoppers	AQM
	Ostracoda	seed shrimps	no code (use FCX)
	Tanaidacea	tanaids	TVN
	Cumacea	hooded shrimps	no code (use FCX)
	Cirripedia	barnacles	no code (use FCX)
Cheliceriformes	Pycnogonida	sea spiders	PWJ
Echinodermata (ECH)	Asteroidea	sea stars	STF
	Ophiuroidea	brittle or basket stars	OWP
	Echinoidea	sea urchins	URX
	Crinoidea	feather stars and sea lilies	CWD
	Holothuroidea	sea cucumbers	CUX
Hemichordata	Pterobranchia	pterobranchs	no code (use INV)
Urochordata	Ascidiacea	sea squirts	SSX
	Thaliacea	salps and pyrosomes	SPX

Table 3 – Basic identifying characteristics, group name and three-digit CCAMLR code

COMMON NAME	**Sponges (PFR)**
PHYLUM	**Porifera**

Spongy, no definite appendages, some with obvious glass spicules. Variety of shapes and structures including encrusting mats, tubular, round, fan-shaped, vase-shaped and branching. If unsure break off a small piece, internally should look like and feel like a bath sponge.

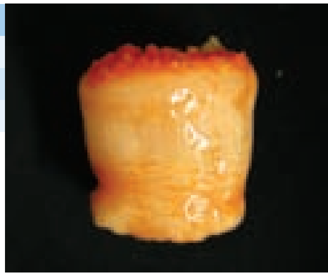
PAGE 45




COMMON NAME	**Anemones (ATX)**
PHYLUM	**Cnidaria**
CLASS	**Anthozoa**
ORDER	**Actinaria**

Anemones are large solitary polyps. The body is round or tubular, soft or firm, slimy, with tentacles. There is always an attachment point at the base although this is sometimes obscured by the contraction of muscles.

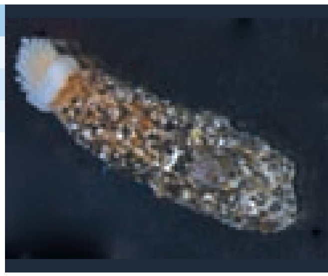
PAGE 50




COMMON NAME	**Tube anemones (ATX)**
PHYLUM	**Cnidaria**
CLASS	**Anthozoa**
ORDER	**Ceriantharia**

Cerianthareans are solitary corals with anemone-shaped, elongated bodies adapted for burrowing. The body is covered by a cylindrical holster and is usually hidden in muddy substrate.

PAGE 52




Photograph by David Wu

COMMON NAME	**Stony corals (CSS)**
PHYLUM	**Cnidaria**
CLASS	**Anthozoa**
ORDER	**Scleractinia**

Hard corals with a solid calcareous skeleton. Can be colonial or solitary.

PAGE 53


COMMON NAME	**Soft corals (no code – AJH)**
PHYLUM	**Cnidaria**
CLASS	**Anthozoa**
ORDER	**Alyconacea**

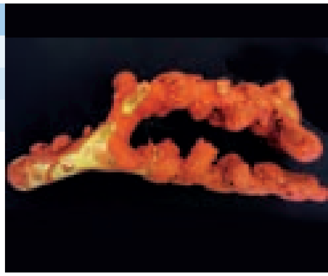
Soft colonial corals; plant-like with a trunk or branches but soft bodied; structure may resemble hard coral but is soft. May look like a colony of mini-anemones. Often quite colourful (reds, pinks, oranges, etc).

PAGE 54

COMMON NAME	**Horny corals (GGW)**
PHYLUM	**Cnidaria**
CLASS	**Anthozoa**
ORDER	**Gorgonacea**

Plant-like branching colonies of small hard polyps. Has a definite trunk from which branches of tiny polyps protrude. The polyps are placed individually along the branches and look quite 'spiky' close up.

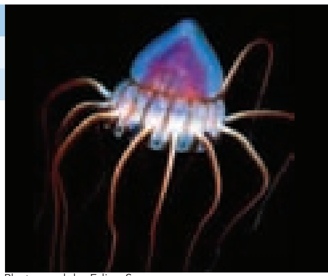
PAGE 56



COMMON NAME	**Jellyfish (JEL)**
PHYLUM	**Cnidaria**
CLASS	**Scyphozoa**

Jellyfish. Soft gelatinous masses that look and feel like 'Jelly'. Umbrella shaped body with tentacle bordering the rim.

PAGE 59



Photograph by Erling Svensen

COMMON NAME	**Hydroids (no code – CNI)**
PHYLUM	**Cnidaria**
CLASS	**Hydrozoa**

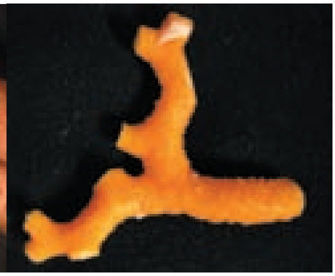
Plant-like cnidarians that form branching or erect 'fern-like' colonies usually 3-10 cm high. Lack obvious mini-anemones like gorgonians.

PAGE 60

COMMON NAME **Hydrocorals (no code – CNI)**
PHYLUM **Cnidaria**
CLASS **Hydrozoa**

Hard, branching, colonial hydrozoans which superficially resemble true hard corals. Often brightly coloured; orange, pink, etc. Dotted in tiny openings which house microscopic polyps.

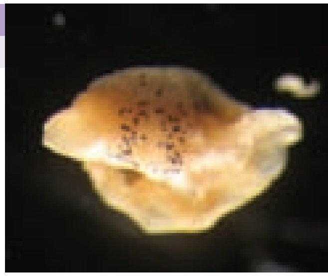
PAGE 63

COMMON NAME **Flat worms (no code – INV)**
PHYLUM **Platyhelminthes**

Relatively simple soft-bodied invertebrate animals. Unlike their worm-like relatives the annelids, flatworms are unsegmented. The flatworm's soft body is ribbon-shaped, flattened dorso-ventrally (from top to bottom), and bilaterally symmetrical. Most flatworms are free-living, but many are parasitic.

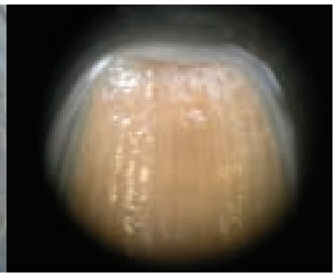
PAGE 64




COMMON NAME **Penis worms (no code – INV)**
PHYLUM **Priapulida**

The cylindrical priapulid body, ranging in length from 0.5 mm to 30 cm, is covered by a thin cuticle, which is divided into three regions: an extensible tube-like proboscis, a trunk, and a tail-like caudal appendage. The body is ringed, and often has circles of spines. These small, yellow or brown, carnivorous worms are free-living.

PAGE 65

COMMON NAME **Peanut worm (no code – INV)**
PHYLUM **Sipunculidae**

Cylindrical worm-like animals. Bilaterally symmetrical, unsegmented marine worms. Can retract their body into a shape resembling a peanut kernel.

PAGE 66


COMMON NAME	**Snails, sea slugs, limpets (GAS)**
PHYLUM	**Mollusca**
CLASS	**Gastropoda**


Usually have a shell of one piece (often coiled), although in some the shell is either reduced or completely absent. Shelled forms are called "snails" and forms without shells are called "sea slugs". With or without a shell, gastropods have a well developed head and a broad, flat muscular foot. Limpets have a conical or 'bowl-shaped shell' as opposed to the spiral shell of the snails.

PAGE 71

COMMON NAME	**Clams and Scallops (CLX)**
PHYLUM	**Mollusca**
CLASS	**Bivalvia**



Photograph by Nicolas Gasco

Laterally flattened molluscs with two valves (shells) hinged at one end. The body is completely enclosed within the valves.

PAGE 73

COMMON NAME	**Chitons (no code – MOL)**
PHYLUM	**Mollusca**
CLASS	**Polyplacophora**



Photograph by Jean-Luc Aubert

Slug-like molluscs characterized by their shell which is divided into 8 overlapping plates that form an armor-like appearance. The body is ovoid shaped with a minute head with no eyes or tentacles.

PAGE 76

COMMON NAME	**Tusk shells (no code – MOL)**
PHYLUM	**Mollusca**
CLASS	**Scaphopoda**


The Scaphopoda have a distinctive tapering, tubular shell that is open at both ends, superficially resembling the tusk of some mammals like the elephant.

PAGE 77

COMMON NAME	**Octopus (OCT) & squid (SQQ)**
PHYLUM	**Mollusca**
CLASS	**Cephalopoda**

Squid have an elongated, torpedo-like body with posterior fins and 2 large well-developed eyes. Octopus have a globular sac-like body with 8 arms conjoined at the base.

PAGE 78

Photograph by Nicolas Gasco

COMMON NAME	**Marine worms (WOR)**
PHYLUM	**Annelida**
CLASS	**Polychaeta**

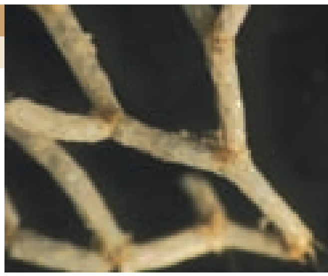
The body is segmented and each segment has a pair of fleshy leg-like appendages bearing bristles. Tiny eyes, antenna and accessory appendages are sometimes obvious at the head end. They may be burrowers, tube-dwellers or free living.

PAGE 80

COMMON NAME	**Sea mosses (no code – INV)**
PHYLUM	**Bryozoa**

Plant-like with branches and trunks but ‘crunchy’, can also be flat, encrusting colonies also ‘crunchy’; skeleton made up of many tiny zooids. All structures within one colony are identical. Often resemble hard corals.

PAGE 82



COMMON NAME	**Lamp shells (BRC)**
PHYLUM	**Brachiopoda**

Two-shelled. Clam-like; superficially resembles a bivalve but the valves (shell) enclose the animal dorsally and ventrally rather than laterally, and one valve is typically larger than the other. Attached species may have a short fleshy stalk protruding from the hinge area of the valves.

PAGE 85

COMMON NAME	**King & Stone crabs (KCX)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea (FCX)**
ORDER	**Decapoda**

Lithodes murrayi (KCM)
Photograph by Nicolas Gasco

Paralomis sp. (PAI)
Photograph by Nicolas Gasco

Large burnt-orange to red crabs with a carapace covered in sharp spines and tubercles (wart-like projections). *Paralomis* and *Lithodes* species differentiated by their abdomen and rostrum. The abdomen of Lithodes has a membranous region, whereas Paralomis does not. The carapace of Paralomis is also more pear-shaped and the rostrum is shorter.

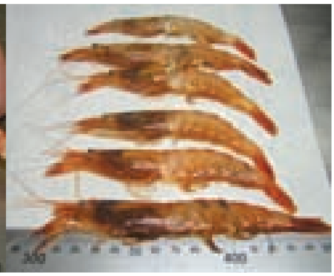
PAGE 88

COMMON NAME	**Clawed lobsters (NEX)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Nephropidae**

'True' lobsters characterised by a hard exoskeleton and 10 legs; the front pair adapted to claws (one claw is often larger than the other). So far only one species known from the HIMI region, Thymosides grobovi (the bellator lobster). This bright orange coloured lobster is usually 3 to 11 cm in length, and somewhat resembles a freshwater crayfish or 'yabby'.

PAGE 90

COMMON NAME	**Prawns & shrimp (DCP)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Decapoda**



Photographs by Keryn O'Regan

Well developed carapace, often with a forward pointing rostrum, and a large abdomen. Five pairs of legs, some of which may be large and clawed. Individuals of the genus Pasiphea are common in the deep waters around HIMI.

PAGE 90

COMMON NAME	**Krill (KRX)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Euphausiacea**

Shrimp-like animals. Carapace with a forward pointing rostrum and a pair of compound eyes. Unlike shrimps, the gills of krill are not enclosed in the carapace and hang vertically between the thoracic appendages

PAGE 92

COMMON NAME	**Sand hoppers (AQM)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Amphipoda**


In general amphipods are flattened from side to side (laterally-flattened), but more accurately they are defined by the presence of "different legs" including tail-limbs (uropods), two pairs of modified appendages for feeding and seven pairs of legs. Two pairs of antennae, and eyes not on stalks. Often give the appearance of a shrimp, but there is no defined carapace. Generally no larger than 1cm although larger species exist.

PAGE 93

COMMON NAME	**Sea slaters (ISH)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Isopoda**


Dorso-ventrally flattened animals with eight pairs of appendages; the first pair which function as mouthparts, and seven pairs of walking legs which are usually of similar structure hence the name "isopoda" which translates to "equal legs" in Greek. Some have a very prehistoric appearance with a shield shaped head and no carapace; others are very insect-like, with a defined body and abdomen; walking high on legs.

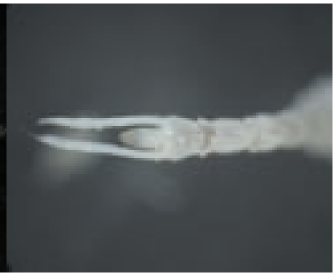
PAGE 96

COMMON NAME	**Tanaids (TVN)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Tanaidacea**


Minute crustacea with 6 thoracic segments and 5 abdominal. Most tanaids are small (2 to 5 mm long), but adult size reaches 0.5 to 120 mm. They have claws on the first walking legs, and are often found residing in sandy tubes.

PAGE 99

COMMON NAME	**Hooded shrimps (no code – FCX)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Cumacea**

Small marine crustaceans with a unique appearance and uniform body plan. They have a strongly enlarged carapace, slim abdomen and a forked tail. The length of most species varies between 1 and 10 mm.

PAGE 100

COMMON NAME	**Seed shrimps (no code – FCX)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Ostracoda**


Tiny crustaceans (generally < 2 mm) with the body entirely enclosed within a bivalved carapace. Often confused as molluscs as they parallel bivalves in many ways. Like bivalves they have two interlocking valves, althought the valves of the ostracods are soft and chitionous as opposed to the bivalves hard calcareous shell.

PAGE 101

COMMON NAME	**Barnacles (no code – FCX)**
PHYLUM	**Arthropoda**
CLASS	**Crustacea**
ORDER	**Cirripedia**

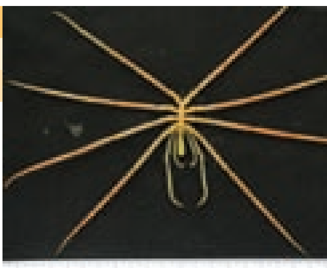

Goose Barnacle


Acorn Barnacle

Two types exist: stalked (goose barnacles) and non-stalked (acorn barnacles). The main body region (capitulum) bears at least 5 hard calcareous plates. The stalk of goose barnacles is strong and leathery. Barnacles are sessile and can attach to most surfaces, including other animals. They are commonly seen attached to sea spiders; make note of this association if observed.

PAGE 102

COMMON NAME	**Sea spiders (PWJ)**
PHYLUM	**Arthropoda**
CLASS	**Pycnogonida**




Resemble terrestrial spiders. They are mostly legs. The body is severely reduced, with a vestigial abdomen, and a head that is dominated by a large proboscis and adjacent appendages that protrude forward.

PAGE 104

COMMON NAME **Sea stars (STF)**
PHYLUM **Echinodermata**
CLASS **Asteriodea**

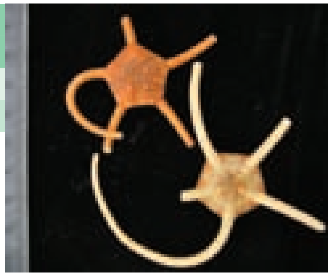
Sea stars or star fish; often 5 arms but can have many. Arms long or short, usually soft or floppy, with rows of tube feet along the underside obvious. Arms appear to flow from the central axis of the body as opposed to the clearly defined body in ophuroids.

PAGE 109

COMMON NAME **Brittle stars (OWP) & basket stars (SBA)**
PHYLUM **Echinodermata**
CLASS **Ophiuroidea**

Small central disc with long thin firm, brittle arms; sometimes arms are long and smooth or branched (i.e. basket stars). Arms have a much solider construction than Asteroids.

PAGE 114



Brittle star

Basket star

COMMON NAME **Sea urchins (URX)**
PHYLUM **Echinodermata**
CLASS **Echinoidea**

Two groups: regular and irregular echinoids. Regular echinoids have round brittle bodies with spines which are often missing. Irregular echinoids include the heart urchins which are very brittle, ovoid shaped and dorsally flattened, with small spines.

PAGE 117

Heart urchin

Regular urchin

COMMON NAME **Sea cucumbers (CUX)**
PHYLUM **Echinodermata**
CLASS **Holothuridae**

Sea cucumbers; soft tubular bodies with rows of tube feet, sometimes with obvious tentacles, no flat attachment point, mouth and anus opposite ends

PAGE 118

COMMON NAME	**Feather stars & sea lilies (CWD)**
PHYLUM	**Echinodermata**
CLASS	**Crinoidea**

Feather stars have a central knob with 5 or 10 long feathery arms and are almost always badly damaged with arms broken off leaving only the central knob. Sea lilies are attached by a stalk. In contrast to other echinoderms, the oral surface of the crinoids faces up.

PAGE 121

Sea lily

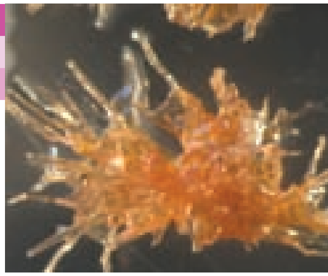
Photograph by Frederic Siniand

Feather star (base or central knob only).

COMMON NAME	**Pterobranchs (no code – INV)**
PHYLUM	**Hemichordata**
CLASS	**Pterobranchia**

A clade of small, worm-shaped animals that live in soft secreted tubes which, for branching colonies, have a plant-like appearance and may easily be mistaken for such organisms as algae. Very hard to see worms without a microscope.

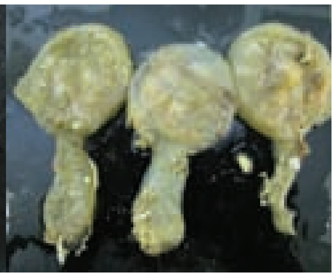
PAGE 123



COMMON NAME	**Tunicates or sea squirts (SSX)**
SUBPHYLUM	**Urochordata**
CLASS	**Ascidiacea**

Sea squirts can be attached, colonial or solitary. Soft gelatinous or leathery body with two openings (siphons). One end is usually attached (although the attachment point is not always obvious) and the opposite end contains the siphons which are not always easy to find. Cannot break off a bit like sponges, and do not have tentacles like anenomes.

PAGE 124



COMMON NAME	**Salps & pyrosomes (SPX)**
SUBPHYLUM	**Urochordata**
CLASS	**Thaliacea**

Thalacians are related to the sea squirts but have no obvious attachment point. They are free-swimming, soft and often large, with two siphons located at either end of the body. The body is gelatinous and semi-transparent.

PAGE 128

Pyrosome

Salp

Photograph by Mick-travels

Pictorial guide to common HIMI taxa

As part of the Australian Antarctic Division's (AAD) annual stock assessment of the HIMI commercial fishery, the AAD conducts a Random Stratified Trawl Survey (RSTS). This survey includes more than 150 hauls spread evenly across the HIMI region. During 2008 we had the opportunity to identify the benthic invertebrates captured by the majority of these hauls. The following organisms were classified as 'common by-catch' based on these results and previous data.

Sponges

Demospongia (siliceous sponges)

Sponges that lack spicules, but have a well-developed spongin skeleton (i.e. often look and feel similar to a bath sponge).

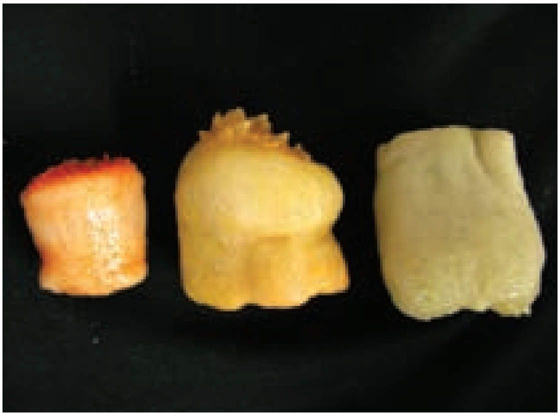
Hexactinellida (glass sponges)

Far less common than the demosponges and mostly found at substantial depths. They are often cup-shaped animals with sturdy internal skeletons made up of fused silicous spicules. Often very spikey.

Cnidarians

Anemones

Smooth deepsea anemones (Family Actinostolidae)



Smooth, cylindrical body with thickened firm walls. Tentacles sometimes obvious. Colours vary between white, creamy white, brown and light pink/red.

Warty deepsea anemones (Family Hormathiidae)

Robust anemone with longitudinal and circumferential furrows which give a warty appearance. Tentacles almost always hidden

***Glyphoperidium bursa* (giant deepsea anemone)**

Large deepsea anemones with a thick wrinkly olive/brown outer layer. Body wall contracted slightly at the top and bottom causing the curved walls. Tentacles usually obvious.

***Liponema* sp. (squat deepsea anemones)**

A firm, squat spherical body form. Fat-short tentacles. Body and tentacles a rusty red colour.

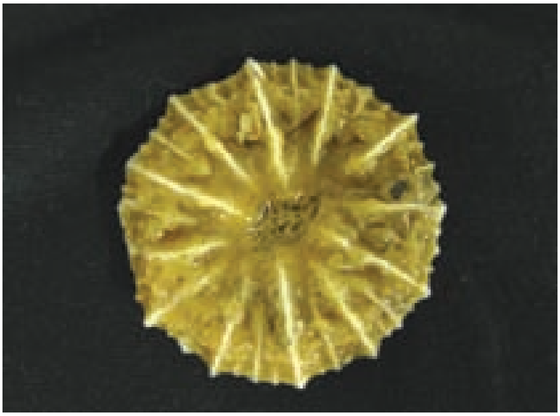
Gorgonians or horny corals

Paragorgia arborea (bubblegum coral)

Robust tree-like colonies with a soft reddish orange exterior coated in small bubble-like concentrations of polyps. Colonies can reach several meters in height.

Stony corals

Flabellum sp.



Solitary hard coral. This hard 'disk-like' structure has a smooth convex base and the ventral surface has numerous thin calcareous rays radiating from the centre. When alive, these corals are covered in a fleshy coating which varies in colour from creamy white, brown to dull red.

Molluscs

Snails

Provocator pulcher (Kerguelen volute)

Large smooth-shelled sea snail often caught as bycatch. Typically yellow to orange.

Clams

Acesta sp. (giant file shell)

Photograph by Keryn O'Regan

Thin, rather fragile shell with fine longitudinal ridges. Shell white to light pink; flesh reddish orange.

Octopus

Benthoctopus levis

Smooth globular head with two rows of unstalked ringed suckers.

Graneledone antarctica

Sac-like head covered in tiny warts giving it a rough bumpy appearance. Only one row of unstalked suckers on the tentacles.

Polychaetes

***Aphroditidae* sp. (sea mouse)**

Easily recognizable species with large scales on the ventral surface and large parapodia and setae per body segment. Abundant throughout the HIMI region.

***Serpula narconensis* (tube worm)**

Calcareous-tube dwelling species. Common at Pike Bank and Shell Bank.

Arthropoda

Prawns and shrimp

Thymopides grobovi (bellator lobster)

Small orange lobster usually found deeper than 500m. Particularly common to the Northeast Plateau region.

Pasiphaea sp.

Photograph by Keryn O'Regan

Large deep sea prawn. Quite delicate with 4 large pincers. Common below 400m; particularly at Northeast Plateau.

Isopods

Antarcturus oryx

Bug-like isopod with a tough spiky exterior.

Ceratoserolis cornuta

Prehistoric looking sea slatter significantly flattened top to bottom. Often exhibits various colours and patterns.

Barnacles

Sessilia sp. (acorn barnacles)

Heavily armored barnacle attached immediately below the capitulum (the body of a barnacle). Frequently captured around Plateau South East.

Pedunculata sp. (goose barnacles)

A fleshy stalk, or peduncle, and a distal capitulum. Capitulum composed of numerous white calcareous plates separated by brown chitinous material. Attached to a pycnogonid leg in photo.

Sea spiders

Colossendeis sp. (giant sea spiders)

Large sea spider, often as large as a small dinner plate. 8 legs, large proboscis and large hook-shaped dorsal appendages. Usually yellow/orange in colour.

Decolopoda australis

Similar to Colossendeis but the main body is less defined and has 10 legs. The top of the legs are almost webed around the thorax. Usually smaller then Colossendeis and often quite red in colour

Echinoderms

Sea stars

Acondontaster elongatus

Five long thin arms, smooth, large.

***Asteriidea* sp.**

Six arms radiating from the central disc. 20mm–300mm diameter. Very common.

Bathybiaster loripes

The most common species in the HIMI region. Creamy-white to pinkish-red in colour with 5 arms bearing large tube feet in wide longitudinal groves. A small central point for projection sometimes obvious in the centre of the aboral surface.

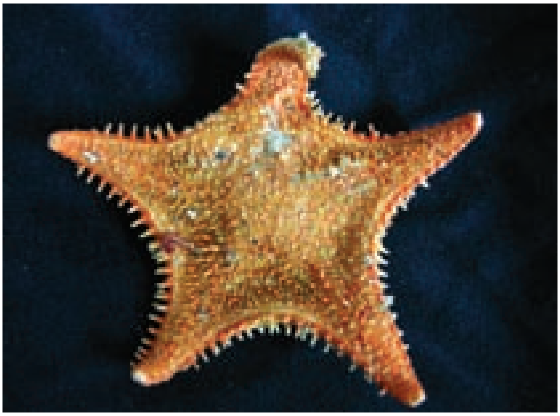
Cheiraster (Luidiaster) hirsutus

Brittle burnt orange sea star. 5 arms with large horizontally projecting spines up to 5mm long in the larger individuals.

Cuenotaster involutus

Edges of the arms bordered by small protruding trunks bearing numerous short spines. Similar minute trunks also cover the aboral surface.

Hippasteria falklandica



5 short arms, almost pentagonal in shape. Coated in sturdy, blunt, conical spines. Pale orange aboral side, paler cream oral side. Up to 25cm in diameter.

***Hymenaster* sp.**

Five armed, small, soft, papillated surface with a pair of large glass-like spines on each oral plate pointing down arms. Areas between arms clear and smooth.

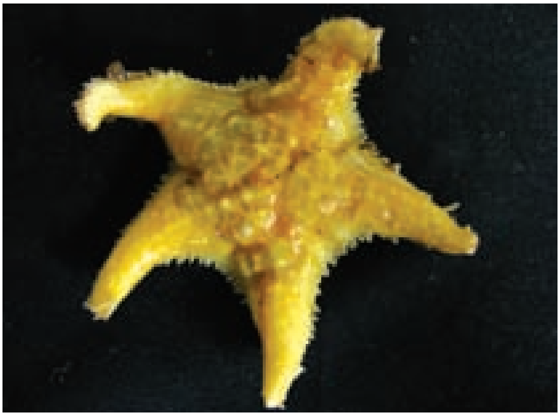
***Labidiaster annulatus* (sun star)**

Round central body bearing many arms that dislodge easily. Creamy white with bands of pale orange. Very common, particularly near Plateau Southeast.

Odontaster meridionalis

Five short arms with a mesh-like aboral surface.

Porania antarctica



Five armed orange/yellow coloured seastar with a mottled dorsal surface and soft, mucus covered oral surface. Marginal edge covered in conspicuous flattened spines.

Smilasterias triremis

Small, five arms, red/orange, tough, often arms missing. Four rows of suckered tube feet.

***Tremaster mirabilis* (cushion star)**

Photograph by Keryn O'Regan

'Umbrella' shaped body with scaly surface.

Sea urchins

Ctenocidaris nutrix (pencil urchin)

Sturdy regular echinoid with large upward reaching spines.

Briaster antarcticus (heart urchin)

Fragile irregular echinoid. Almost always crushed. Dark brown with a longitudinal grove on one side and small forward projecting 'beak' like structure on the other – if broken total counts should be based on the number of 'beaks' present as these sturdy structures generally remain intact.

Dermechinus horridus

Large deepsea urchin. Larger spines long and slender. Smaller spines very numerous, fine, bearing thorns, and terminating in a hook. Test dull orange to dull purple. This is the least common of the four.

Sterechinus sp.

Common regular echinoid coated in short spines. Quite fragile; total count should be based on the number of 'Aristotles lanterns' (i.e. mouth parts). Dull purple in colour.

Brittle stars (ophiuroids)

Ophionotus hexactis

Light brown to dull purple hexagonal brittle star with a pale underside.

Ophiurolepis carinata

Dull white to bright orange pentamerous brittle star with distinct oral and aboral plates.

Ophiacantha pentactis

Aboral surface pale orange with dark orange groves and a covering of short spines. Segmented arms clearly separate from the body and covered in spines.

Ophiogena laevigata

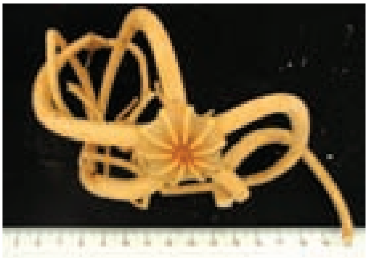
Thin-flat pentamerous brittle star with a smooth reptilian-like body wall.

Snake stars

Asteronyx loveni

Soft bright orange body with 5 unbranched arms. Smooth skin-like body wall. Common in the plateau benthic communities.

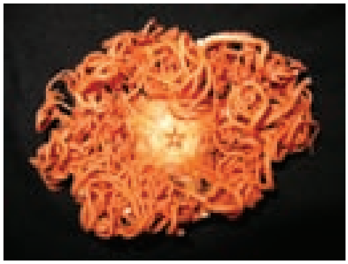
Astrotoma agassizii



5 unbranched arms flat on the underside. Arms with transverse bands of granules, interspersed with narrow, smooth, depressed bands. Creamy white to pinkish orange.

Basket star

Gorgonocephalus chilensis



Orange basket star with a mass of arms tangled to form a 'basket' shape. Particularly common around Western Plateau.

Sea cucumbers

Molpadia musculus

Tough rubbery exterior coated in tiny black dots. May reach up to 20cm long. Grey to dull purple in colour.

Psolus paradubiosus

Tough semi-calcified exterior consisting or brown and white scales. The soft skinned underside is almost transparent revealing the internal structure.

Staurocucumis liouvillei

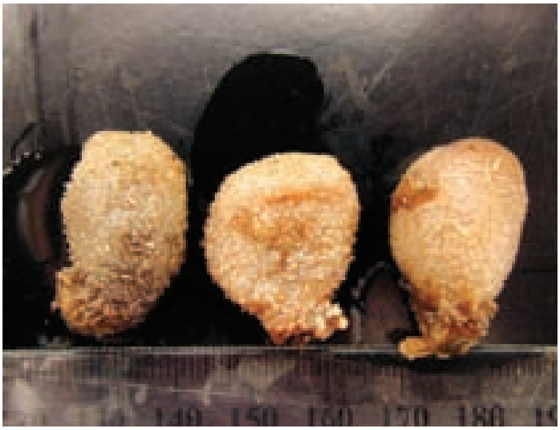
Soft & slimy with lines of tube feet running parallel to the body, and tentacles usually obvious at one end. Body creamy white/yellow and ovoid in shape when inflated. Most common holothurian in the region.

Ascidians (sea squirts)

Molgula pedunculata

Smooth soft leathery sea squirt with a stalk and bulbous head.

Cnemidocarpa verrucosa



Bulbous rough skinned sea squirt. Coated in wart-like lumps with the two siphons easily visible at the top. Often remains firm and inflated with liquid for some time.

Species identification documents

Porifera

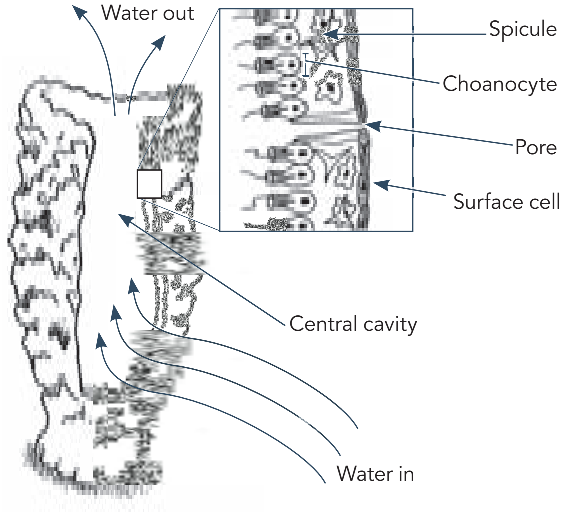
Sponges

Code PFR

1. Typically resembles a household bath sponge
2. 'Spongy' to the touch
3. Diverse morphology, shapes and sizes
4. Lots of holes or 'pores'
5. Structure may consist of glass-like needles or 'spicules'

Sponges are primitive, sessile, mostly marine filter feeders that pump water through their bodies to filter out particles of food matter. They are 'spongy' with no definite appendages. Basically, a sponge consists of a collection of cells enclosing a system of canals and chambers which are connected to the exterior through small openings (pores). These cells lie within a gelatinous matrix called mesohyl which is supported on a framework of skeletal elements which may consist of calcareous or siliceous spicules or a fibrous material called spongin. Their body form and internal make-up is extremely variable, being influenced by the type of substratum and the amount of water movement (Barnes 1980). See diagram for the basic sponge structure from which others are derived.

Sponges are important components of benthic communities of Antarctic and sub-Antarctic waters. Number of species is high, similar to those in the Arctic, and comparable or higher than those of temperate marine environments (McClintock *et al*. 2005). The sponge fauna of Antarctica is largely indigenous, with a remarkable degree of homogeneity in their distribution throughout continental Antarctica as well as surrounding islands extending even to the sub-Antarctic, including Heard Island.



Basic sponge structure.

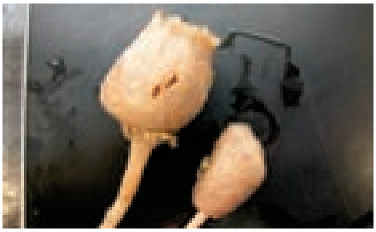
The most recent estimate of sponge species numbers lies at 436 (R.W.M. van Soest, unpublished data); the distribution of at least 55 of these species extends to the HIMI region.

Sponges are a very difficult group taxonomically. There are four sponge classes; grouped according to the type of spicules in their skeleton. These include the bath sponges (class Demospongiae), glass sponges (class Hexactinellida), bony sponges (class Calcarea) and coralline sponges (class Sclerospongia). Only demosponges and hexactinellid sponges have been recorded from the HIMI region, and hence only these groups are discussed here. Representative images for each type of sponge found in the HIMI region based on exteral morphology is given below.


Porifera spA (PO1): fine pored bath sponge (Demospongia)


Hexactininellida spp (PO2): large vase-shaped glass sponge

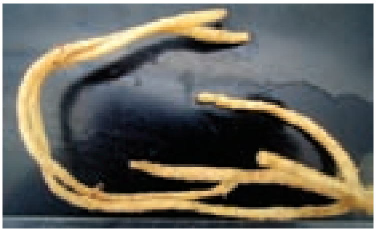

Tetilla leptoderma (PO3): round firm ball-shaped sponge


Stylocordyla borealis (PO5): stalked sponge


Porifera spD (PO7): tough, stringy


Porifera spH (PO13): common large pored bath sponge

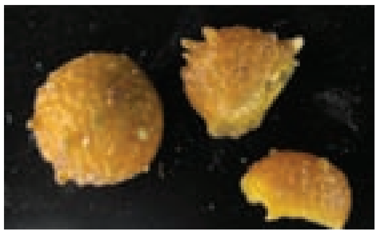

Latrunculia spB (PO16): firm dark sponge with numerous warty protrusions. Almost skin-like surface

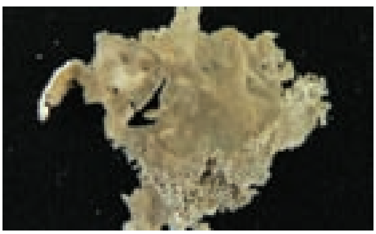

Porifera spL (PO20): finger sponge

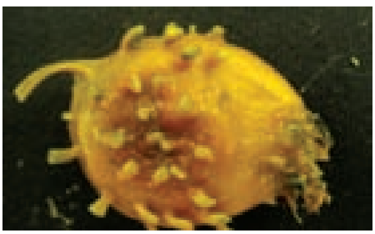

Porifera spN (PO22): fan-shaped


Cinachyra antarctica (PO24): small balls with soft spines


Porifera spU (PO31): small open vase


Suberites caminatus (PO48): firm orange lumps with a warty skin like surface


Porifera spAK (PO50): flat encrusting sponge


Porifera spAO (PO56): spiky orange sponge


Porifera sp.

Siliceous or bath sponges (Class Demospongiae)

The majority of sponges found in in Antactic and sub-Antarctic waters, including HIMI, belong to the Demospongiae. The Demosponges are the largest class in the phylum Porifera containing 90% of all species of sponges, with 190 species recorded from the Southern Ocean thus far (Clarke and Johnston 2003). Included in this class are the bath sponges, which obviously lack spicules, but have a well-developed spongin skeleton (i.e. would look and feel similar to a bath sponge). See Sara *et al*. (1992) for a full revision of Southern Ocean demosponges.

Glass sponge (Class Hexactinellida)

Hexactinellid sponges, often referred to as glass sponges, are far less common and more depauperate in terms of species richness than the demosponges with only 29 species reported from the Southern Ocean, most of which are found at substantial depths (Clarke and Johnston 2003). They are often cup-shaped animals with sturdy internal skeletons made up of fused silicous spicules, that form “spicule mats” which can be several layers deep. This morphology provides a three-dimensional habitat that serves as a valuable refuge for a wide variety of marine invertebrates. As such these often large, spiky sponges habour a commensal fauna that is richer than the demosponges (Barthel 1995), and are therefore an very important group ecologically. Barthel and Tendal (1994) provide a full review for the Southern Ocean taxa.

Cnidaria

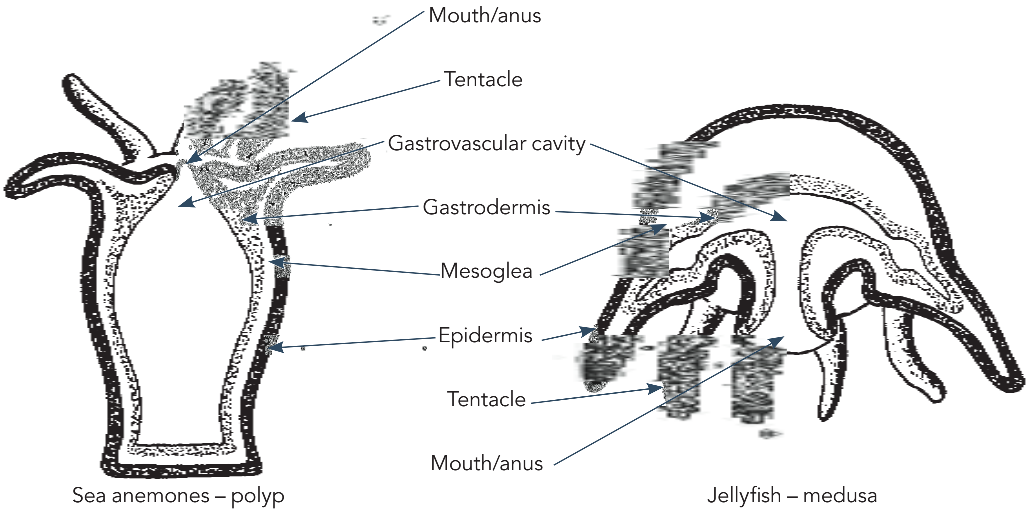
Anemones, corals, jellyfish & hydroids

Code CNI

Next to sponges, cnidarians are the most important part of polar benthic communities, providing structure to the benthic habitat (Brandt *et al.* 2007). The phylum contains five classes which are generally grouped into two subphyla, the Medusozoa containing the Hydrozoa (hydroids), Scyphozoa (jellyfish) and Cubozoa (box-jellyfish), and the Anthozoa containing the Octocorallia (soft corals, sea fans and sea pens) and Zoantharia (sea anemones and hard corals). The most diverse and abundant to the HIMI region are the anthozoan taxa, namely soft corals and sea anemones. Table 4 lists cnidarian groups found in the HIMI region and associated CCAMLR codes.

Cnidarians are radially symetrical animals with a basic body plan consisting of a sac containing an internal cavity, which functions in both digestion and gas exchange, with a single opening that functions as both mouth and anus. In most cnidarians, this opening is surrounded by tentacles. These tentacles contain cnidocytes, specialized cells that carry stinging organelles or nematocysts, which they use to catch prey and defend themselves from predators. The possession of cnidocysts is what unites cnidarians and gives them their name.

Throughout their life cycle, the majority of cnidarians alternate between two body forms: the free-swimming medusa stage and the sedentary polyp stage (see diagram). The benthic polypoid stage lives attached to the substrate, with mouth directed upward (i.e. anemones), whereas the pelagic medusoid form is free-swimming, with mouth and tentacles directed downward (i.e. jellyfish). The Medusozoa life cycle typically contains both a benthic and a pelagic phase, where the pelagic phase can dominate (as in the jellyfish). In anthozoans the medusa stage is usually lost from the life cycle. This can make the decision of what consititutes a benthic cnidarian taxon somewhat arbitrary. Within the hydrozoa, the dominant stage in the life cycle is typically benthic, whereas scyphozoans and cubozoans are predominantly pelagic. However for the purpose of this guide scyphozoa will be discussed as jellyfish are a common bycatch to the HIMI fishery, whereas Cubozoa are a tropical group and are not considered further here.



Cnidarian body structures.
Adapted from a diagram from Campbell & Reece (2005).

Phylum	Subphylum	Class	Order	English name	CCAMLR Code
Cnidaria (CNI)	Anthozoa (AJH)	Zoantharia	Actinaria	Sea anemones	ATX
			Ceriantharia	Tube anemones	ATX
			Scleractinia	Hard corals	CSS
		Octocorallia	Alyconacea	Soft corals	No code
			Gorgonacea	Horny corals or Gorgonians	GGW
			Pennatulacea	Sea pens	No code
	Medusozoa	Scyphozoa	–	Jellyfish	JEL
		Cubozoa	_	Box-jellyfish	No code
		Hydrozoa	–	Hydroids	No code

Table 4 – Cnidarian groups and corresponding CCAMLR codes.

Class Zoantharia

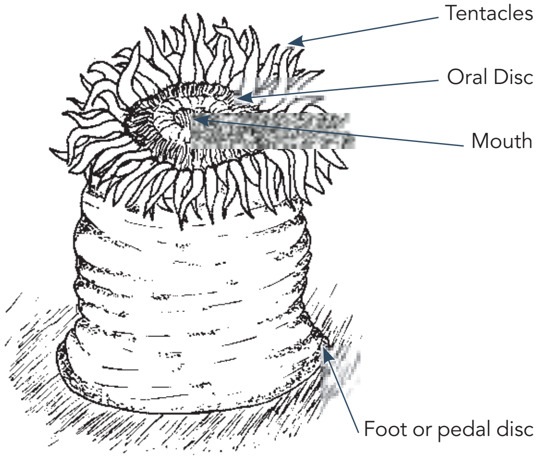
Sea anemones

Code ATX

1. Round or tubular body with tentacles
2. Soft or firm and often slimy
3. No anus
4. Attachment point at base although this is sometimes obscured by contraction of muscles

The solitary sea anemone (order Actinaria) is the largest of the anthozoans. Their structure is basically a sac with a column shaped body ending in an oral disc. In the middle of the oral disc is the mouth, surrounded by tentacles armed with many cnidocytes. The sea anemone has an adhesive foot (or pedal disc) which in most species attaches itself to rocks or anchors in the sand.

Throughout the world, anemones occupy habitats from the subtidal zone to depths of hundreds of metres, feeding upon other invertebrates and small fish. Despite the presence of stinging cells, sea anemones also host some animals, such as small shrimps and fish, which live among their tentacles.



Basic external features of a sea anemone.

Sea anemones constitute a considerable portion of the bycatch in the HIMI fishery, with the greatest diversity and biomass found throughout Southern Plateau. To date, eighteen morphospecies have been identified from the HIMI region. The most common include smooth deepsea anemones like Actinaria spC and Actinaria spD, giant anemones like *Glyphoperidium bursa*, and warty anemones like Actinaria spH.

Actinaria spA (CNI5)

Actinaria spB (CNI8)

Actinaria spC (CNI10)

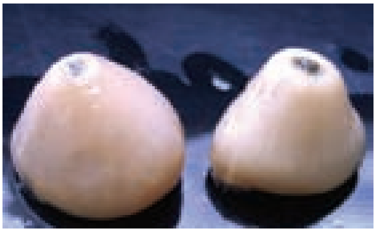

Limponeria sp. (CNI11)

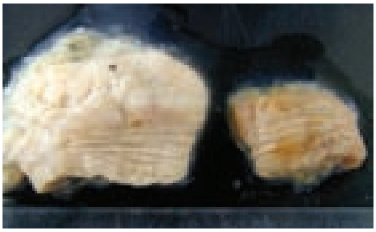

Hormathiidae spp (CNI12)


Actinaria spD (CNI13)


Glyphoperidium bursa (CNI26)


Actinaria spE (CNI28)


Endongaria sp. (CNI32)

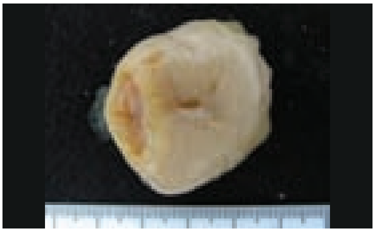

Bolocera sp (CNI37)


Actinaria spF (CNI38)


Actinostolidae sp (CNI41)


Actinaria spG (CNI53)


Actinaria spH (CNI56): warty deep sea anemone


Actinaria spL (CNI57)


Actinaria spK (CNI63)

Tube anemones

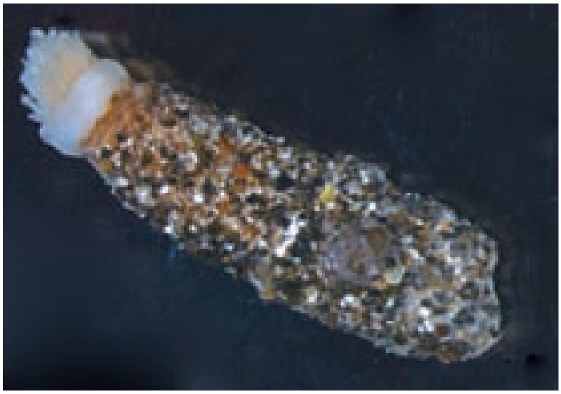
No code (use ATX)

1. Reside in tubes
2. Anemone shaped heads
3. Found in soft sediment plateau communities

Cerianthids (order Ceriantharia), or tube anemones, are anthozoans with anemone-shaped heads and elongated bodies covered by a cylindrical holster or tube composed of used (i.e. discharged) nematocysts and sand. Unlike the sea anemones which live attached to hard substrates, tube anemones are adapted for burrowing. They reside in sandy or muddy substrates, and retract into the tube when disturbed or threatened.

To date, two cerianthids have been identified from the HIMI region. These species are particularly common to the Southern Plateau, where the substrate is likely to be more suited to burrowing organisms. Research suggests cerianthids could even be considered indicator species for HIMI 'plateau benthic communities'.

Ceriantharia spA (CNI33)



Ceriantharia spB (CNI44)

Live tube-dwelling anemone (Cerianth
arian)
Photograph sourced from SNO (2007)

Hard corals

Code CSS

1. Hard like rock, hence they are referred to as 'stony corals'
2. Mostly colonial cnidarians
3. Various growth forms
4. Retain all individuals for DNA analysis except CNI7 (see Page 17 for instructions)
5. Not that common to HIMI and can be confused with hydrocorals or bryozoans

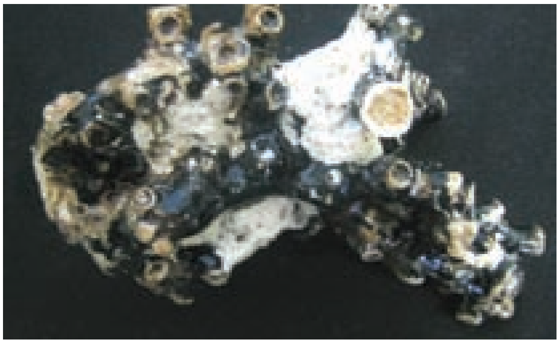
Hard corals (order Scleractinia), also often refered to as stony corals, are mostly colonial anthozoans that secrete a heavy external calcareous skeleton; hence their name. Some scleractinians, however, do not form colonies, like *Flabellum* sp (CNI7).

Scleractinian corals display various growth forms: some are low and encrusting; others are upright and branching. The surface configuration of the skeleton depends upon the size of the polyps and how near they are placed to each other. The polyps of scleractinian corals are similar to those of the sea anemones but are usually smaller, and usually retracted within the corals hard exterior, unless feeding.

Only a handful of stony corals are found in the HIMI region and their distribution appears sparse. The most common is the solitary coral, *Flabellum* sp (CNI7). We ask that you retain all stony corals aside from CNI7 for DNA analysis. For a complete review of Antarctic scleractinians see Cairns (1990).

Flabellum sp. (CNI7)
Photograph by Gilles Cauvin

Cnidaria sp40 (CNI40)



Madrepora oculata (CNI50)

Class Octocorallia

The class Octocorallia (also known as Alyconaria) includes the soft corals (order Alcyonacea), sea fans, sea whips (order Gorgonacea) and sea pens (order Pennatulacea). The group is defined by their 8-fold symmetry in which each of the polyps, or hydroid members, has eight feathery tentacles around its mouth, as opposed to six in the hard corals.

Soft corals

No code (use GGW)

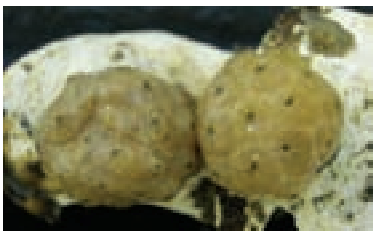
1. Soft, rubbery, colonial cnidarians
2. Polyps like mini-anemones
3. Variety of colours and forms
4. Less delicate than the gorgonians

Soft corals (order Alyconacea) are an order of corals which do not produce calcium carbonate skeletons, and hence do not have the skeletal support of hard corals. Instead, each polyp is connected by a fleshy tissue and reinforced by calcareous spicules. This fleshy tissue often forms rubber-like colonies of polyps that may be encrusting, erect, or cushion-like with lobes or peaks. Morphologically they can tend to resemble a mass of small, interconnected anemones, and their colours vary widely. They generally have a softer structure and are less delicate than gorgonians, often resembling scleractinian corals that are soft to the touch.


Cnidaria sp6 (CNI6)

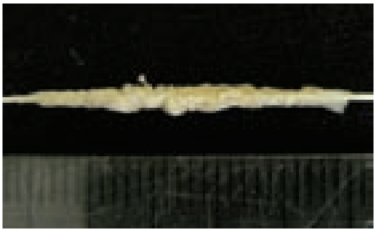

Cnidaria sp16 (CNI16)


Cnidaria sp17 (CNI17)


Cnidaria sp18 (CNI18)


Cnidaria sp19 (CNI19)


Cnidaria sp20 (CNI20)


Cnidaria sp21 (CNI21)


Cnidaria sp25 (CNI25)

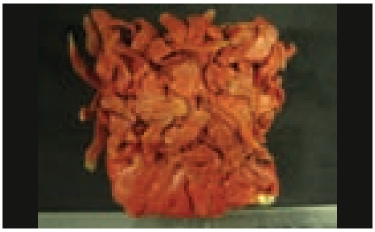

Cnidaria sp30 (CNI30)


Cnidaria sp35 (CNI35)


Cnidaria sp36 (CNI36)


Cnidaria sp42 (CNI42)


Cnidaria sp43 (CNI43)


Cnidaria sp49 (CNI49)


Cnidaria sp58 (CNI58)


Cnidaria sp48 (CNI48)

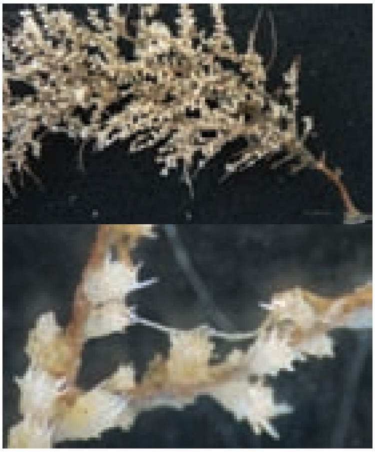
Horny corals or gorgonians

Code GGW

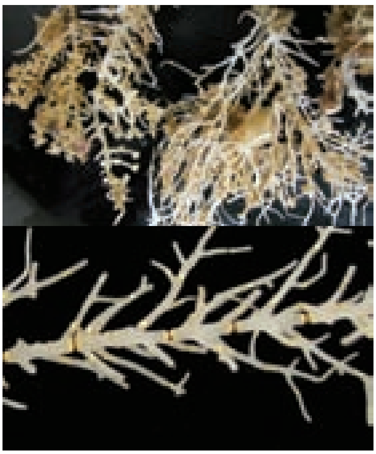
1. Delicate but firm, branching, upright colonies
2. Variety of colours and forms
3. Minute polyps that may be quite 'spiky' in appearance
4. More delicate that the soft corals

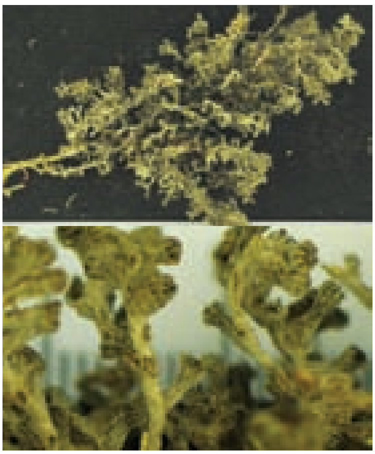
Closely related to the soft corals are the gorgonians (order Gorgonacea), also refered to as 'sea fans and sea whips'. Like the soft corals, they too form colonies of polyps which secrete a firm, though delicate, skeleton to live on that is partly composed of a horny material called gorgonin. These skeletons form branching, upright colonies that are far less robust than their relatives the soft corals, but display similar diversities in colour and form. The gorgonians are perhaps the best known octocorals and are common in the HIMI region with 16 morpho-species identified to date.


Cnidaria sp1 (CNI1)


Cnidaria sp2 (CNI2)


Cnidaria sp3 (CNI3)

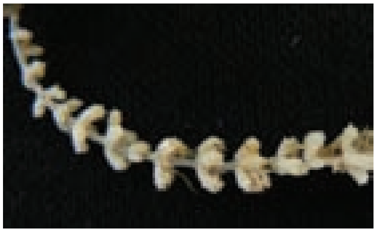

Cnidaria sp4 (CNI4)


Cnidaria sp24 (CNI24)

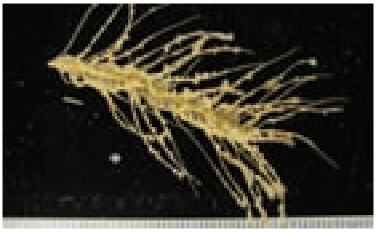

Cnidaria sp34 (CNI34)


Cnidaria sp23 (CNI23)


Cnidaria sp29 (CNI29)


Cnidaria sp45 (CNI45)

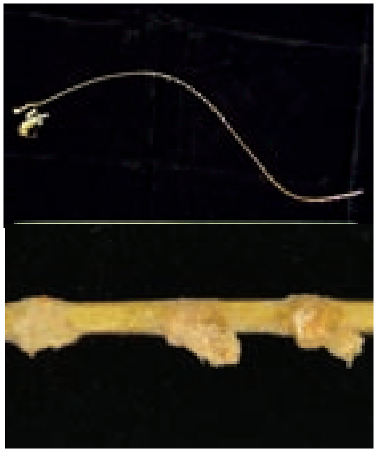

Cnidaria sp46 (CNI46)

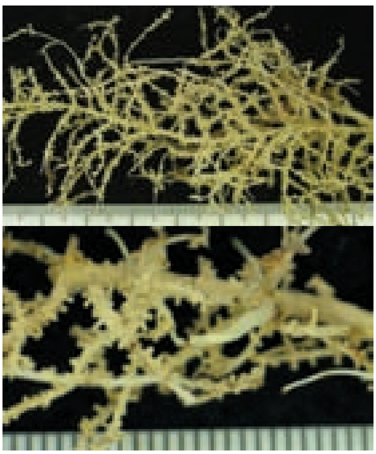

Cnidaria sp55 (CNI55)


Cnidaria sp62 (CNI62)


Cnidaria sp47 (CNI47)


Paragorgia arborea (CNI51)


Cnidaria sp52 (CNI52)


Cnidaria sp64 (CNI64)

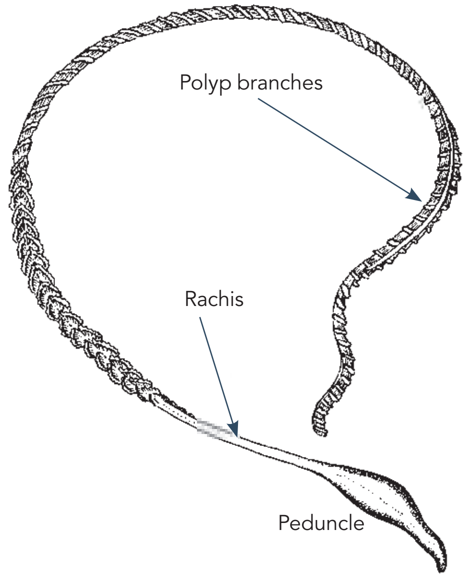
Sea pens

No code (use GGW)

1. Reminisent of antique quill pens
2. Branches of polyps extending from a central stalk or rachis
3. Root or peduncle at base

Sea pens (order Pennatulacea) are specialised octocoral colonies that live on branches extending from a central stalk or rachis. At the base of the rachis is a bulbous root or peduncle used for anchorage to the substrate. Their tissue is reinforced with calcareous spicules, and the rachis with calcium carbonate, providing support for the colony. Sea pens often have a feather-like appearance reminiscent of antique quill pens, hense their common name.

Only eight of the thirty-four valid genera of sea pens worldwide are known to occur in the Southern Ocean (Lopez-Gonzalez and Williams 2002); one of which has been recorded from the HIMI region. This sole individual was captured as by-catch of the long-line fishery, although observations and comments from observers suggest other specimens have been captured but not retained.



Morphology of a sea pen (order Pennatulacea).
Adapted from an illustration by Ernst Haeckel (1904).

Pennatulacea spA

Class Scyphozoa

Jellyfish

Code JEL

1. Bell-shaped body form
2. Predominant free-swimming medusoid or jellyfish stage
3. Numerous tentacles and four oral arms
4. Stinging cells or nematocysts
5. Often badly damaged by the trawl gear
6. May only resemble a gelatinous mass once aboard

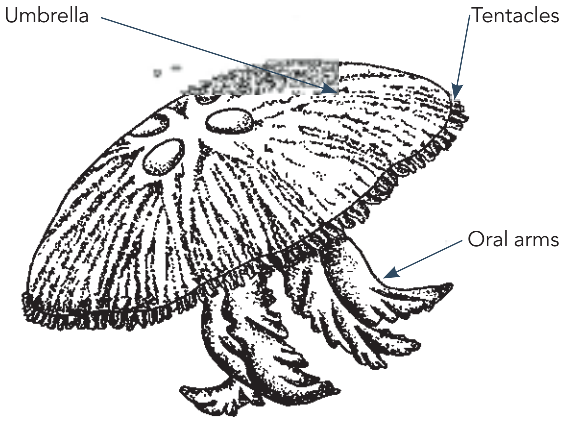
Jellyfish (class Scyphozoa), are cnidarians that predominantly remain in the medusoid form. Although these pelagic species don't necessarily constistute a benthic taxon, they are a common bycatch species in the HIMI fishery.

The umbrella shaped medusoid form of the jellyfish is considerably larger and more conspicuous than in other cnidarians. Their translucent bell-shaped body, or umbrella, is often tinted with red, orange, pink, purple, and other colours. In most species, tentacles of varying numbers and length hang from the margin of the umbrella and four 'oral arms' hang from the centre. Like other cnidarians these hanging appendages possess stinging cells, and are used to prey on animals of various shapes and sizes.

Jellyfish captured as bycatch in the HIMI region are predominantly unclassified as they are often badly damaged and indescribable. However, one readily identifiable species common to the region is the giant red jelly or helmet jelly, *Periphylla periphylla*.

Giant Red Jelly (JED)

The conical or hemispherical dome of the helmet jelly, *Periphylla periphylla*, may reach a height of 35 cm. The 12 tentacles can be more than 50 cm long. The color varies from pale pink or orange to dark red (Telnes 2007).



Morphology of a jellyfish.

Periphylla periphylla
Photograph by Erling Svenson

Class Hydrozoa

Hydrozoans (class Hydrozoa) are cnidaria which have solid tentacles (as opposed to fluid filled tentacles). They can be both solitary or colonial and are diverse, both in life-cycle forms and morphology. Hydrozoans found in the HIMI region include the hydroids and hydrocorals.

Hydroids or sea ferns

No code (use CNI)

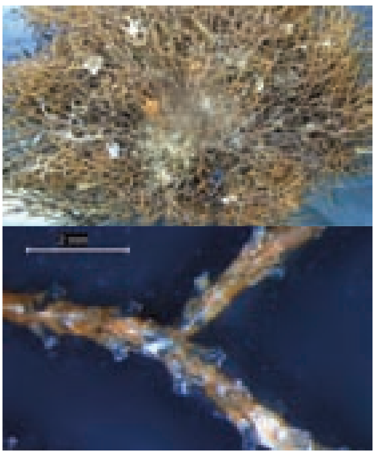
1. Branching plant-like structures
2. Generally form colonies supported on a chitinous exoskeleton
3. Colonies usually between 3-10 cm high
4. Numerous microscopic polyps arranged along the individual branches
5. Often semi-translucent
6. Often resemble soft bryozoans but bryozoans' polyps are uniform in structure whereas hydroids have different shaped polyps for feeding, reproduction, etc.

Hydroids, commonly known as sea ferns, are small, colonial plant-like organisms often seen clinging to wharves and submerged objects along the seacoasts everywhere.

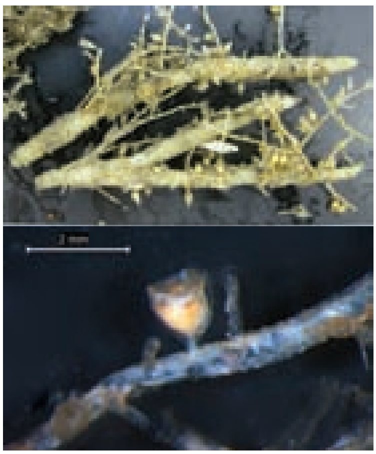
Most hydroid colonies are 3-10 cm high, and supported by an external chitinous skeleton. The colony can either be a branching sessile structure attached to the substrate or it can have erect fern-like 'fronds'. Arranged along the individual branches of these structures are cup shaped microscopic polyps with a central mouth surrounded by tentacles. To the naked eye, these polyps may be observed as small openings positioned along the length of each branch. The tentacles are armed with nematocysts, which they use to prey on small planktonic animals such as copepods.

To date some 180 hydroids have been identified from Antarctic and sub-Antarctic regions (Clarke and Johnston 2003). Based on gross morphological characteristics, 20 hydroid taxa have been identified from the HIMI region. Observers have yet to identify the presence of hydroids as bycatch in the fishery. Hydroids are important habitat forming components of the HIMI benthos but can be difficult to identify; often resembling weed.

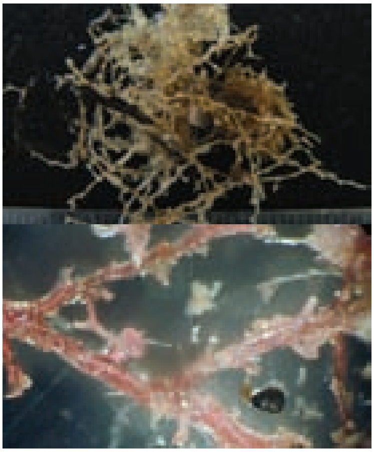
Schizotrica sp1 (HYD1)



Staurotheca sp1 (HYD2)



Filellum sp1 (HYD3)

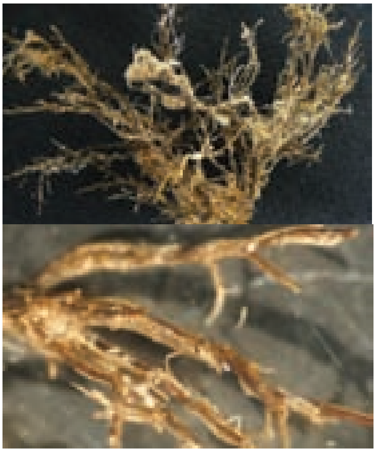


Symplectoscyphus sp1 (HYD4)

Lafoeidae sp1 (HYD5)

Schizotrica sp2 (HYD6)

Symplectoscyphus sp2 (HYD7)



Eudendrium sp1 (HYD8)

Halecium tehuelcha (HYD9)

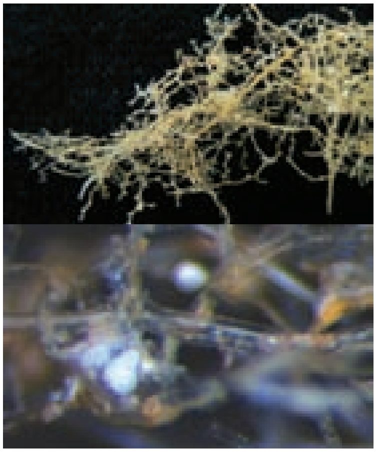
Eudendrium sp2 (HYD10)

Lafoea cf. *dumosa* (HYD11)

Symplectoscyphus sp3 (HYD12)

Halecium sp1 (HYD13)

Symplectoscyphus sp4 (HYD14)



Symplectoscyphus sp5 (HYD15)

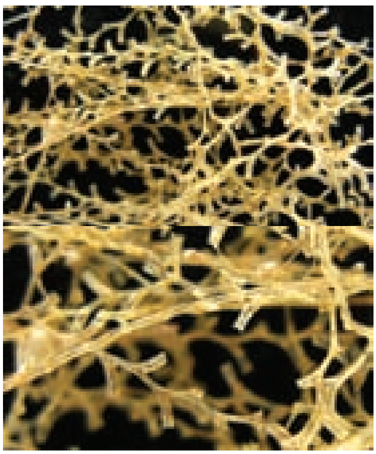
Halecium sp2 (HYD16)

Eudendrium cf. *cyathiferum* (HYD17)

Lafoeidae sp2 (HYD18)

Plumularia sp1 (HYD19)

Halecium macrocaulus (HYD20)



Symplectoscyphus sp6 (HYD21)

Hydrocorals

No code (use CNI)

1. Hard, branching hydrozoans.
2. Superficially resemble true hard corals.
3. Brightly coloured; orange, pink, etc.
4. Dotted with tiny openings which house microscopic polyps.

The so-called hydrocorals (Hydrocorallina) are colonial hydrozoans that have a hard calcified supporting skeleton which superficially resembles real hard corals or some bryozoans.

Hydrocorallina includes the cnidarian orders Milleporina (massive hydrocorals) and Stylasterina (branched hydrocorals). The millepore hydrocorals, commonly known as 'fire corals' for their coral-like growth and their painful sting, are essentially warm water animals, and have yet to be recorded from Antarctic latitudes. Stylasterine hydrocorals however, have been recorded from the Southern Ocean, with 29 species described from Antarctic and sub-Antarctic regions to date. The distribution of these species is sparse, and only one has been described from the HIMI region, *Errina kerguelensis* (Cairns 1983).

In this assessment of the HIMI region, one hydrocoral was recorded; *Errina* sp. (CNI39). This species, commonly observed near Plateau Southeast, is likely to be *E. kerguelensis*, although additional taxonomic expertise is required to confirm this. For a comprehensive overview of Southern Ocean Stylasterines, see Lowe (1967) or Cairns (1983).

Errina sp. (CNI39)

Platyhelminthes

Flatworms

No code (use INV)

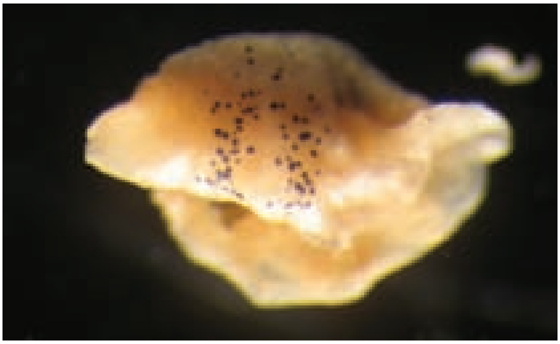
1. Unsegmented worm-like animals
2. Body flattened from top to bottom
3. Smooth semi-gelatinous and often semi-transparent body

The flatworms are a phylum of relatively simple soft-bodied invertebrate animals found in marine, freshwater, and even damp terrestrial environments. Most flatworms are free-living, but many are parasitic.

Unlike their worm-like relatives the annelids, flatworms are unsegmented. The flatworm's cephalized soft body is ribbon-shaped, flattened dorso-ventrally (from top to bottom), and bilaterally symmetrical (i.e. if you cut a flatworm is half from end to end, the resulting halves would mirror one another).

There are about 25,000 known species of flatworms. These species are divided into four classes: Trematoda (flukes), Cestoda (tapeworms), Monogenea (ectoparasitic flukes with simpler life cycles than Trematode flukes; living exclusively a parasitic existence) and Turbellaria (all other flatworms). The latter group; Turbellaria, consists of 8 orders including the marine flatworms, order Polycladida.

Two undescribed taxa from the order Polycladida have been discoved in the HIMI region. The second taxa Platyhelminthes spB, is a large distinctive flatworm that would be easily identifiable if captured as bycatch.



Platyhelminthes spA (PLATY1)

Platyhelminthes spB (PLATY2)

Priapulida

Penis worms

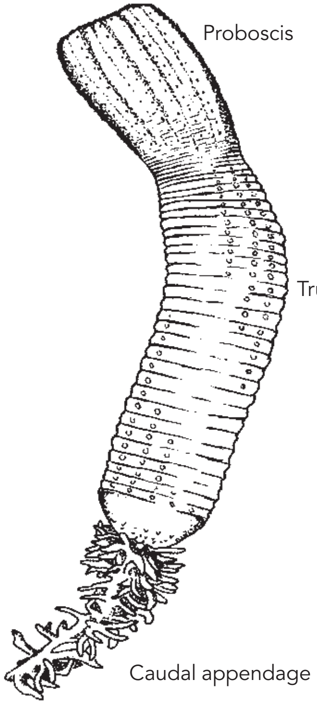
No code (use INV)

1. Segmented worm-like animals
2. Body divided into 3 regions: tube-like proboscis, trunk and tail-like caudal appendage.
3. Yellow or brown in colour

Priapulida (priapulid worms or penis worms) are a phylum of marine worms with an extensible spiny proboscis. These small, yellow or brown, carnivorous worms are free-living. They partly bury themselves in marine sediments of polar, temperate, and tropical seas worldwide, at depths down to several kilometres.

The cylindrical priapulid body, ranging in length from 0.5 mm to 30 cm, is covered by a thin cuticle, which is divided into three regions: a tube-like proboscis, a trunk, and a tail-like caudal appendage. The body is ringed, and often has circles of spines, which are continued into the slightly protrusible pharynx. Priapulids move through the sediment by pushing and pulling their body along with the help of layered muscles. Small priapulids are thought to be deposit feeders, consuming bacteria, but large species feed on soft-bodied invertebrates, such as polychaete worms and other priapulids. Their mouth is extended during feeding with their oral teeth being used to seize prey (Hebert 2002).

The tiny phylum has only three representatives in the Southern Ocean (van der Land 1970); at least one of these occur in the HIMI region. Although the specimen has yet to be reliably identified, it is likely to be the previously identified Antarctic species, *Priapulus tuberculatospinosus*. This species is defined by its thick proboscis and a caudal appendage that resembles a mass of tentacles like that of Priapilidae spA.



Morphology of a priapulid or penis worm.
Adapted from an illustration by Charles Douglas, Canadian Museum of Nature (2008).

Priapulidae spA (PRI1)

Sipunculidae

Peanut worms

No code (use INV)

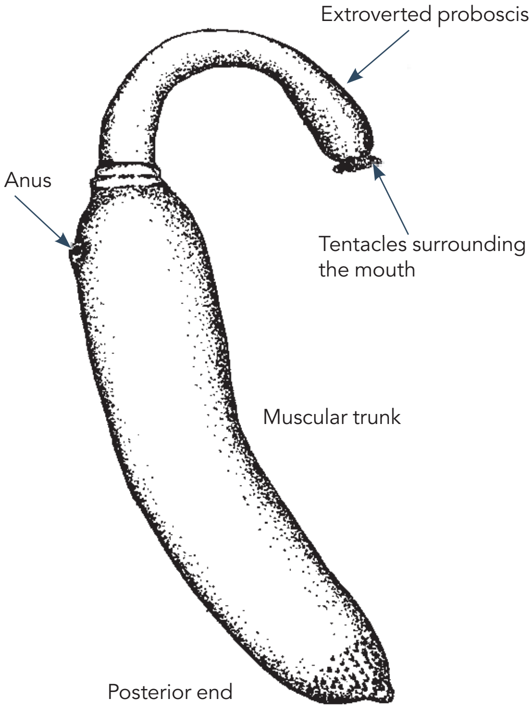
1. Unsegmented and rigid worm-like body
2. Body the shape of a peanut kernel
3. Mouth surrounded by a fringe of tentacles which may be hard to see if retracted into the trunk
4. Often found within dead gastropod shells
5. Only few occurrences so far in the HIMI region

Sipunculidae (sipunculid worms or peanut worms) is a phylum containing 144-320 species (estimates vary) of bilaterally symmetrical, unsegmented marine worms.

Sipunculids are relatively common world-wide, but have only been recorded on a handful of occasions in the HIMI region. They reside either in burrows or in discarded shells like hermit crabs do. Some even bore into solid rocks to make a shelter for themselves. Although typically less than 10 cm long, some Sipunculids may reach several times that length.

The most recognizable feature of Sipunculid worms is their mouth, which is surrounded by a fringe of tentacles, all of which may be inverted into the body. Their unsegmented body consists of a retractable introvert or proboscis and a trunk. The body wall is strong and muscular and when threatened, Sipunculids can retract their body into a shape resembling a peanut kernel.

Currently 16 species are recognised from the Southern Ocean (Saiz-Salinas 1995). Two taxa with extremely limitied distributions have been recorded from the HIMI region; these have yet to be classified. Individual specimens of Sipuncula spA have been collected from Coral Bank, Southern Shell Bank and Western Plateau, and one specimen of Sipuncula spB from Northeast Plateau; found within a discarded gastropod shell.



Morphology of a Sipunculid or peanut worm.
Adapted from an illustration by Charles Douglas, Canadian Museum of Nature (2008).

Sipunculida spA (SIP1)

Sipunculida spB (SIP2)

Mollusca

Snails, slugs, clams, octopus etc.

Code MOL

The molluscs are members of the very large and diverse phylum of invertebrate animals known as Mollusca. The phylum provides some of the most familiar animals, including the univalves (class Gastropoda), bivalves (class Bivalvia) and the cephalopods (class Cephalopoda). The phylum Mollusca also includes lesser known forms such as the chitons (class Polyplacophora) and tusk shells (class Scaphopoda), among others.

The Mollusca of the Antarctic and sub-Antarctic sector of the Southern Ocean are fairly well described, with some 1200 molluscs identified from the region, dominated by gastropods followed by bivalves (Linse *et al.* 2006). To date we know approximately seventy-six molluscan morphospecies of five classes from the HIMI region. Many of these are too small to be captured as bycatch and only the larger taxa like the cephalopods, large snails or clams would be familiar to observers. However it is important to make observers aware of the diversity of molluscs they're likely to encounter. Table 5 summarises the common molluscan groups and their associated CCAMLR codes.

Phylum	Class	English name	CCAMLR Code
Mollusca	Gastropoda	sea snails, sea slugs & limpets	GAS
	Bivalvia	clams	BIV
	Cephalopoda	squid & octopus	SQQ (Squid), OCT (Octopus)
	Polyplacophora	chitons	no code (use MOL)
	Scaphopoda	tusk shells	no code (use MOL)

Table 5 – Molluscan groups and corresponding CCAMLR codes.

Class Gastropoda

Next to polychaetes, Gastropods (class Gastropoda) are the most speciose group in the Southern Ocean with 895 shelled species described thus far (Linse *et al.* 2006). They include the familiar sea snails, sea slugs and limpets. Most gastropods have a shell of one piece (often coiled), however there are quite a few groups that have either reduced or internal shells, or no shell at all. Shelled forms are generally called "snails" and forms without shells are called "slugs". With or without a shell, these soft-bodied creatures have a well developed head and a broad, flat, creeping sole or muscular foot. Most gastropods possess a radula, a file shaped tongue, which is used to feed on algae, detritus or other deceased organisms.

Sea snails

Code GAS

1. Spiralling one-piece shell with a single opening
2. Well developed head and flat muscular foot
3. Variety of colours and sizes

Snails are the most common gastropod to the HIMI region with 38 taxa identified thus far, the majority of which are classified to family level or better. The most notable is the large gastropod *Provocator pulcher* commonly known as the Kerguelen volute; a species often caught as bycatch. This typically yellow to orange, large, smooth-shelled gastropod is commonly found throughout the HIMI region.

Provocator pulcher (MOL2)

Buccinidae spB (MOL9)

Buccinidae spA (MOL8)

Enixotrophon spA (MOL4)

Buccinidae spB (MOL10)

Naticidae spA (MOL11)

Trochidae spA (MOL13)

Fusitriton aurora (MOL15)

Epitoniidae spA (MOL16)


Turridae spA (MOL18)


Trichotropis spA (MOL20)


Enixotrophon spB (MOL21)


Enixotrophon spC (MOL25)


Cancellariidae spA (MOL26)

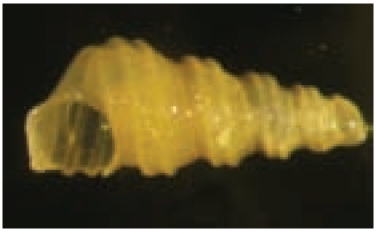

Turridae spB (MOL27)


Cerithiopsidae spA (MOL36)


Atyidae spA (MOL40)

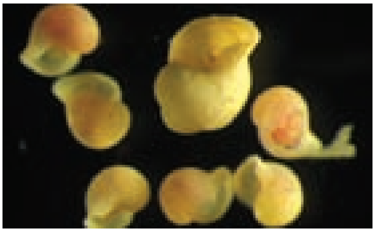

Cancellariidae spB (MOL41)


Turridae spC (MOL42)


Inuncula spA (MOL44)


Fasciolariidae spA (MOL54)

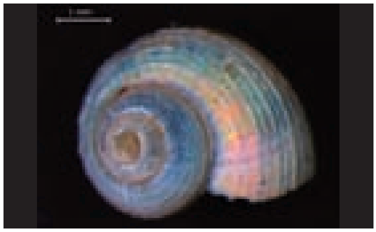

Terebridae spA (MOL60)

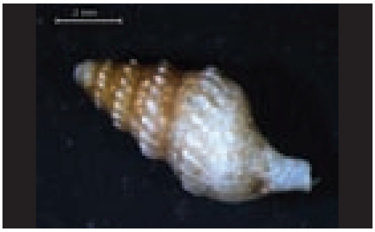

Gastropoda spB (MOL61)

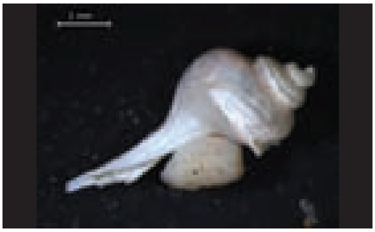

Buccinidae spD (MOL63)


Rissoidae spA (MOL64)

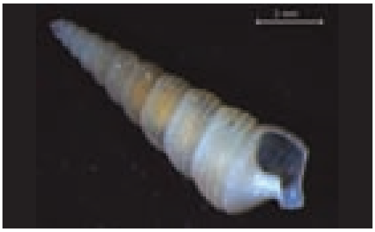

Nassariidae spA (MOL66)


Trochidae spB (MOL79)


Turridae spD (MOL80)


Gastropoda spF (MOL81)

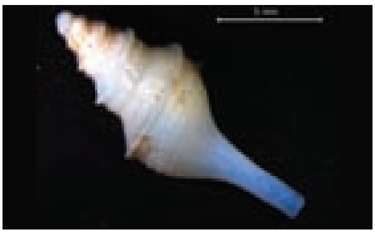

Fasciolariidae spB (MOL82)

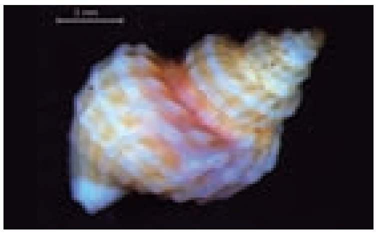

Cerithiopsidae spB (MOL86)


Turridae spE (MOL87)


Turridae spF (MOL88)


Turridae spG (MOL89)


Fasciolariidae spC (MOL91)


Buccinidae spE (MOL92)


Gastropoda spN (MOL93)

Sea slugs or nudibranchs

No code (use GAS)

1. Shell completely lacking or small and concealed
2. Well developed head and flat muscular foot
3. May resemble terrestrial slugs

In the sea slugs (order Opistobranchia) the shell is either completely lacking or small and concealed within the body. 12 taxa occur in the HIMI region; the majority of which require further taxonomic work.


Opistobranchia spA (MOL17)


Austrodoris kerguelenensis (MOL19)

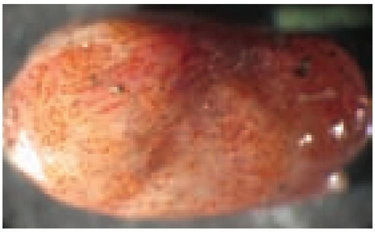

Opistobranchia spB (MOL19A)


Lamellariidae spA (MOL23)


Opistobranchia spC (MOL31)


Opistobranchia spD (MOL32)

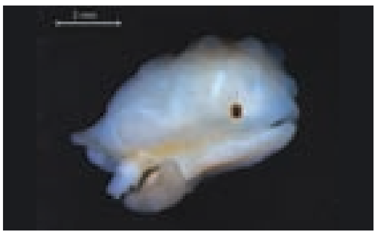

Opistobranchia spF (MOL46)


Opistobranchia spE (MOL45)


Opistobranchia spG (MOL53)


Opistobranchia spH (MOL65)


Bathydoris sp. (MOL73)


Opistobranchia spJ (MOL77)

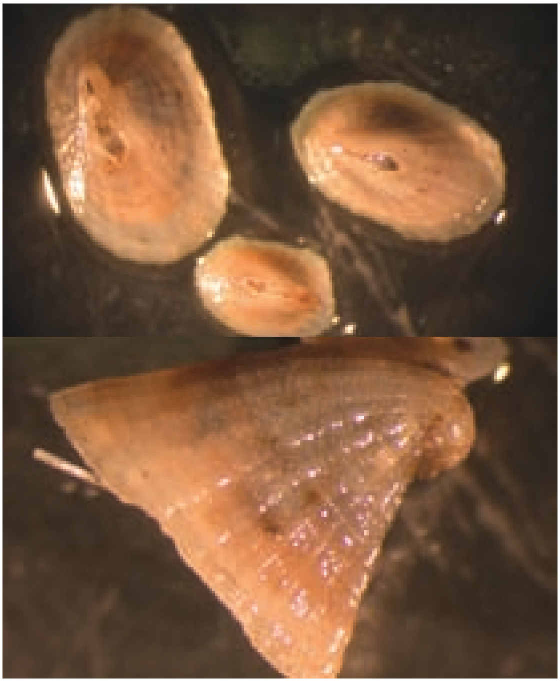
Limpets

No code (use GAS)

1. One-piece conical shell
2. Well developed head and flat muscular foot

The shell of the Limpet (order Patellogastropoda) is conical, almost like a bowl as opposed to the spiraled shell of the snails. Two species have been recorded in the deep seas of the HIMI plateau; *Nacella* spA and *Fissurellidae* spA. Both are relatively small species in comparison to their relatives that inhabit the inter-tidal zone of oceans world-wide; but larger specimens may exist that we are yet to see.

Nacella spA (MOL29)



Fissurellidae spA (MOL38)

Class Bivalvia

Clams, mussels & scallops

Code BIV

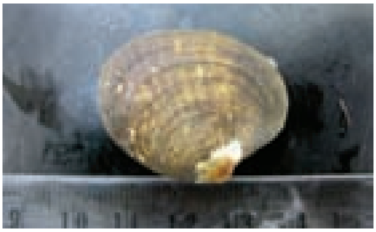
1. Two shells or valves hinged dorsally
2. Body completely enclosed within the 2 shells in most species
3. Found attached to the substrate or in the sand

The bivalves include forms such as clams, mussels, scallops and oysters. Bivalves are laterally compressed animals with two shells or "valves", hinged dorsally, that completely enclose the body in most species. In the bivalves, the musclar foot is much reduced, and often adapted for burrowing. Unlike other molluscs, bivalves lack a radula; instead most bivalves are suspension feeders, filtering small organisms and organic particles from the water (such as phytoplankton, zooplankton, bacteria and non-living organic detritus). Bivalves can be found attached to hard surfaces or burrrowed into the sand.

From the Southern Ocean and adjacent regions approximately 379 bivalve species are known (Linse *et al.* 2006). At least 28 species from 16 families have been recorded from the HIMI region specifically. Most are small and inconspicuous, but larger species like *Laternula* spA, *Psammobiidae* spA, *Crassatellidae* spA and Bivalvia spB, have previously been captured as by-catch and their presence should be noted.

Laternula spA (MOL6)

Psammobiidae spA (MOL7)



Crassatellidae spA (MOL12)

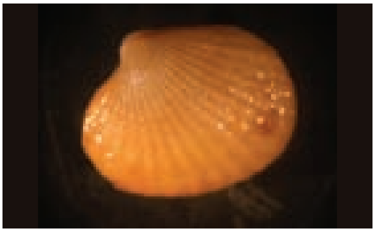
Cuspidae spA (MOL14)

Limopsidae spE (MOL22)

Nuculana spA (MOL28)

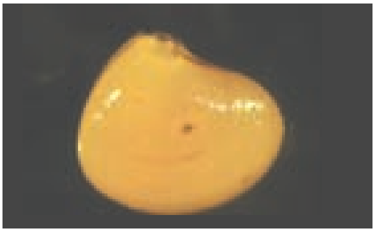
Arcidae spA (MOL33)

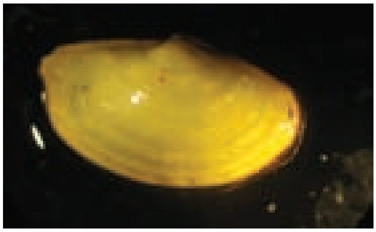
Cardiidae spA (MOL34)



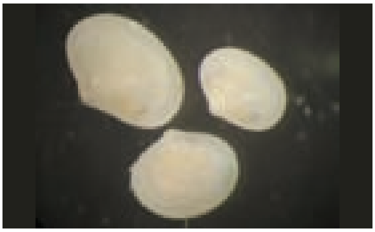
Crassatellidae spB (MOL35)

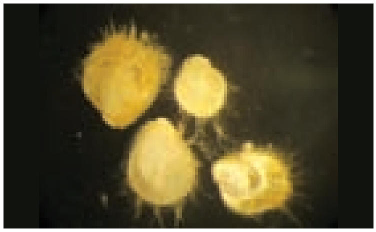

Hiatella spA (MOL39)


Gouldia (Gouldiopa) spA (MOL43)

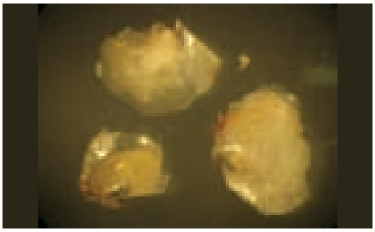

Nuculana spA (MOL47)


Limopsidae spA (MOL48)

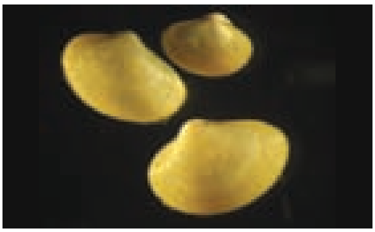

Cyamiidae spA (MOL49)

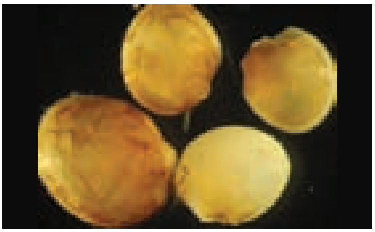

Limopsidae spB (MOL50)

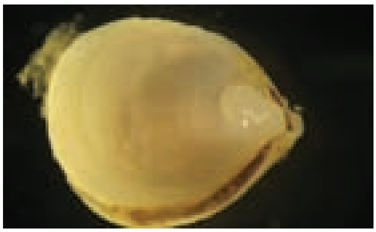

Cyclopecten spA (MOL51)

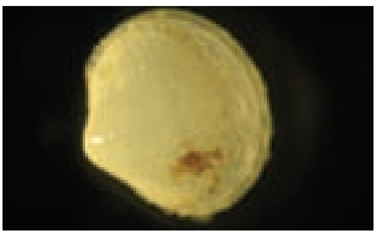

Ostreidae spA (MOL52)

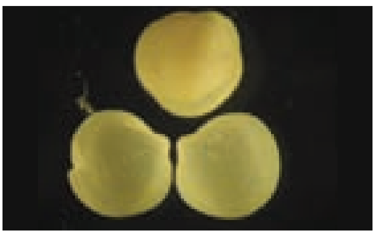

Kidderia spA (MOL55)


Cyamiidae spB (MOL56)

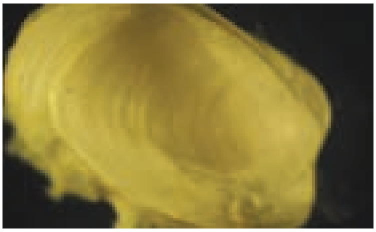

Limopsidae spC (MOL57)


Hochstetteria meridionalis (MOL58)

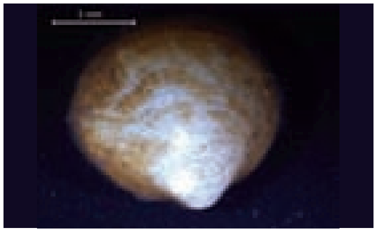

Euciroa spA (MOL59)

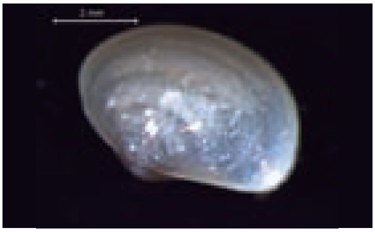

Cardiidae spB (MOL62)

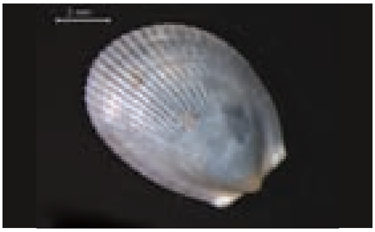

Veneroida spA (MOL67)


Galeommatidae spA (MOL68)


Acesta SpA (MOL70)


Ungulinidae spA? (MOL85)


Bivalvia spD (MOL90)


Bivalvia spE (MOL94)

Class Polyplacophora

Chitons

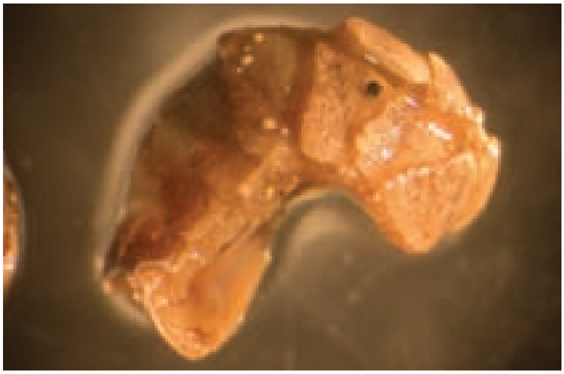
No code (use MOL)

1. Ovoid shaped
2. Shell divided into eight overlapping plates
3. Tiny head and a large muscular foot

The Polyplacophora, commonly known as chitons, is a class of dorsally-flattened, ovoid shaped marine invertebrates. The most characteristic feature of chitons is their shell which is divided into seven or eight overlapping dorsal plates. They have a large foot to allow them to hold-fast to rocks and other substrata, and only a tiny head with no eyes or readily identifiable appendages.

Polyplacophorans of the Southern Ocean are poorly described, although studies attest to low diversity with less than 10 species recorded to date (Clarke and Johnston 2003). Three taxa occur in the HIMI region: Polyplacophora spA, *Leptochiton kerguelenensis* (both captured during research hauls) and Polyplacophora spB (captured as long-line by-catch). These taxa are widely distributed throughout the HIMI region but are most common on the rocky banks.

Polyplacophora spA (MOL30)



Leptochiton kerguelenensis (MOL37)

Polyplacophora spB (MOL74)

Class Scaphopoda

Tusk shells

No code (use MOL)

1. Tapering tubular shell open at both ends
2. Shell resembles an elephant's 'tusk'

The Scaphopoda (tusk shells) have a distinctive tapering, tubular shell that is open at both ends, superficially resembling the tusk of some mammals like the elephant. The approximately 350 described species world-wide are all marine forms, usually between 3 and 6 cm long. Scaphopods lie buried in soft sediments in shallow to moderately deep water (usually less than 2,000 metres deep), the larger end of the shell (containing the head and foot) facing downward, and with the smaller aperture projecting above the surface. The mouth area is surrounded by tentacles bearing adhesive knobs, which capture small organisms such as foraminiferans.

Less than 10 species of tusk shells have been reported from the Southern Ocean (Dell 1964; Steiner and Linse 2000); which may be considered a fairly typical diversity for a group that is nowhere speciose (Clarke and Johnston 2003). Of these ten, at least one occurs at HIMI; *Dentalium aegeum*. This species is found throughout the HIMI region, but is most common to the sediment rich flats of Western Plateau where the habitat is more suitable to burrowing species like *Dentalium aegeum*.

Dentalium aegeum (MOL5)

Class Cephalopoda

Cephalopods include the familiar squids and octopus, both of which are frequently caught as by-catch in the HIMI region. A brief overview of each group is given below; for a more comprehensive review of Southern Ocean cephalopod fauna see Rodhouse *et al.* (1994).

Squid

Code SQQ

1. Torpedo-like body with posterior fins
2. Ten arms including two longer ones
3. Two or more rows or stalked suckers
4. Serrated rings and/or hooks running the length of the arms

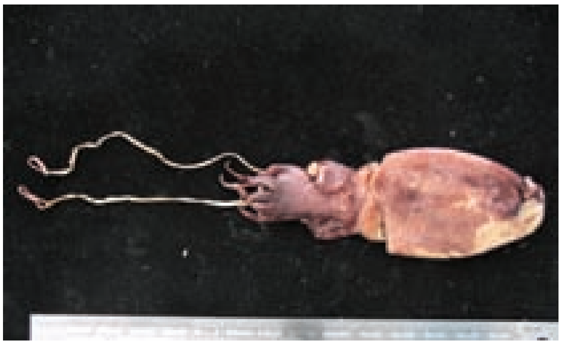
Squid are marine cephalopods of the order Teuthida. They have an elongated, torpedo-like body with posterior fins and two large well-developed eyes. Squid have ten arms, including two longer ones, with two or more rows of stalked suckers with rings and/or hooks running the entire length.

Squid in particular are often very abundant in pelagic marine environments, where they are voracious predators of many organisms, especially fish. In return, they are also the major prey item of many fish and some marine mammal and seabird species and hence play an important role in the marine ecosystem.

The most common bycatch species is the Warty squid, *Moroteuthis ingens*, that has a mantle which is either smooth or covered in round fleshy warts. Examples of other bycatch species include the small deep-maroon coloured Crown squid, *Bathyteuthis abyssicola* with short stubby tentacles, as well as the Glacial cranch squid, *Galiteuthis glacialis*; a moderately large species with a long slender mantle and relatively small concave-shaped posterior fins. Several other species are found throughout the HIMI region but are yet to be incorporated in this guide.

Moroteuthis ingens

Galiteuthis glacialis (MOL75)



Bathyteuthis abyssicola (MOL76)

Octopus

Code OCT

1. Globular sac-like body
2. Eight arms webbed at the base
3. Un-stalked suckers
4. HIMI species defined by skin texture and sucker arrangement


Benthoctopus levis (MOL1)

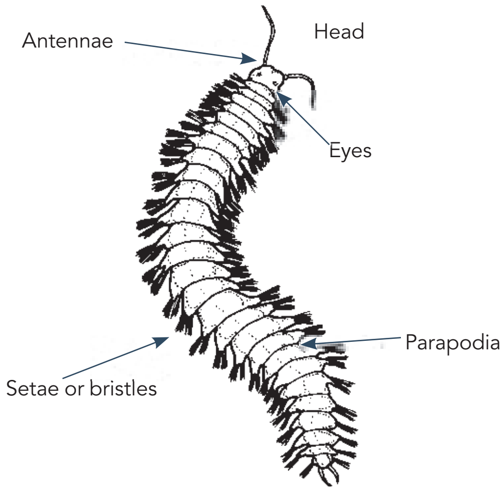
The octopus is a cephalopod of the order Octopoda. Octopus have a short globular sac-like body with 8 arms, connected together at the base by a membrane-like web, with unstalked suckers along the arms. Unlike the squid, most species of octopus have secondarily assumed a benthic existence where they feed on crustaceans and fish.

A recent synopsis of Southern Ocean octopods reports of 34 species, the majority of which belong to the genus *Pareledone* (Allcock 1997). Octopus are frequently caught as by-catch throughout the HIMI region and are particularly abundant in the Southern Plateau region. The most common species are *Benthoctopus levis* and *Graneledone antarctica*. *B. levis* has a smooth globular head with two rows of unstalked ringed suckers. *G. antarctica* has only one row of unstalked suckers and its sac-like head is covered in tiny warts giving it a rough bumpy appearance.


Graneledone antarctica (MOL3)

Annelida

The annelids, collectively called Annelida, are a large phylum of animals comprising the segmented worms. Although this phylum contains several groups known to occur in the Southern Ocean, including the oligochaetes and leeches (class Clitellata), only the polychaetes (class Polychaete) have recieved sufficient attention.



Basic morphology of a polychaete.
Original illustration sourced from Raffles Museum of Biodiversity Research (2009).

Class Polychaeta

Marine worms or bristle worms

Code WOR

1. May have bristles or hairs down the length of the body
2. May possess arm like appendages called parapodia
3. Can have scales on the aboral surface
4. Well developed head
5. Often housed in a chitinous tube; or calcareous tube like *Serpula* spA.

The Polychaeta are one of the most speciose taxa of the Southern Ocean benthos (Brandt *et al.* 2007). They include the tube-worms and bristle-worms; worms that have a body divided into segments. Each segment has a pair of fleshy appendages, known as parapodia, that bear many bristles or setae, that are used for movement, sensory perception and defense. They have well-developed heads compared to other annelids, with eyes and jaws often obvious.

The majority of polychates collected from the HIMI region remain largely un-classified, although common representatives include the sea mouse (Aphroditidae spA), *Neanthes kerguelensis* and *Serpula narconensis*; a calcareous-tube dwelling species. Numerous other morphospecies have been recorded, although these taxa require further taxonomic work, and are far less common.

Sabellidae sp (POL4)

Maldanidae spA (POL6)

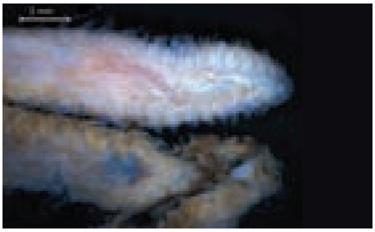
Polynoidae sp (POL7)

Aphroditidae spA (POL1)

Serpula narconensis (POL2)

Neanthes kerguelensis (POL5)

Terebellidae sp (POL8)

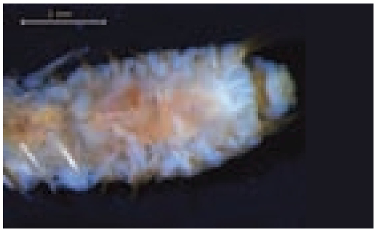


Nephtyidae sp (POL9)

Glyceridae sp (POL10)

Flabellideridae sp (POL11)

Lumbrineridae sp. (POL12)



Ampharetidae sp (POL13)

Sigalionidae sp. (POL14)

Phyllodocidae sp. (POL15)

Syllidae sp. (POL16)

Bryozoa

Sea mosses

No code (use INV)

1. Colonies of independent animals or zooids
2. Similar to some corals, sponges or algae
3. Generally have hard stony skeletons
4. May be found encrusting rocks
5. Covered with lots of tiny openings
6. Variety of shapes and patterns: lacy fans, branching twigs, etc.

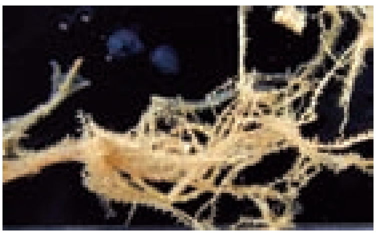
Bryozoans or sea mosses are tiny colonial animals, although each animal, or zooid, is independent of the colony and is usually no bigger than 1 mm. They generally build stony skeletons of calcium carbonate and grow in a variety of shapes and patterns from lacy fans (e.g. *Smittina anecdota*) and branching twigs (e.g. *Malakosaria sinclarii*) to matts or mounds covering rocks (e.g. *Buffonellodes* spA). Their skeletons have numerous tiny openings, each of which is home to a solitary zooid. These zooids feed with a specialised, ciliated structure called a lophophore, which is a crown of tentacles surrounding the mouth. Their diet consists of small microorganisms, including diatoms and other unicellular algae. In turn, bryozoans are preyed on by grazing organisms such as sea urchins and fish.

These structures may be found anchored to a variety of hard substrates including rocks, shells and entwined within sponges. In contrast, some bryozoan colonies do not grow on solid substrates, but form colonies on sediment. Bryozoans can often be mistaken for other organisms such as corals, sponges or algae, due to their superficial similarities.

Southern Ocean bryozoans are now a relatively well-known group, with a recent and thorough revision of the phylum by Hayward (1995). In the HIMI region, areas like Coral and Aurora Bank have dense coverings of bryozoa. These assemblages provide important structural complexitity and habitats for other organisms, reflected by the high diversity of animals found in such regions (Hibberd *et al.* 2008).

Only a small portion of the total biomass of bryozoa collected from the HIMI region has been identified. From this portion some 34 taxa were recorded, although undoubtedly if we were to undertake further taxonomic work on the remaining samples, numerous more taxa would be revealed.

Isosecuriflustra angusta (BRY1)



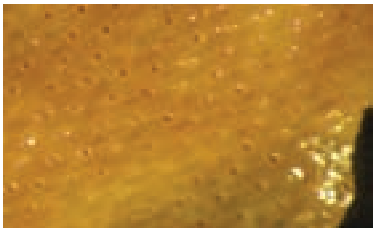
Cornucopina spA (BRY2)

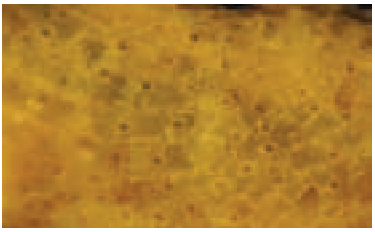
Cellarinella spA (BRY4)

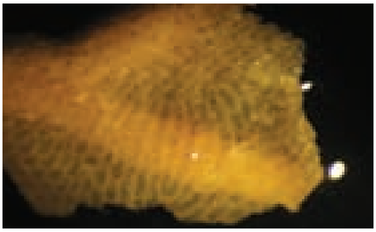

Malakosaria sinclarii (BRY5)


Nevianipora spA (BRY6)


Osthimosia spA (BRY7)

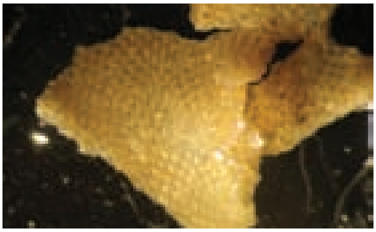

Thrypticocirrus spA (BRY8)


Schizomavella spA (BRY9)


Smittoidea ornatipectoralis (BRY10)


Entalophoridae spA (BRY11)


Reteporella spA (BRY12)

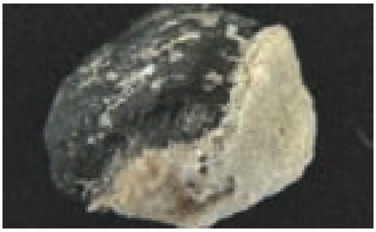

Filaguria spA (BRY13)


Turritigera spA (BRY14)


Turritigera spB (BRY15)


Cellaria spA (BRY16)


Caberea darwinii (BRY17)


Buffonellodes spA (BRY18)

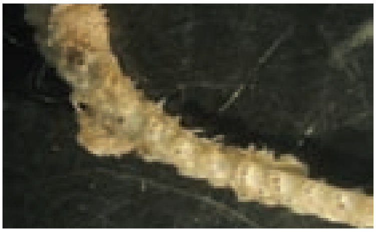

Lageneschara lyrulata (BRY19)


Smittina anecdota (BRY20)


Cyclostomata spA (BRY21)


Arachnopusia inchoate (BRY22)


Carbasea ovoidea (BRY23)

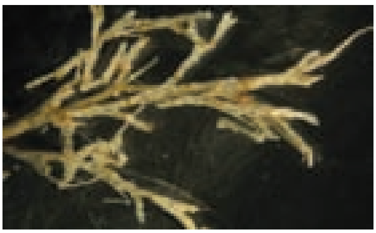

Arachnopusia spA (BRY24)


Klugeflustra spA (BRY25)

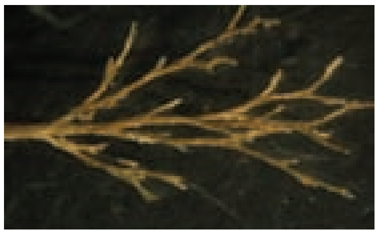

Galeopsis bullatus (BRY26)


Oncousoecia spA (BRY27)

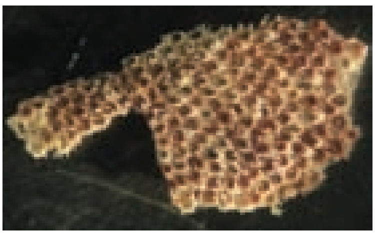

Bugulopsis spA (BRY28)

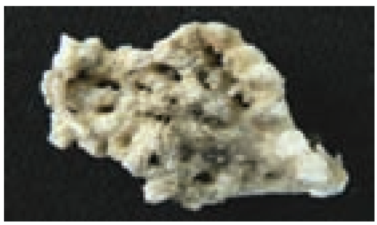

Notoplites spA (BRY29)


Cellaria spB (BRY30)


Ctenostomata spA (BRY31)


Pemmatoporella marginata (BRY32)


Chaperiopsis spA (BRY33)


Arachnopusia spB (BRY34

Brachiopoda

Lampshells

Code BRC

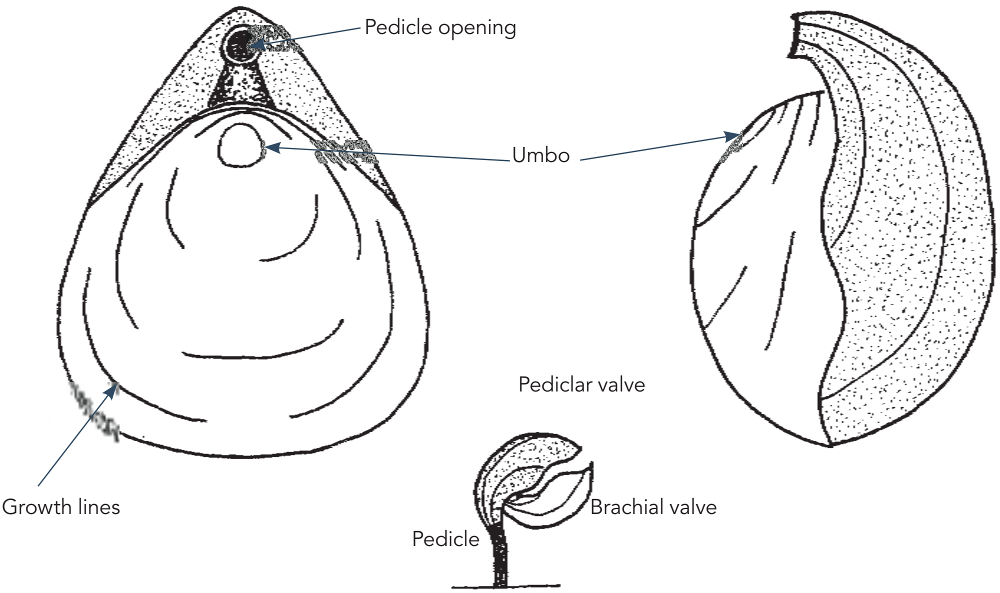
1. Two-shelled
2. Clam-like, superficially resembling a bivalve
3. Fleshy 'stalk' at hinge to attach to substrate

Brachiopods or lampshells are sessile, two-shelled, marine animals with an external morphology superficially resembling clams or bivalves of the phylum Mollusca. These sessile suspension feeders once dominated the seas, but declined with the rise of the bivalve molluscs, and nowadays are confined largely to polar, deep-sea and cave habitats (Clarke and Johnston 2003)

Despite superficial similarities, bivalves and brachiopods differ markedly and are not closely related. Bivalves usually have a plane of symmetry between the shells, whereas most brachiopods have a plane of bilateral symmetry through the shells and perpendicular to the hinge. A second major difference is that most brachiopods are attached to the substrate by means of a fleshy 'stalk' or pedicle. In contrast, although some bivalves, such as oysters or mussels, are fixed to the substrate, most are free-moving, usually by means of a muscular 'foot'.

Phylum Brachiopoda is divided into two classes: Articulata and Inarticulata. Articulata have two valves with an articulating hinge as opposed to the Inarticulata, which have no hinge.

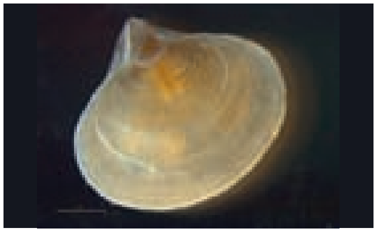
The Southern Ocean brachiopod fauna is small, with 19 species described to date (Foster 1974). Five taxa, all belonging to the class Articulata, have been recorded from the HIMI region. Of these, two are common; Articulata spA and *Notosaria nigricans pyrxidata*.



Morphology of a brachiopod shell.
Adapted from an illustration by Muriel Gottrop (2005).


Magellania cf. *kerguelensis* (BRAC3)


Aerothyris maquarensis (BRAC4)


Articulata spC (BRAC5)


Articulata spA (BRAC1)


Notosaria nigricans pyrixidata (BRAC2)

Arthropoda

The phylum Arthropoda includes three main subdivisions: crustaceans, chelicerates (arachnids and pycnogonids) and uniramians (insects and relatives).

Subphylum Crustacea

Code FCX

The crustaceans are a large group of arthropods, comprising approximately 52,000 described species. They include various familiar animals, such as lobsters, crabs, prawns, shrimp, isopods, amphipods and barnacles. Copepods and other microscopic animals are also crustaceans but are not covered in this guide.

Unlike their fellow arthropods, the arachnids and insects, crustaceans are primarily aquatic, living in either freshwater or marine environments. The majority are motile, moving about independently, although a few taxa are parasitic and live attached to their hosts (including sea lice and fish lice), and adult barnacles live a sessile life.

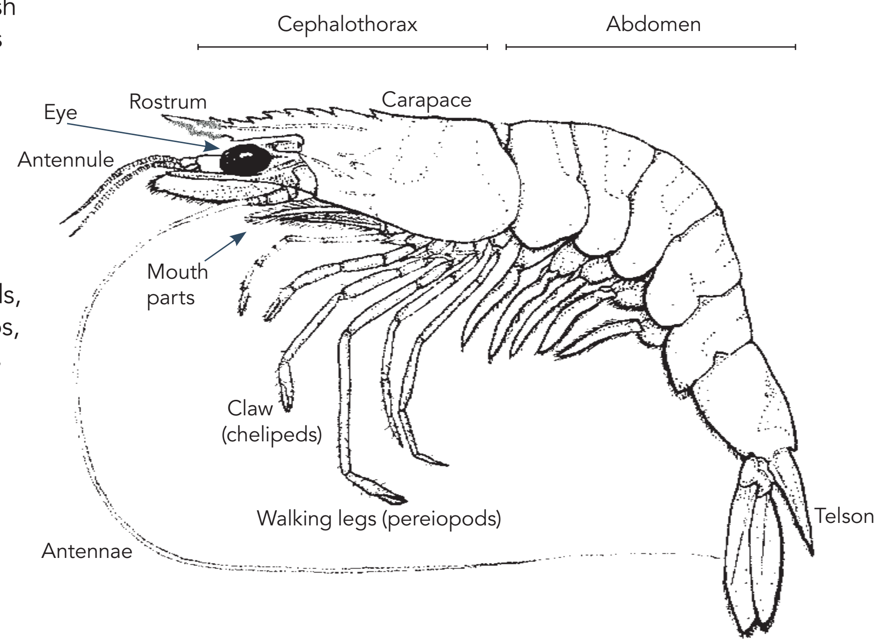
Crustaceans likely to be observed in the HIMI benthos can be divided into ten major groups: crabs, lobsters, prawns and shrimps, krill, isopods, amphipods, seed shrimps, tanaids, hooded shrimps and barnacles. After a brief introduction to the common body plan of a crustacean a description of each group follows.

Body structure

Crustaceans vary so much in shape, form and behavior that it is a difficult task to create a definition which lists traits that are common to all of them. This is especially so with the barnacles, which look like no other crustacean in the adult stage.

The basic characteristics features of crustaceans include:

- Hard 'crusty' outer shell
- A defined head, thorax and abdomen
- Head and thorax sometimes fused to form a cephalothorax
- Between sixteen and sixty body segments.
- A telson or tail (i.e. last segment of the abdomen of a lobster).
- Stalked eyes (except in amphipods and isopods)
- Most crustaceans have a carapace (a shell that covers all or part of the thorax)
- The head carries pairs of appendages, usually the antennae and 3 pairs of appendages that are modified into mouthparts.
- The thorax and abdomen have pairs of appendages used for movement and in some cases, for respiration and mating



Generalized anatomy of a crustacea using a prawn as an example.

Crabs

As by-catch species, crabs (order Decapoda) are uncommon in the HIMI fishery but far more common in the waters surrounding Macquarie Island; an area often visited enroute to HIMI. The majority of crabs identified from this region belong to the family Lithodidae commonly known as stone or king crabs.

Stone or king crabs

Code (see table 6)

1. Not true crabs
2. Asymmetrical abdomen; believed to be derived from hermit crab ancestors
3. Carapace pear shaped
4. Spiny and often orange to red in colour
5. Well developed eyes.
6. Species distinguished by their rostrum

Lithodids are large crab-like decapod crustaceans chiefly found in cold seas. They are often orange to red in colour and are characterized by a pear-shaped carapace and long spiny legs.

Two species common to the HIMI region include *Lithodes murrayi* and *Paralomis* sp. According to by-catch records for all Antarctic fisheries, *L. murrayi* is by far the most common lithodid species, constituting more than 40% of crabs captured as by-catch in recent years. Lithodids from the genus *Paralomis* constitute approximately 10% of crab by-catch and to date have all been classified as *Paralomis* sp.; although it is likely that these crabs were actually *Paralomis aculeata* which is a common species to nearby regions. The remaining 40-50% of crab bycatch has merely been named after the family Lithodidae due to a lack of reference material to aid observers in identification; although it's likely the majority of these were *L. murrayi*. The decision rules for classifying Lithodid species and associated CCAMLR codes are given in Table 6. For identifying features see the following descriptions.

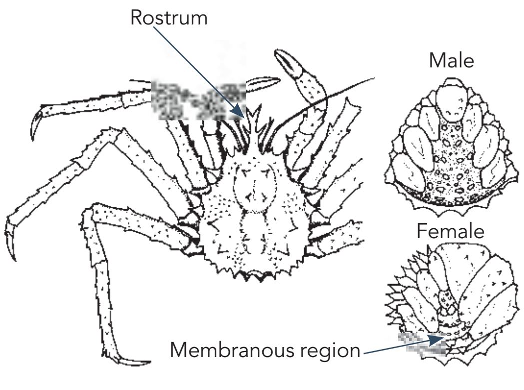
Family	Genus	Species	CCAMLR Code	Decision rules
Lithodidae	Unknown	Unknown	KCX	From the family Lithodidae
	Lithodes	*Lithodes* sp.	KCZ	From the family Lithodidae and the genus *Lithodes*
	Lithodes	*Lithodes murrayi*	KCM	Species *Lithodes murrayi* from the family Lithodidae and the genus *Lithodes*
	Paralomis	*Paralomis* sp.	PAI	From the family Lithodidae and the genus *Paralomis*
	Paralomis	*Paralomis aculeata*	KCU	Species *Paralomis aculeata* from the family Lithodidae and the genus *Paralomis*

Table 6 – Decision rules for classifying Lithodid crabs likely to be observed and their associated CCAMLR codes.
Note: characteristics of the rostrum (calcareous point that protrudes from the front apex of the carapace) and the abdomen is what differentiate Lithodid species.

Lithodes sp.

Code KCZ

Large spiky crab. Carapace and legs covered with unequal sharp spines and tubercles (wart-like projections). Differentiated from *Paralomis* sp. by the abdomen which has a membranous region containing calcareous nodules. The carapace of *Lithodes* sp. also has larger spines and a larger rostrum. *Lithodes* species caught in the region are more than likely *Lithodes murrayi*.

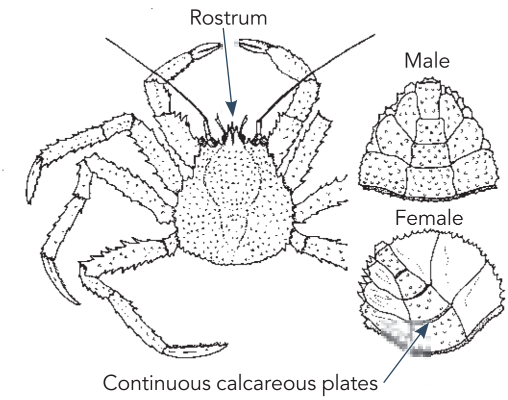


Schematic of *Lithodes* sp. and male and female abdomens.

Paralomis sp.

Code PAI

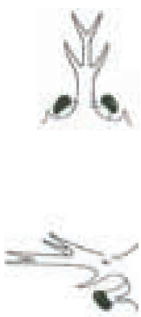
Pear shaped carapace, covered by spinous tubercles. Unlike *Lithodes* the *Paralomis* abdomen is without membranous areas; the calcareous plates being continuous. The rostrum is also shorter with 2 straight and divergent spines and one larger median spine. *Paralomis* species caught in the region are more than likely *Paralomis aculeata*.



Schematic of a *Paralomis* sp. and male and female abdomens

Lithodes murrayi

Code KCM



Photographs by Nicolas Gasco

Paralomis aculeata

Code KCU

Photographs by Nicolas Gasco

Clawed lobsters

Code NEX

1. 'True' lobsters
2. Hard exoskeleton, 10 legs and two large claws; one often larger than the other
3. May resemble freshwater crayfish or 'yabbies'

Clawed lobsters (family Nephropidae) are a group of marine crustaceans found all over the world. Though several different groups of crustaceans are known as "lobsters", the clawed lobsters are most often associated with the name. Clawed lobsters are not closely related to the widely recognised rock lobsters; instead their closest relatives are the tropical reef lobsters (genus *Enoplometopus*) and the various families of freshwater crayfish. They are characterised by a hard protective exoskeleton and ten legs, with the front ones adapted to claws, and generally live singly in crevices or in burrows on rocky, sandy, or muddy bottoms.

Only one species of clawed lobster is recognised from the HIMI region, the bellator lobster (*Thymopides grobovi*). *T. grobovi* is known only from this region and the surrounding Kerguelen Plateau, where it is found at depths between 525 and 1220 m (Burukovsky & Averin, 1976; Ledoyer, 1979). This bright orange coloured lobster is easily recognisable, ranging in size from 3 to 11 cm, and is particularly common to the Northeast Plateau region.

Thymopides grobovi (CRU7)

Prawns & shrimp

Code DCP

1. Superficially similar groups of the order Decapoda
2. Have a chitinous exoskeleton and cephalothorax
3. Larger than krill with a more rigid outer shell which is usually non-transparent in the adult form
4. Shrimp are distinguishable from prawns by the structure of their gills

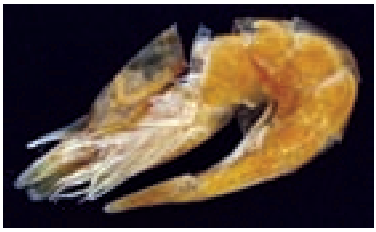
Prawns and shrimps are superficially similar groups of the order Decapoda. The true shrimps are swimming, decapod crustaceans classified in the infraorder Caridea, found widely around the world. Prawns however are shrimp-like crustaceans, belonging to the sub-order Dendrobranchiata. Shrimps are distinguished from the superficially similar prawns by the structure of the gills. There is, however, much confusion between the two, especially among non-specialists, and many shrimp are called "prawns" and many prawns are called "shrimp".

A number of more or less unrelated crustaceans share the word "shrimp" in their common name. Examples are the mantis shrimp and the opossum or mysid shrimp, both of which belong to the same class (Malacostraca) as the true shrimp, but constitute two different orders within it, the Stomatopoda and the Mysidacea. To avoid confusion, all shrimps and prawns are to be classified under the code DCP.

Eleven prawn/shrimps have been recorded from the HIMI region. The most common are prawns of the genus Pasiphaea.

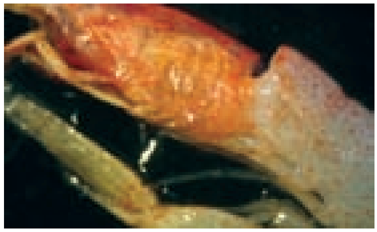

Pasiphaea spA (CRU8)
Photograph by Keryn O'Regan

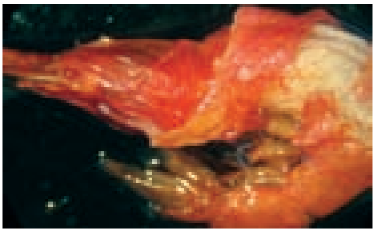

Caridea spA (CRU35)


Oplophoridae spA (CRU36)


Pasiphaea spB (CRU37)

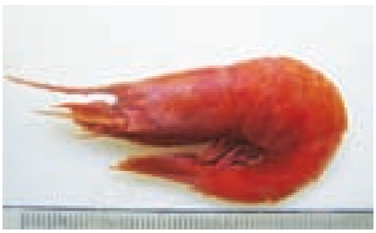

Thysanoessa macrura (CRU38)


Sergestidae spA (CRU46)


Decapoda spB (CRU47)


Decapoda spF (CRU55)


Gnathophausia ingens (CRU56)


Acanthephyra pelagica (CRU57)


Decapoda spG (CRU58)


Oplophorus spA (CRU60)


Decapoda spC (CRU61)


Campylonotus spA (CRU65)
Photograph by Keryn O'Regan

Krill

Code KRX

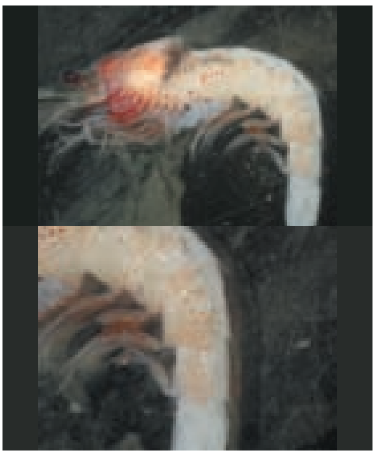
1. Have a chitinous exoskeleton and cephalothorax
2. Outer shell is transparent in most species
3. Feature intricate compound eyes
4. Distinguished from other crustaceans like shrimps by their externally visible gills

Krill (order Euphausiacea) are shrimp-like crustaceans closely related to decapods. These planktonic marine invertebrates are found throughout oceans worldwide, but certain filter-feeding species occur in enormous numbers in Antarctic waters, and have been studied in considerable detail. Although krill are a pelagic taxon, they are often captured in the HIMI region, entangled within the catch as the net is hauled through the water column.

Four species of Euphausiids have been identified from benthic samples collected from the HIMI region: *Euphausia triacantha, E. vallentini* and two unidentified species. *E. triacantha is* distinguished by three pronounced spines on the back of its abdomen. *E. vallentini* is distinguished by the presence of an 'antennular lappet'; a small over-lapping scale at the joint between the first and second segment of the antenna.

Euphausiacea spA (CRU48)

Euphausiacea spB (CRU49)



Euphausia triacantha (CRU51): 3 pronounced spines on the back of the abdomen

Euphausia vallentini (CRU52): antennular lappet present

Amphipods or sand hoppers

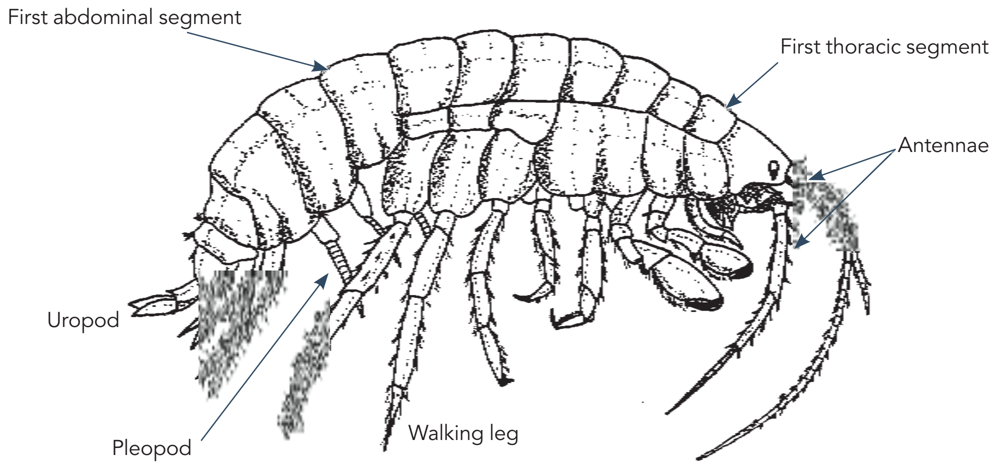
Code AQM

1. More shrimp-like than isopods
2. No obvious thoracic or abdominal region
3. Eyes on the side of the head not on stalks
4. Laterally flattened (flattened side to side)

The two largest orders of crustaceans other than decapods (i.e. prawns, shrimp, crabs etc.) are the amphipods and isopods. These taxa, most of which are only about a centimeter in length, share a number of similarities and are the most frequent crustaceans found in benthic environments of the sub-Antarctic (Wagele 1991). Most notably, the compound eyes are on the sides of the head and not on stalks, as in the decapods. Also no carapace is present, and the thoracic and abdominal regions are not sharply demarcated on the dorsal side.

In general the most obvious difference between the two is their body form. Isopods tend to be dorso-ventrally flattened (wider than they are high), whereas amphipods are laterally flattened (higher than they are wide) and look somewhat like a shrimp with a curved body. But more accurately, amphipods are defined by the presence of "different legs" (i.e. uropods or tail-limbs), usually two pairs of legs modified to help with feeding, and seven pairs of walking legs, some facing forward; others backward). The head carries two pairs of antennae, the eyes, and the mouthparts. Amphipods often give the appearance of a shrimp, but there is no defined carapace and the eyes are not on stalks.

The order Amphipoda includes over 7,000 described species; most of which are marine. Marine amphipods may be pelagic or benthic. In cold seas, benthic amphipods are enormously diverse and abundant. These crustaceans are amoung the most intensly studied marine taxa in the Southern Ocean, and have been thoroughly reviewed by De Broyer & Jazdzewski (1993). According to De Broyer & Jazdzewski (1993) and many authors thereafter, amphipods may be considered as the most abundant benthic crustacean in the Southern Ocean. An abundance of amphipods have been collected from the HIMI region although they are largely unsorted at this stage. Included here are some of the more common and readily identifiable taxa. The most abundant is *Themisto gaudichaudii*. Living in the Southern Ocean, this amphipod congregates in dense swarms, where it is a voracious predator of copepods and other small members of the zooplankon.



Morphology of an amphipod.
Adapted from an illustration in Dorit *et al.* (1991).


Empimeria spA (CRU10)


Caprellidae sp (CRU11)


Phromima spA (CRU40)


Gammaridea spB (CRU42)

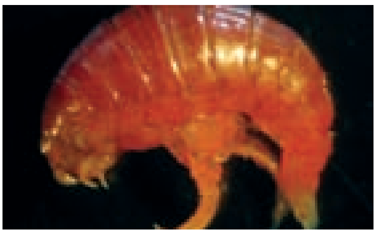

Gammaridea spC (CRU43)


Hyperiidea spA (CRU44)


Gammaridea spE (CRU45)


Thermisto gaudicaudii (CRU50)

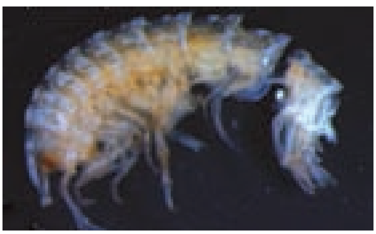

Primno macropa (CRU62)


Gammaridea spA (CRU63)


Amphipoda spA (CRU66)


Amphipoda spB (CRU67)

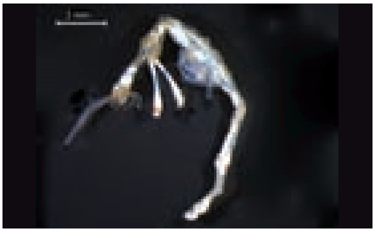

Amphipoda spC (CRU68)


Amphipoda spD (CRU69)


Amphipoda spE (CRU70)


Amphipoda spF (CRU71)


Amphipoda spG (CRU72)


Amphipoda spH (CRU73)


Amphipoda spI (CRU74)


Amphipoda spJ (CRU75)

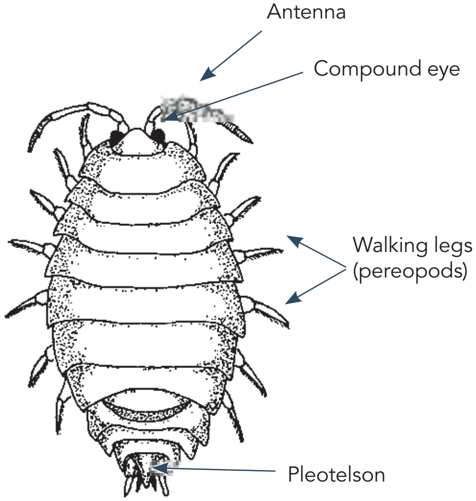
Isopods or sea slaters

Code ISH

1. Look more like terrestrial slaters or bugs
2. More robust than amphipods
3. Dorso-ventrally flattened (flattened top to bottom)

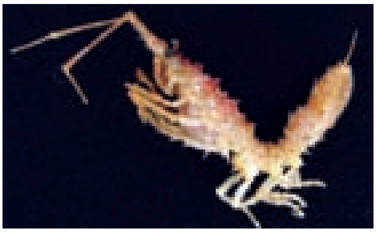
The isopods, also known as pill bugs or sea slaters, are peracarid crustaceans with a reduced carapace. Isopoda are frequently caught in the same habitats as the amphipoda and normally have a dorso-ventrally flattened body and different appendages to the amphipods. They may appear more robust than amphipods and tend to have a 'slater' (e.g. *Natatolana* spA) or more 'bug-like' (e.g. *Antarcurus oryx*) appearance.

Like the amphipods, isopods are more accurately defined by their legs. All isopods have eight pairs of appendages; the first pair which function as mouthparts, and seven pairs of walking legs which are usually of similar structure (hence the name iso-pod from the Greek isos meaning 'equal' and podes meaning 'feet').



Morphology of an isopod.
Adapted from an illustration by Ivy Livingstone, © BIODIDAC (2007).

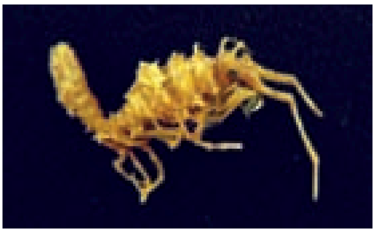
The Southern Ocean isopod fauna is well known particularly thanks to the extensive taxonomic work of Brandt (1988; 1991; 1999) and Wagele (1989). Estimates of total species numbers vary between 250-350 (Arntz *et al.* 1997; Clarke and Johnston 2003). Twenty-six taxa have been identified from the HIMI benthic fauna. The most common is the prehistoric looking *Ceratoserolis cornuta* followed by the more bug-like *Antarcturus oryx* and *Arcturides cornutus.*

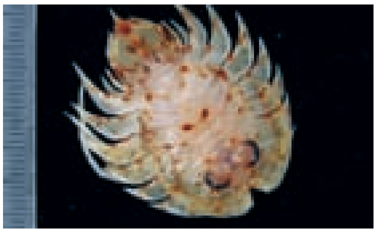

Antarcturus oryx (CRU1)


Arcturides cornutus (CRU2)


Serolis gracilis (CRU3)


Natatolana spA (CRU4)


Tuberarcturus spA (CRU5)


Ceratoserolis cornuta (CRU6)

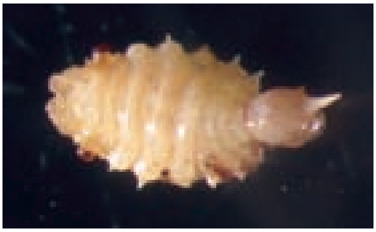

Euneognathia gigas (CRU12)


Ananthura elegans (CRU13)

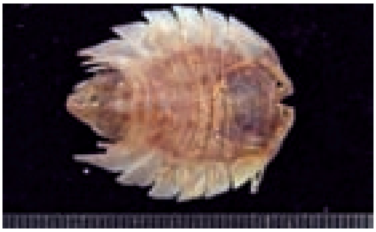

Cymodopsis spA (CRU14)

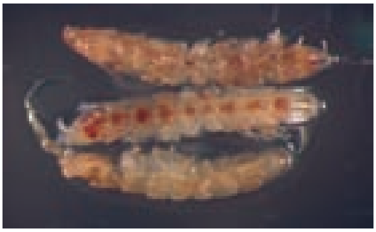

Eisothistos antarcticus (CRU15)


Neastacilla kerguelensis (CRU18)


Munna spA (CRU19)


Asellota spA (CRU20)


Serolis spA (CRU21)


Asellota spB (CRU23)


Notatolana cf. *oculata* (CRU25)


Dolichiscus aft. *annae* (CRU27)

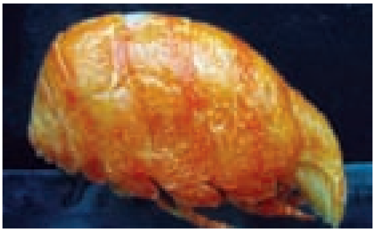

Antarcturidae spA (CRU29)


Antarcturidae spB (CRU30)


Asellota spC (CRU31)


Asellota spD (CRU32)


Litarcturus stebbingi (CRU34)


Isopoda spQ (CRU64)


Litarcturus aft. *granulosus* (CRU64)

Tanaids

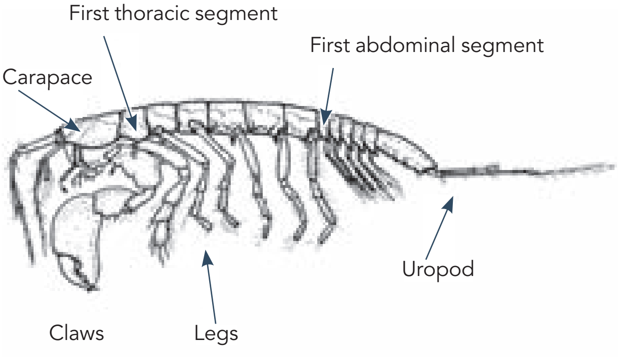
Code TVN

1. Minute crustacea with 6 thoracic and 5 abdominal segments.
2. Claws on the first walking legs
3. Often reside in sandy tubes

Tanaids (order Tanaidacea) make up a minor crustacean group within the class Malacostraca. Most tanaids are small (2 to 5 mm long), but adult size reaches 0.5 to 120 mm. They have a carapace formed via fusion of the first 2 thoracic segments. They also have claws on the first walking legs (pereiopods), 6 free thoracic segments, 5 abdominal segments bearing pleopods and a pleotelson or tail fan with a pair of uropods (Sieg 1986b).

Most species of Tanaidacea are benthic marine dwellers. The tanaidaceans can be found at a wide variety of depths, from the littoral zone to deep waters. They mostly reside in sandy or muddy substrates where they feed on detritus and its associated microorganisms; a few predatory species also attack small animal prey. Many tanaids construct tubes with particles of sand and detritus. Generally, these tubes are open at both ends, and tanaids use their pleopods to create water currents drawing food particles into the tube. The seafloor is often littered with the tubes built by tanaids which helps stabilise the sediment, favouring the colonization of other sedentary species.

Much of our knowledge of Southern Ocean Tanaidacea fauna comes from research undertaken in the late 80's by Sieg (1983; 1986a; 1986b). Based on more recent decriptions some 173 species are known from the Southern Ocean, mostly from shelf depths (Guerrero-Kommritz and Blazewicz-Paszkowycz 2004). So far only three species have been recorded from the HIMI region. However, sampling techniques used to collect organisms for this guide are unsuitable to reliably sample such minute organisms and hence a greater diversity may be revealed should more suitable methodologies be used.



Morphology of a tanaid.
Adapted from an illustration by Kim Larsen (2002).

Notolanais spA (CRU9)

Apseudomorpha spA (CRU17)

Tanaidacea spA (CRU26)

Cumaceans or hooded shrimps

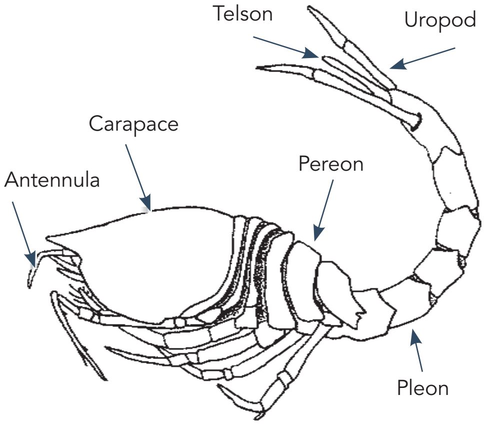
No code (use KCX)

1. Unique body plan – enlarged carapace, slim abdomen and a forked tail
2. Very small – less than 10 mm

Cumaceans (order Cumacea), occasionally called hooded shrimps, are small marine crustaceans with a unique appearance and uniform body plan that makes them easily distinguishable from other crustaceans. They have a strongly enlarged carapace and pereon (breast shield), a slim abdomen and a forked tail (see diagram). The length of most species varies between 1 and 10 mm.

These minute crustaceans are mainly marine, although some can survive in low salinity environments. They live in sandy or muddy substrates where they feed mainly on microorganisms and organic material either by filtering food out of the mud or grazing individual sand grains. Some genera possess minute piercing organs, which can be used for predation on microscopic organisms (i.e. foraminiferans) and small crustaceans.

Seventy-seven cumaceans have been described from the Southern Ocean, 73 of which are endemic to the area (Brandt *et al.* 2007). Only one has been recorded from the HIMI benthos, Cumacea spA. Although as with the other minute crustaceans like tanaids and ostracods, sampling methods used may have failed to sample this group reliably.



Morphology of a Cumacean.
Adapted from an illustration by Hans Hillewaert (2006).

Cumacea spA (CRU16)

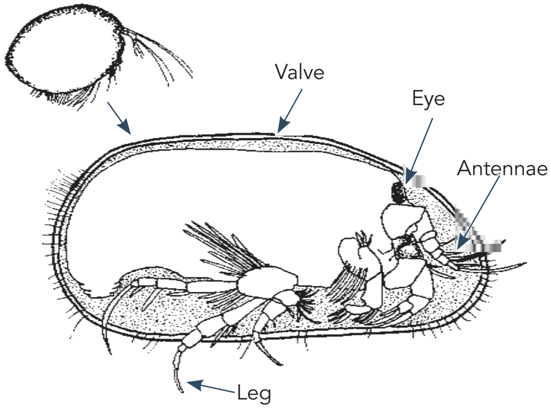
Ostracods or seed shrimps

No code (use KCX)

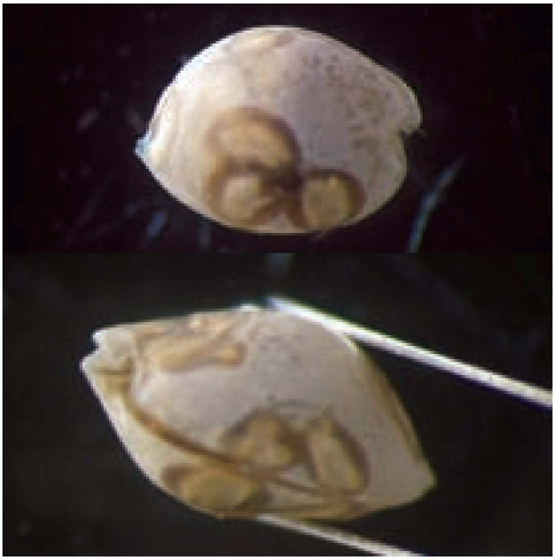
1. May resemble a bivalve
2. Very small – generally less than 2 mm
3. Two chitinous valves (i.e. like in bivalves but not calcified) which enclose the body.

Another minute crustacean frequently found in Southern Ocean marine sediments is the Ostracoda, or seed shrimps. Ostracods (class Ostracoda) are tiny crustaceans with the body entirely enclosed within a bivalved carapace. Ostracods are often confused as molluscs as they parallel the bivalves in many ways. They have two interlocking chitinous valves, usually 2 mm or less in length. These valves enclose the body which is mostly head, for the thorax, abdomen and associated appendages are greatly reduced. They have two antennae and well developed head appendages; although without a microscope these features would be difficult to identify.

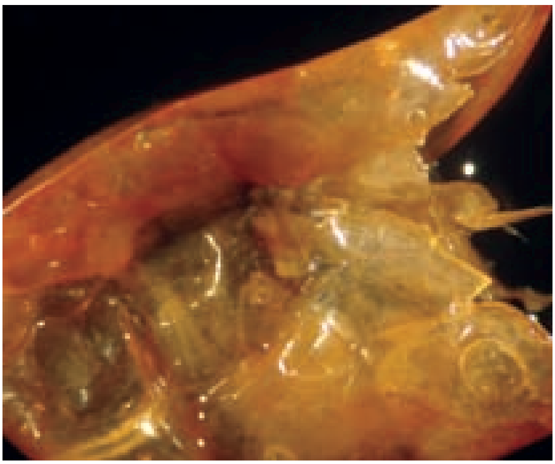
The ostracod fauna off Kerguelen and Heard Island was recently studied in detail by Ayress *et al.* (2004), who recorded 26 shallow-water and 35 deep-sea benthic ostracods. Research undertaken for this guide recorded only two morphospecies in the HIMI benthos. More species are likely to be present, but were not sampled in this study, and are therefore unlikey to be captured as bycatch in the HIMI fishery.



Morphology of an Ostracod.
Adapted from Smith *et al.* (2006).



Ostracoda spp (CRU22)



Ostracoda spA (CRU39)

Barnacles

No code (use KCX)

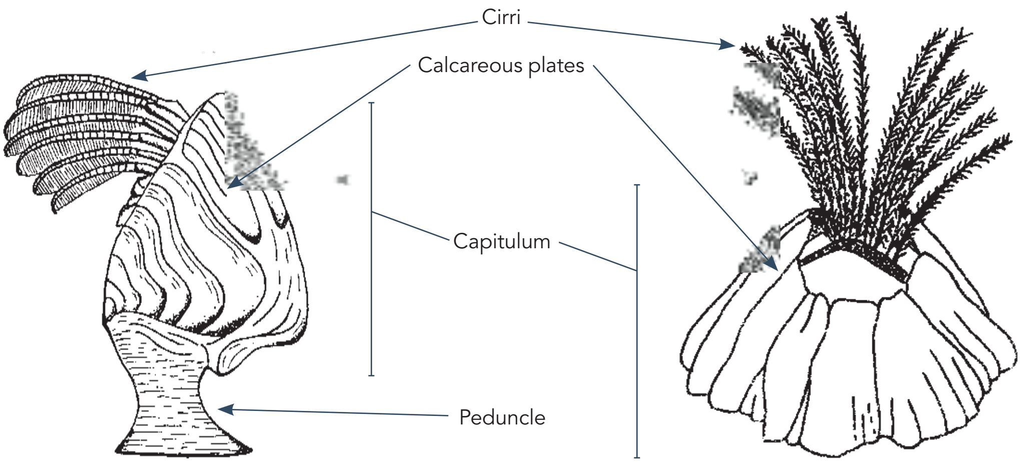
1. The only sessile crustacean.
2. Two body forms: stalked (goose barnacles) or sessile (acorn barnacles).
3. The body or capitulum consists of calcareous plates which enclose the body inside.
4. Attachment point at base
5. Found attached to substrate, floating objects or moving animals.
6. May be attached to pycnogonids – please take note of this association

Barnacles (class Cirripedia) are filter feeding crustaceans whose body is enclosed within a bivalved carapace covered with protective calcareous plates. The barnacles are markedly different from other crustaceans both in form and lifestyle. Unlike their relatives, barnacles are also sessile, living attached to the substratum.

Barnacles can be divided into two forms; pedunculate (stalked) and sessile (stalkless) barnacles. The body of stalked barnacles, sometimes called goose barnacles, is composed of a fleshy stalk, or peduncle, and a distal capitulum (meaning the body of the barnacle itself). The body of the sessile barnacles, sometimes called acorn barnacles, consists mostly of the capitulum, with the peduncle reduced to an attachment platform on which the capitulum rests.

Whilst stalked barnacles may be found attached to floating objects or the body of swimming animals, most sessile barnacles have become adapted for life on rock or other hard substrata. Barnacles have been observed on numerous sessile structures from the HIMI region including cnidarians, porifera and ascidians. They have also been observed attached to motile animals like pycnogonids (sea spiders); please look out for these associations, retain the individual and take observations.

Little information is available on Southern Ocean barnacles, although a recent review by Clarke and Johnston (2003) estimates the total species number at around 50. Three barnacles have been identified from the HIMI benthos; one stalked barnacle, *Pedunculata* spA and two acorn barnacles, *Sessilia* spA and *Sessilia* spB. Further taxonomic worked is required on these specimens.



General morphology of stalked (left) and sessile (right) barnacles.
Stalked barnacle adapted from Farlex clipart collection. © 2003-2008 Princeton University, Farlex Inc.


Sessilia spA (CIRRI1)


Sessilia spB (CIRRI3)


Pedunculata spA (CIRRI2)
Pycnogonid/barnacle association

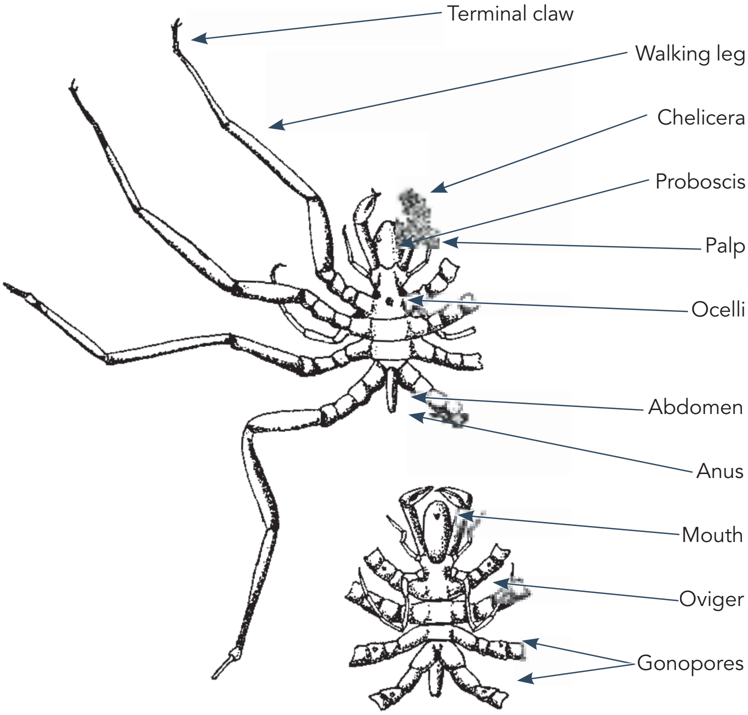
Subphylum Chelicerata

The chelicerates comprise the horseshoe crabs (merestomatans), the arachnids (spiders, mites, scorpions and allies) and the pycnogonids (sea spiders). There are no horseshoe crabs in the Southern Ocean. The marine mites appear to occur widely, but are too small and inconspicuos to be observed by the naked eye. Hence for the purpose of this guide, only pycnogonids will be covered.

Sea spiders

Code PWJ

1. Resembles common terrestrial spiders
2. Long legs in contrast to a small body
3. Large proboscis that functions as the mouth
4. Four to six pairs of legs together with other appendages which may resemble legs
5. Described as "an emaciated (under fed) spider walking backwards."



Schematic of a sea spider.
Adapted from Hickman (1973).

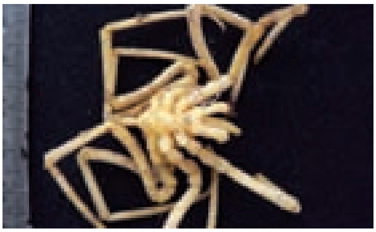
Class Pycnogonida consists of a small group of long-legged marine arthropods called sea spiders or pycnogonids. They are found all over the world, and are particularly common in Antarctic and sub-Antarctic waters, frequently captured as by-catch in the HIMI region.

The extremely reduced body of the pycnogonid consists of the cephalothorax and much smaller abdomen. The abdomen lacks appendages, and in most species it is reduced and almost vestigial. There is up to two pairs of dorsally located simple eyes on its chitinous exoskeleton, though sometimes the eyes can be missing, especially among species living in the deep oceans. The anterior region of a pycnogonid consists of 4-6 pairs of walking legs as well as other appendages which often resemble legs. These additional appendages, including the chelifores, palps and ovigers, are used in grooming, caring for young and courtship. They feed through a proboscis, commonly refered to as a tubular feeding or sucking organ, which extends from the head of the animal. In some species the chelicera, palps and ovigers can be reduced or missing in adults. In those species that lack chelicera and palps, the proboscis is well developed and more mobile and flexible.

They range in size from 1-10 mm, to over 90 cm in some deep water species with the largest found in Antarctica.

Sea spiders do not swim but rather walk along the bottom with their stilt-like legs. Most are carnivorous and feed on cnidarians, sponges, polychaetes and bryozoans. Sea spiders are generally predators or scavengers.

More than 180 pycnogonid species have been reported for Antarctic and sub-Antarctic waters (Munilla Leon 2001). Pycnogonids of the HIMI region have been studied in detail. So far, twenty-nine species have been recorded and of those, more than ten have never been described before and are possibly endemic to the region (Dave Staples, pers. comm.)



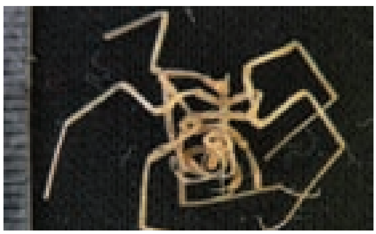
Ammothea adunca (PYC2)

Decolopoda australis (PYC3)

Pycnogonum sp1 (PYC4)

Colossendeis sp1 (PYC5)

Nymphon sp1 (PYC6)



Nymphon brachyrhynchum (PYC7)


Tanystylum sp1 (PYC8)


Ammothea sp1 (PYC9)


Ammothea sp4 (PYC10)


Ammothea sp2 (PYC11)


Tanystylum sp2 (PYC12)


Pallenopsis vanhoffeni (PYC13)


Nymphon sp2 (PYC16)


Austrodecus glaciale (PYC18)


Austropallene sp1 (PYC19)


Ammothea sp3 (PYC20)


Ammotheidae sp1 (PYC21)


Austrodecus sp1 (PYC22)


Pycnogonum sp2 (PYC23)


Austropallene brachyara (PYC24)

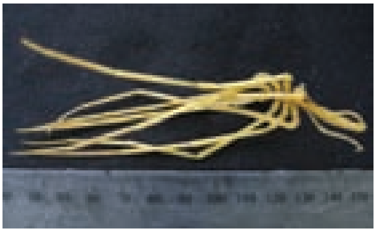

Austrodecus sp2 (PYC25)


Nymphon sp3 (PYC26)


Nymphon sp4 (PYC27)


Austrodecus simulans (PYC28)


Oropallene dimorpha (PYC29)


Colossendeis enigmatica (PYC30)


Colossendeis sp2 (PYC31)


Colossendeis lilliei (PYC32)

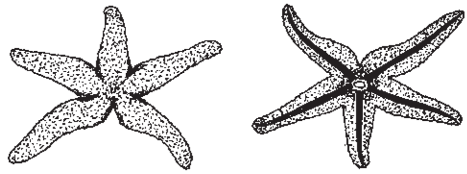

Pseudopallene glutus (PYC34)

Echinodermata

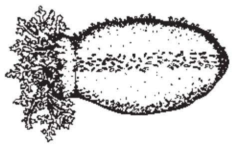
Code ECH

The echinoderms (phylum Echinodermata) are one of the most speciose and common invertebrate by-catch groups in the HIMI region. Echinoderms are distinguished by possessing pentamerous (five-part) radial symmetry and move by means of adhesive tube feet. The body wall contains an endoskeleton of small calcareous pieces, or ossicles, which commonly include surface spines, hence the phylum name Echinodermata which translates as 'spiny skin'.

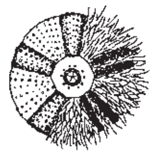
There are five main classes represented in this guide: sea stars (class Asteroidea), brittle stars and basket stars (class Ophiuroidea), sea urchins (class Echinoidea), sea cucumbers (class Holothuroidea) and the feather stars and sea lilies (class Crinoidea). Table 7 lists echinoderm groups and associated CCAMLR codes.



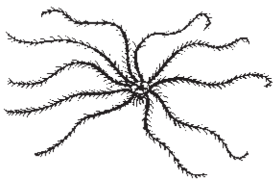
Asteroidea (sea stars)



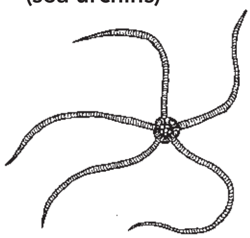
Holothuroidea (sea cucumbers)



Echinoidea (sea urchins)



Crinoidea (feather stars & sea lillies)



Ophiuroida (brittle & basket stars)

Phylum	Class	English name	CCAMLR Code
Echinodermata	Asteroidea	Sea stars	STF
	Ophuroidea	Brittle stars & basket stars	OWP
	Echinoidea	Sea urchin	URX
	Holothuroidea	Sea cucumber	CUX
	Crinoidae	Feather stars & sea Lilies	CWD

Table 7 – Echinoderms and their corresponding CCAMLR codes.

Class Asteroidea

Sea stars

Code STF

1. Five or more arms, each with a 'furrow' or 'groove' on the oral surface extending from the mouth to the tip.
2. Tough aboral surface covered in calcareous pieces, or ossicles.
3. Rows of tube feet aligned within the furrow on the oal surface.
4. A diversity of shapes and colours.
5. Most common bycatch species in the HIMI region

The class Asteroidea includes the easily recognisable sea stars or starfish. Asteroids have five or more arms emanating from a central disc, although unlike other echinoderms (i.e. ophiuroids), the arms are not sharply set off from the disc. Located beneath this disc, on the oral, or bottom surface, is the sea star's mouth. Also on this surface, along each arm, are a multitude of tube feet used for locomotion and restraining prey. The spiny upper surface is called the aboral or dorsal surface. Most sea stars are 7 to 24 cm in diameter and while having a similar basic body plan, starfish radiate diversely in shapes and colors, the morphology differing between each species.

Forty-one asteroid species are known from the HIMI region, displaying a great diversity of sizes, shapes and colours. They are one of the most common invertebrate by-catch groups to the region, in particular species like *Bathybiaster loripes*, *Labidiaster annulatus* and *Chiraster (Luidiaster) hirsutus*.

Acondontaster elongates (AST1)

Odontaster meridionalis (AST3)

Tremaster mirabilis (AST4)

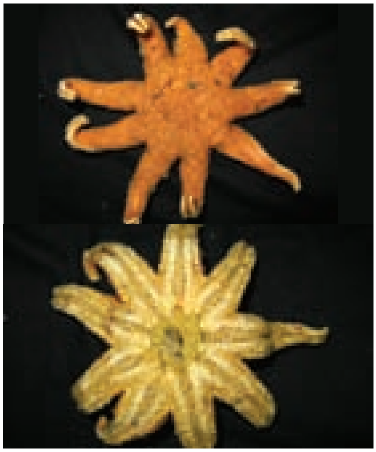
Hippasteria falklandica (AST2)

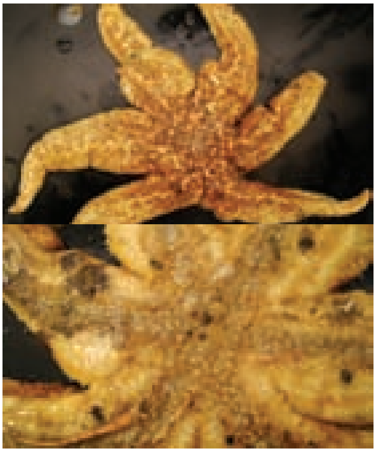
Labidiaster annulatus (AST12)

Bathybiaster loripes (AST17)


Porania antarctica (AST5)


Pteraster spA (AST6)


Solaster regularis subarcuatus (AST7)


Asteriidea *spA* (AST8)

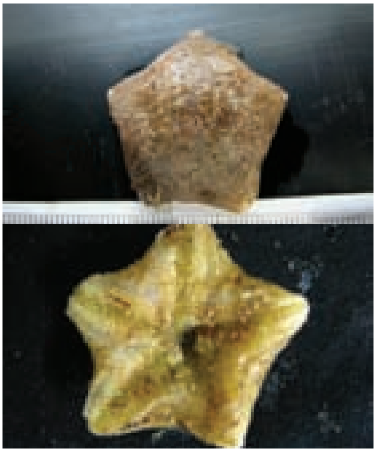

Pteraster spB (AST9)


Smilasterias triremis (AST10)


Cuenotaster involutus (AST11).


Leptychaster spA (AST14)


Henricia spA (AST15)



Pteraster spC (AST16)

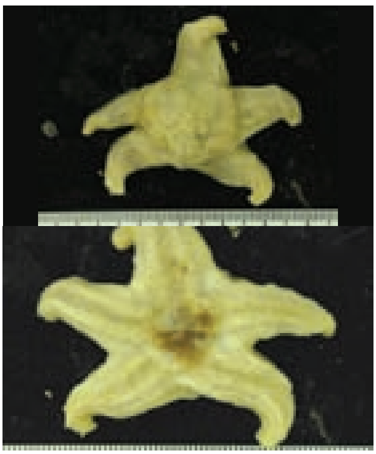
Cheiraster (Luidiaster) hirsutus (AST18)

Rhopiella hirsuta (AST19)

Henricia obesa (AST20)

Leptychaster kerguelensis (AST21)

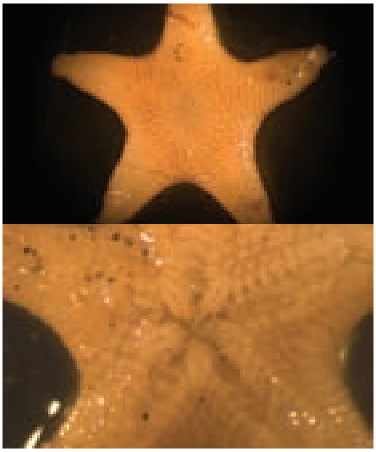
Cycethra verrucosa (AST22)



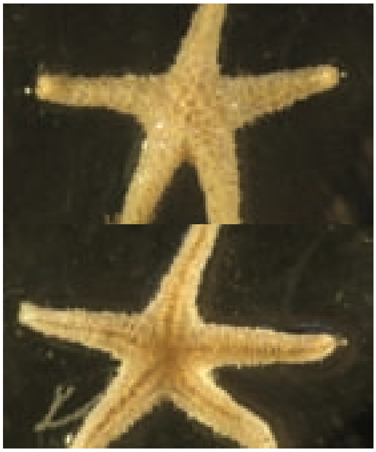
Pteraster rugatus (AST23)

Pseudarchaster spA (AST24)

Hymenaster spA (AST25)

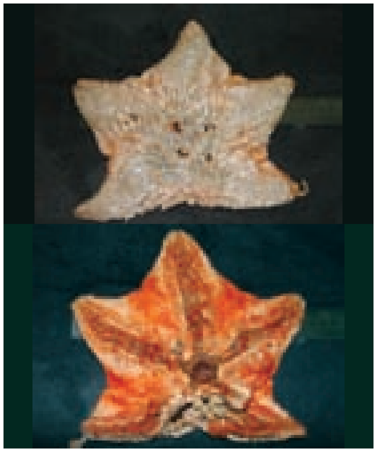

Goniasteridae spA (AST26)

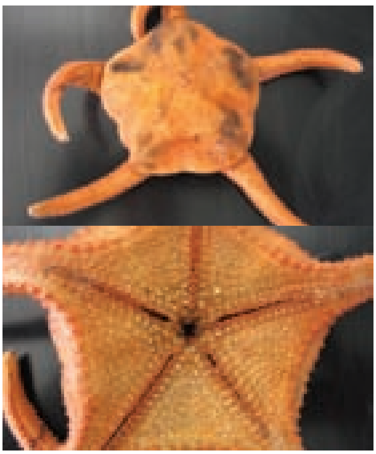

Asteriidae spB (AST27)


Asteroidea spA (AST28)


Anetliaster cf. *australis* (AST30)


Zoroaster spA (AST31)
Photographs by Antoine Dervaux


Hymenaster cf. *carnosus* (AST32)
Photograph by Yann Lecorre


Asteroidea spB (AST33)

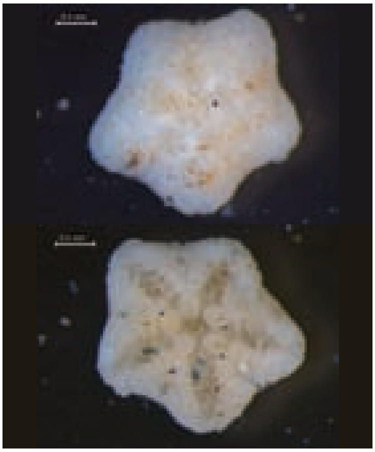

Henricia studeri (AST34)

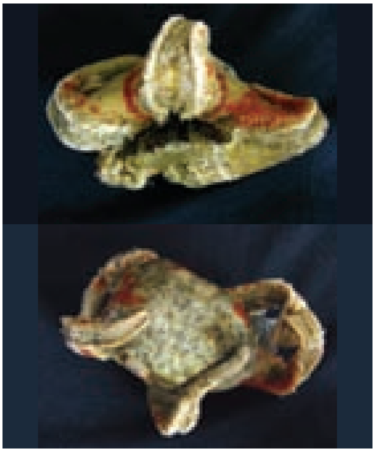

Asteroidea spC (AST37)


Asteroidea spD (AST38)


Lophaster spA (AST39)


Porcellanasteridae spA (AST40)


Asteroidea spE (AST41)


Asteroidea spF (AST42)


Asteroidea spG (AST43)


Cycethra spA (AST44)


Porcellanaster cf. *ceruleus* (AST45)


Crossater cf. *penicillatus* (AST46)

Class Ophiuroidea

Brittle stars & basket stars

Code OWP (brittle stars) & SBA (basket stars)

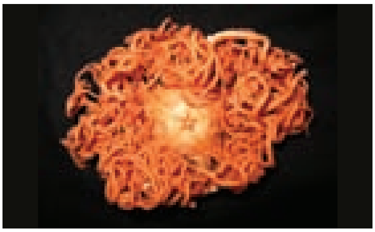
1. Generally five arms, but unlike the asteroids the arms are thinner and sharply marked off from the central disc.
2. Arms very brittle and often missing.
3. Branching arms in the case of the basket stars.
4. No obvious furrow or tube feet in the arms.
5. Generally a tough calcareous exterior.

Ophiuroids, commonly refered to as brittle stars or basket stars (class Ophiuroidea), are echinoderms closely related to starfish. Of all echinoderms, the ophiuroidea may have the strongest tendency toward 5-part radial symmetry. The body outline is similar to the asteroids, in that ophiuroids have five or more arms joined to a central disc. However, in ophiuroids the central body disc is sharply marked off from the arms.

The ophiuroids generally have five long slender, whip-like arms which may reach up to 60 cm (2 feet) in length on the largest specimens. For captured specimens often only the central disc remains as the arms are very brittle and tend to dislodge easily, hence their name.

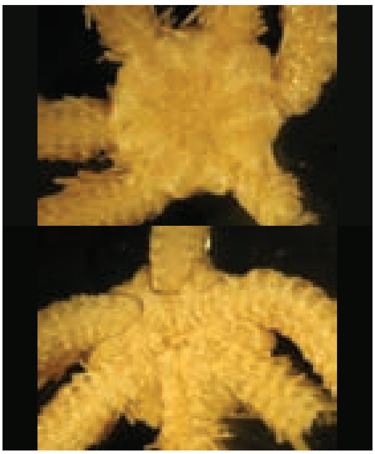
Ophiuroidea contains two large clades, Ophiurida (brittle stars) and Euryalida (basket stars and snake stars). Twenty-three taxa have been identified from the HIMI region; the majority of which belong to the clade Ophiurida. Three Euryalids have been identified; *Astrotoma agassizii*, the common *Asteronyx loveni*, and the easily recognisable *Gorgonocephalus chilensis*.

Ophiacantha pentactis (OPH1)

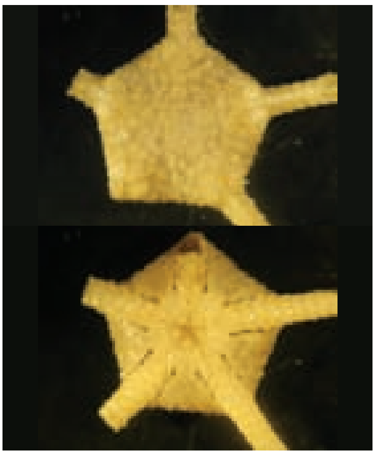


Gorgonocephalus chiensis (OPH5)

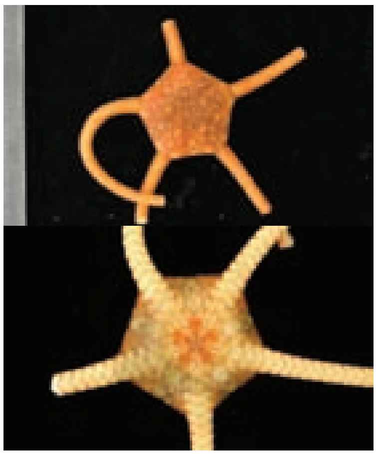
Ophiogena laevigata (OPH6)



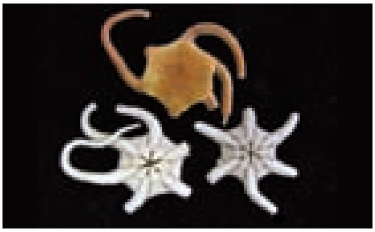
Ophiacantha vivipara (OPH2)

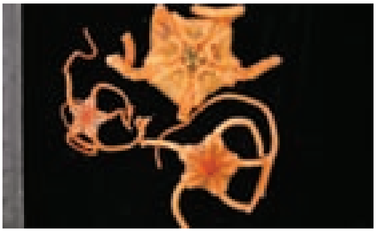


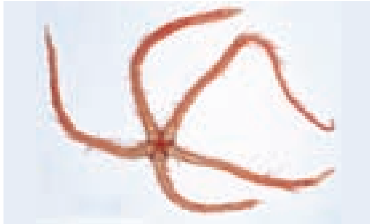
Ophiuroglypha ambigua (OPH3)

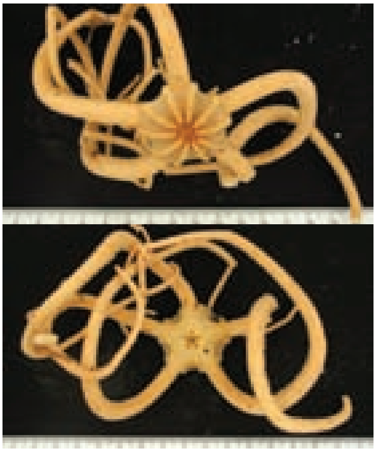


Ophiurolepis carinata (OPH4)

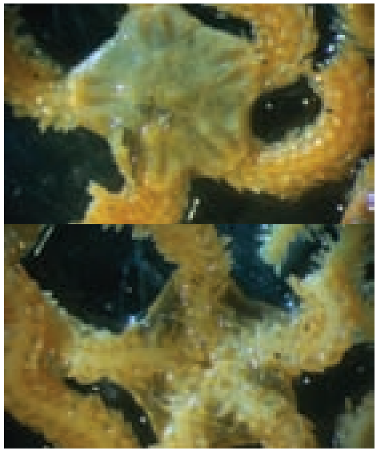

Ophionotus hexactis (OPH7)

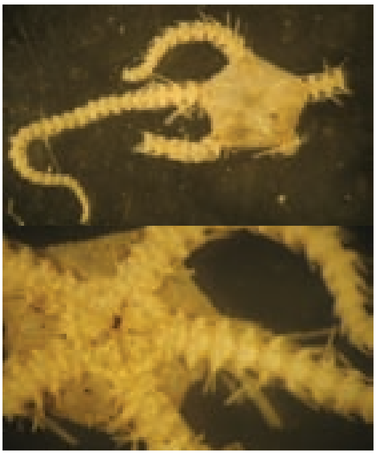

Asteronyx loveni (OPH8)

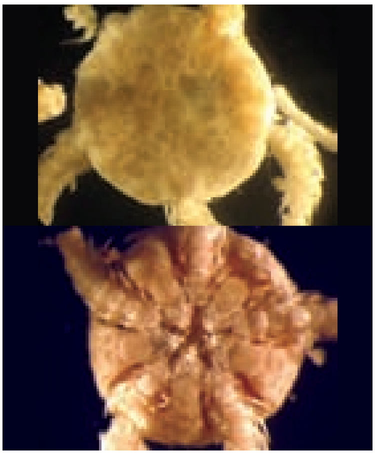

Ophiacamax sp1 (OPH30)
Photograph by Nicolas Gasco


Astrotoma agassizii (OPH9)

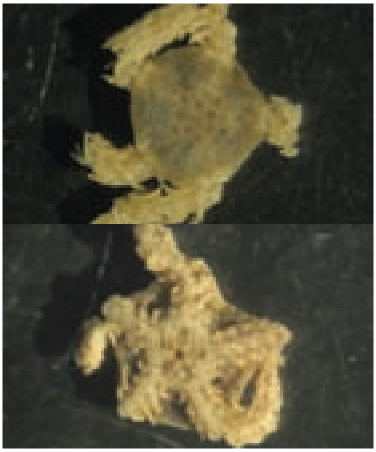

Ophiomisidium speciosum (OPH13)


Amphiura cf. alternans (OPH14)


Ophiacantha imago (OPH16)

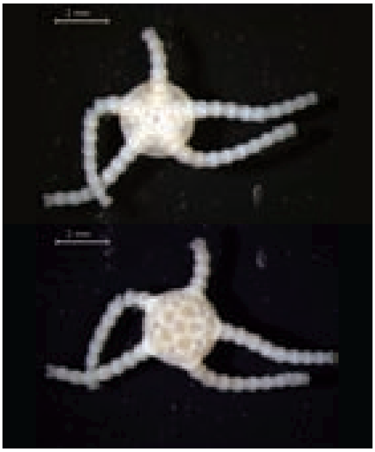

Ophiocten amitinum (OPH17)

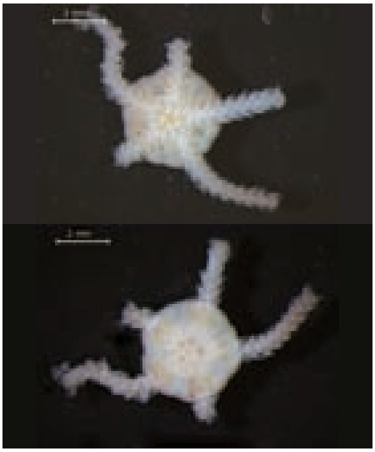

Amphiura sp1 (OPH18)


Amphiura sp2 (OPH19)

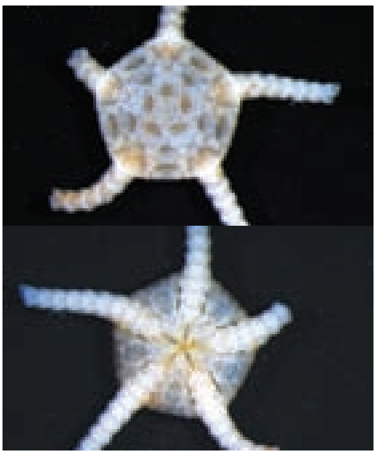

Ophiolimna antarctica (OPH22)

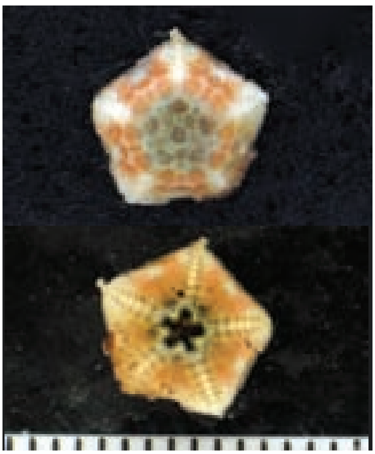

Ophiolebella cf. *biscutifera* (OPH23)


Theodoria cf. *relegata* (OPH24)


Amphiura sp3 (OPH25)


Ophiomitrella sp1(OPH26)


Ophiura sp1 (OPH28)


Astrophiura permira (OPH29)

Class Echinoidea

Sea urchins

Code URX

1. Generally globular in shape covered with spines or shell.
2. Adult test typically 3 to 10 cm in diameter.
3. There are "regular" and "irregular" forms.
4. Rigid structures that should be counted when conducting a total count as the 'test' is often crushed (eg. Aristotles lantern)

Class Echinoidea or sea urchins are small, spiny marine invertebrates found in oceans all over the world. Their shell, which is also called the 'test', is globular in shape and covered with spines. The size of an adult test is typically from 3 to 10 cm. Together with sea cucumbers (Holothuroidea) they make up the subphylum Echinozoa, which is defined by primarily having a globoid shape without arms or projecting rays. But like other echinoderms they have 5-part symmetry (although not immediately obvious) and move by means of hundreds of tiny, transparent, adhesive tube feet.

Typical sea urchins have spines that are 1 to 3 cm in length, 1 to 2 mm thick, and not terribly sharp. Common colours include black and dull shades of green, olive, brown, purple, and red.

Specifically, the term "sea urchin" refers to the "regular echinoids", which are symmetrical and globular. Besides sea urchins, the Echinoidea also includes three groups of "irregular" echinoids: flattened sand dollars, sea biscuits, and heart urchins.

Five urchins have been recorded from the HIMI region: one species of irregular echinoid, the fragile heart urchin (*Brisaster antarcticus*); and four regular echinoids; *Sterechinus* spA, *Ctenocidaris nutrix*, *Abatus cordatus* and *Dermechinus horridus*. The most abundant, particularly to the deep plateau communities, are *Sterechinus* spA and *Briaster antarcticus*; both very fragile species. These taxa have certain rigid structures that generally remain intact even when the remainder of the test is crushed. These include the mouth parts on the oral surface of regular echinoids like *Sterechinus* spA, referred to as 'Aristotles lantern'; and a small forward projecting 'beak like' structure on aboral side of the heart urchin. It is these structures that should be used when recording total numbers.

Sterechinus spA (ECH1)

Ctenocidaris nutrix (ECH2

Brisaster antarcticus (ECH3)

Abatus cordatus (ECH4)

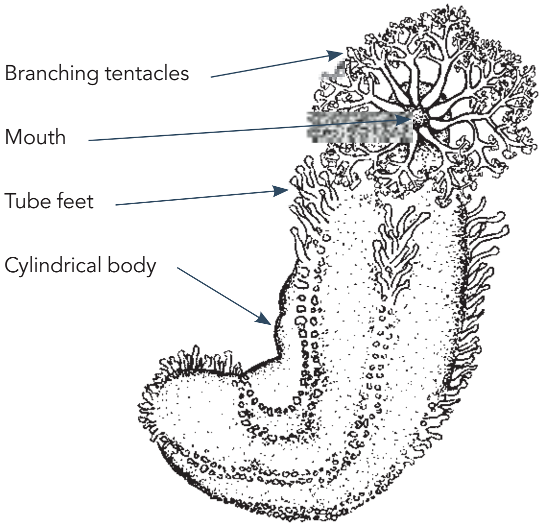
Dermechinus horridus (ECH5)

Class Holothuroidea

Sea cucumbers

Code CUX

1. Soft tubular bodies with leather-like skin
2. Tentacles are sometimes obvious at one end
3. Mouth and anus opposite ends
4. Often have lines of tube feet running parallel with the body
5. Sometimes coated in a slimy mucous layer (e.g. *Staurocumumis liouvillei*)
6. Often confused for anemones, but there is no flat attachment point at one end



Basic morphology of a sea cucumber.

Holothurians or sea cucumbers (class Holothuroidea) are a class of Echinozoa characterised by a cylindrical body and smooth leathery, and often slimy, skin. Like sea urchins there are no arms, but a ring of five or more tentacles may surround the mouth, which is usually at one end of the body (although these tentacles are not always obvious). Tube feet may be present or lacking. There is no flat attachment point, and the mouth and anus are located at opposite ends of the body.

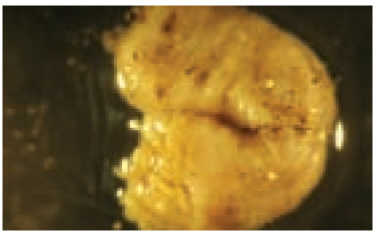
Holothurians from the HIMI region have been studied in considerable detail, revealing high levels of diversity, with low abundances and degrees of endemism or isolation (Hibberd *et al.* 2008). 23 taxa have been identified, including seven which are likely to be undescribed; Dactylochirotida sp.nov., *Pseudostichopus* sp.nov., Synalactes sp.nov., Molpadiidae sp.nov., *Cucumaria* sp.nov, *Psolus* sp.nov. and *Mesothuria* sp.nov. (M.O'Loughlin, pers.comm.).

Staurocucumis liouvillei (HOL1)

Synallactes sp.nov. (HOL2)

Pseudocnus laevigatus (HOL3)

Heterocucumis godeffroyi (HOL4)



Paradota marionensis (HOL5)

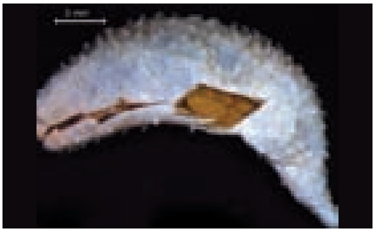
Trachythyone muricata (HOL8)

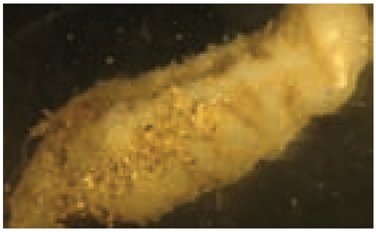

Pseudostichopus sp.nov. (HOL9)


Dactylochirotida sp.nov. (HOL10)


Molpadiidae sp.nov. (HOL11)

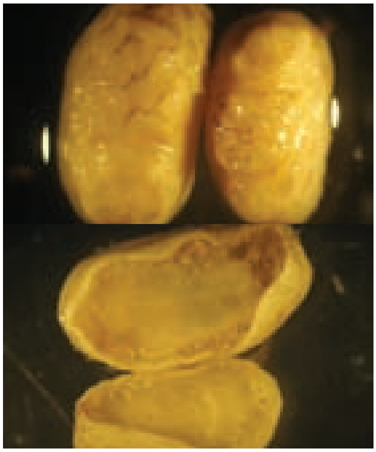

Molpadia musculus (HOL12)


Cucumaria sp.nov. (HOL14)


Pseudostichopus peripatus (HOL17)


Psolus paradubiosus (HOL6)


Psolidium poriferum (HOL7)


Psolus ephippifer (HOL15)


Cucumaria kerguelensis (HOL19)


Pseudocnus serrata (HOL20)


Pseudostichopus sp1 (HOL22)

Psolus sp.nov. (HOL23)

Pseudostichopus sp2 (HOL24)

Cucumariidae sp1 (HOL25)

Mesothuria sp.nov. (HOL26)

Pseudostichopus cf. *peripatus* (HOL27)

Class Crinoidea

Feather stars & sea lilies

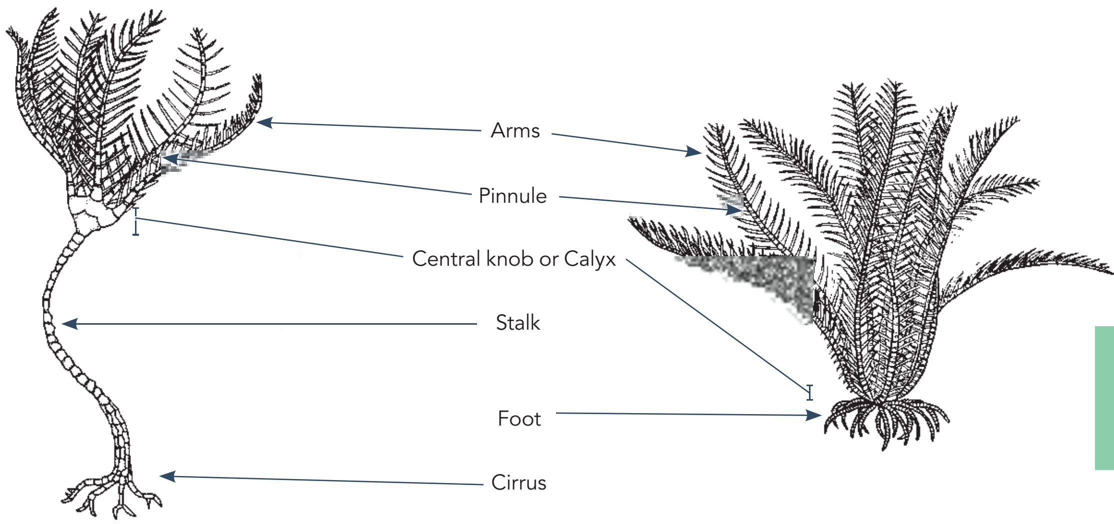
Code CWD

1. Main body consists or a central knob or calyx
2. Five or more feathery arms
3. Feather stars are unattached whereas sea lilies are attached via a stalk
4. Oral surface directed upwards
5. Feather stars are almost always badly damaged, with arms broken off and only the calyx remaining
6. Taxa characterised by the number of arms originating from the calyx

The class Crinoidea differ from other echinoderms in that the oral surface is directed upwards (i.e. the oral surface is directed down in asteroids and echinoids, and holothurians lie on their side). This group includes the feather stars and sea lilies. Feather stars are unattached but perch on the substratum with aboral cirri; sea lilies are attached to the bottom by a stalk.

All crinoids have a central knob (or calyx) which bears 5 or more feathery arms. When captured crinoids are almost always badly damaged, leaving a mass of broken bits of arms, and the solitary central calyx. Hence it is the calyx which is used in identification.

Feather stars are quite abundant in the HIMI region, particularly to Aurora Bank and Southern Shell Bank. Although despite their numbers, diversity is low, with only two species recorded so far: *Promachocrinus kerguelensis* and *Solanometra antarctica*. These taxa are characterised by the number of feathery arms projecting from the calyx. The calyx of *P. kerguelensis* gives rise to 20 arms, whereas *S. antarctica* has 10. One species of sea lily, *Hyocrinidae* sp., has also been reported, although its distribution is scarse and not well documented.



Morphology of a sea lily (left) and feather star (right).
Sea lily adapted from an illustration by Ivy Livingstone, © BIODIDAC (2007).

Promachocrinus kerguelensis (CRI1)
Photograph by David Wu (bottom)

Solanometra antarctica (CRI2)

Hyocrinidae sp. (CRI3)
Photographs by Frederic Simiand

Hemichordata

Hemichordata are a phylum of worm-shaped marine animals, generally considered the sister group of the echinoderms. They seem to have a primitive form of notochord, formed from a diverticulum of the foregut called a stomochord, but this is most likely the result of convergent evolution. They can be divided into two classes: the Enteropneusta, commonly called acorn worms, and the Pterobranchia which are widespread throughout the HIMI region.

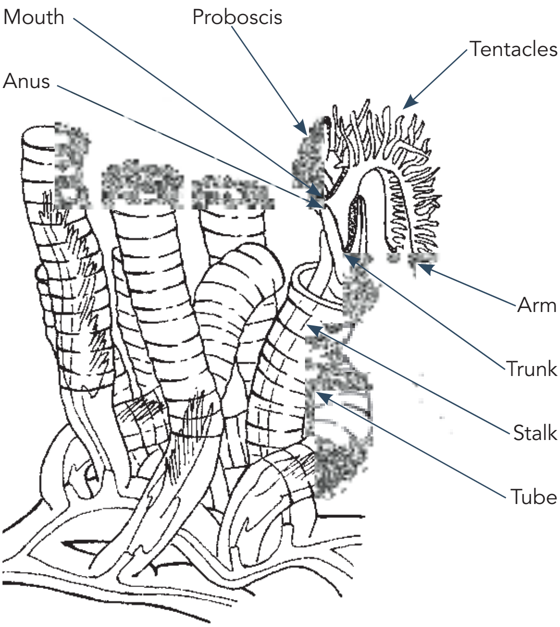
Pterobranchs

No code (use INV)

1. Colony of small, worm-shaped animals
2. Lives in tubes which conjoin to form colonies that have a plant-like appearance
3. The colonies could easily be confused for a colony of tube-worms (i.e. polychaetes) or even algae.

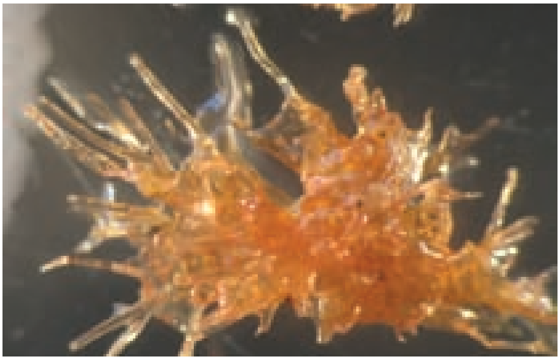
Pterobranchs are a clade of small, worm-shaped animals. They belong to the hemichordata, and live in secreted tubes on the ocean floor. These secreted tubes are conjoined in a colony; somewhat resembling a cluster of small tube worms (e.g. *Cephalodiscus* sp1). In the case of the microscopic pterobranchs; these colonies have a plant-like appearance, possibly resembling algae (e.g. Pterobranchia spB). Pterobranchia feed by filtering plankton out of the water with the help of cilia attached to tentacles. There are about 30 known living species in the group.

Of the 30 known living species world-wide, at least two occur in the HIMI region; *Cephalodiscus* sp1 and the less common Pterobranchia spB. Both are most frequently observed on the banks of the HIMI region (i.e. Coral, Aurora and Southern Shell Bank), and considerable quantities of *Cephalodiscus* sp1 have also been observed at Plateau North and Western Plateau. Additional taxonomic work is required to determine that correct phylogeny for these taxa.



Morphology of a Pterobranch colony.
Adapted from an image by BIOEDNET, © BIODIDAC (2009).

Cephalodiscus sp1 (PTERO1)



Pterobranchia spB (PTERO2)

Chordata

Subphylum Urochordata

About 2300 species which constitute the subphylum Urochordata (also referred to as Tunicata) includes the sea squirts (class Ascidiacea) and salps (class Thaliacea). Individuals within this subphylum are considered to be an evolutionary link between invertebrates and vertebrates, as juvenile urochordates possess a notocord, similar to the back bone of chordates (phylum Chordata), which includes man. However, unlike the chordates, this backbone like feature is lost upon reaching adulthood.

Sea squirts

Code SSX

1. More-or-less spherical or tubular shaped bodies
2. Two siphons (often not easy to find)
3. Attachment point at one end
4. Range in size from a pinhead to a small potato
5. Can be colonial with many tiny individuals crowded together
6. Generally quite soft with a tough leathery or skin-like outer layer that's difficult to tear

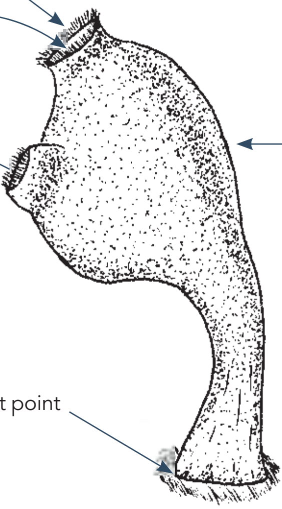
Ascidians or sea squirts are sessile marine filter feeders consisting of a hollow sac with two siphons. They occur in a variety of colours and are usually spherical or tubular in shape, ranging in size from a pinhead to a small potato. Their outer skin or "tunic" is often tough and leathery; made of the polysaccharide tunicin; which is why they are sometimes refered to as 'tunicates'. The presence of tunicin is unique to the Ascidians, and makes them far more robust than species from the sister group Thaliacea. Ascidians further differ from their sister groups by being sessile: remaining firmly attached to the substratum such as rocks and shells.

There are three main types: solitary ascidians, social ascidians, that form clumped communities by attaching at their bases, and compound ascidians, that consist of many small individuals forming colonies up to several metres in diameter.

They are filter feeders. Inside their sac-like outer skin there is a sieve-like organ which filters microscopic food particles out of the seawater. Fresh seawater is drawn in through the inhalent siphon and filtered seawater and waste material is ejected through an exhalent siphon. Sea squirts are the natural prey of many animals, including flatworms, molluscs, crabs and starfish (Dorit *et al.* 1991).

It is well known that ascidians are important members of Southern Ocean benthic communities, particularly to the continental shelf fauna (Clarke and Johnston 2003). The most recent taxonomic revisions are those of Kott (1969) and Monniot & Monniot (1983; 1994). Ascidians are common habitat forming species found throughout the HIMI region with thirty-four taxa identified thus far. They are often caught in large quantities as bycatch; particularly species like *Molgula pedunculata*, *Cnemidocarpa verrucosa* and *Ascidia challengeri*.

Note that most specimens pictured are deflated (i.e. would usually be inflated with sea water).



Morphology of an adult sea squirt.

Cnemidocarpa verrucosa (ASD1)

Ascidia challengeri (ASD2)

Sycozoa sillinoides (ASD3)

Molgula pedunculata (ASD4)

Ascidia spA (ASD5)

Polyclinidae spA (ASD6)

Polyclinidae spB (ASD7)

Tylobranchion speciosum (ASD8)

Ascidiacea spA (ASD9)


Polyclinidae spC (ASD10)

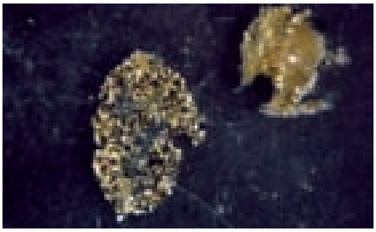

Didemnidae spp (ASD11)


Polyclinidae spD (ASD12)


Aplidiopsis discoveryi (ASD13)

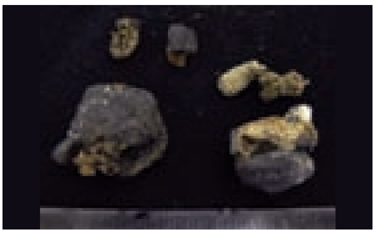

Ascidiacea spB (ASD14)


Styela nordenskjoldi (ASD15)

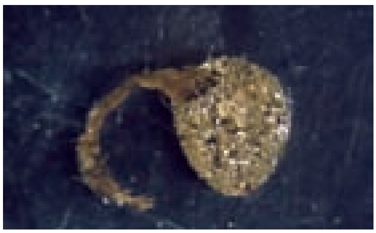

Molguloides spA (ASD16)

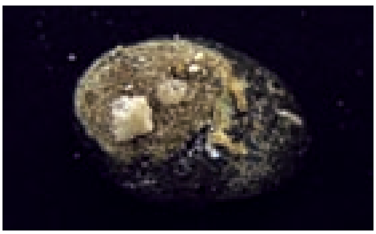

Molgula malvinensis (ASD17)


Pyura vittata (ASD18)


Ascidiacea spC (ASD19)

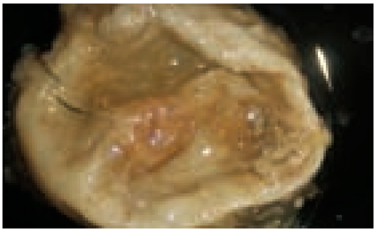

Didemnidae spA (ASD20)

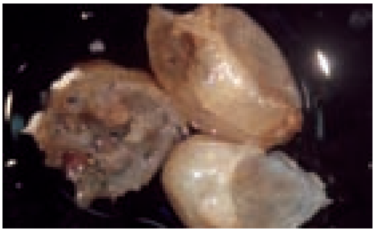

Molgula sluiteri (ASD21)


Ascidiacea spD (ASD22)

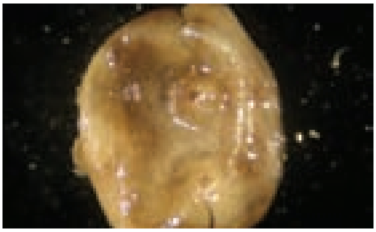

Styela spA (ASD23)


Styelopsis spA (ASD24)

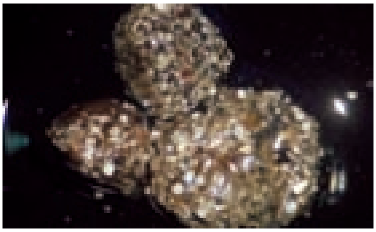

Oligocarpa megalorchis (ASD25)


Polyzoinae spA (ASD26)


Molgula kerguelenensis (ASD27)


Styela spB (ASD28)


Polyzoinae spB (ASD29)


Molgulidae spA (ASD30)


Pyura spB (ASD31)


Eugyra kerguelenensis (ASD32)


Styelinae spA (ASD33)

Salps & pyrosomes

Code SPX

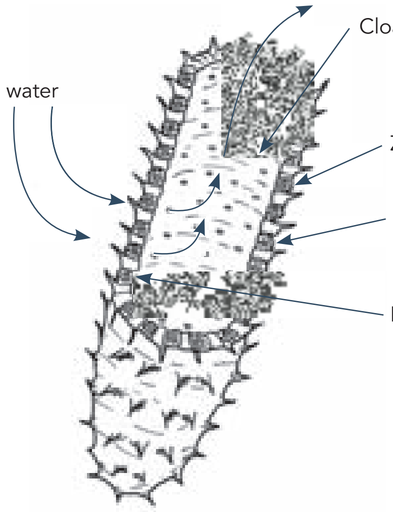
1. Semi-transparent barrel-shaped animals
2. Gelatinous body
3. Siphon at opposite ends of the body
4. Solitary or colonial
5. May look and feel somewhat like Jelly
6. Commonly found in the plankton

The class Thaliacea, often called salps, contains about 70 species world wide and are semi-transparent barrel shaped marine animals world-wide. Unlike their bottom-dwelling relatives, the ascidians, thaliaceans are free-floating, pelagic species, and although they do not necessarily consistute a benthic taxon, they have been recorded as bycatch in HIMI fishery; and hense will briefly be described here.

Thaliaceans can be divided into 3 orders: Pyrosomida, Doliolida, and Salpia. Pyrosomes are colonial thaliacians, with many tiny individuals or 'zooids' arranged around a central chamber called the cloaca, whereas doliolids and salps alternate between solitary and colonial life stages. Doliolids and salps rely on muscular action to propel themselves through surrounding sea water, whereas pyrosomes rely on water exhaled by each individual zooid which exits the cloaca through a common opening propelling the organism through the water.

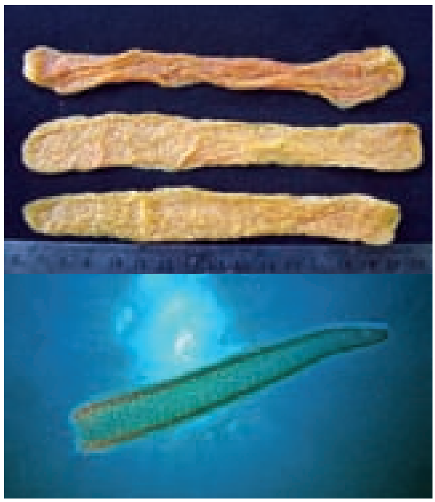
They swim as they feed, or visa versa because like all the Urochordates thaliaceans are filter feeders. However, unlike the ascidians, the siphons are located at opposite ends of their body to assist in locomotion. Bands of muscles in the body wall assist cilia (hair-like appendages) in drawing a current of water in through the inhalant siphon and out through the exhalent siphon extracting food as it passes (Dorit *et al.* 1991).

Both salps and pyrosomes have been recorded in samples from the HIMI region. Pyrosomes are relatively easy to distinguish; whereas salps are more difficult as their delicate gelatinous bodies



Morphology of a pyrosome.
Adapted from Bay-Nouailhat (2007-2009).

are often badly damaged. One characteristic feature is the salp's gut which is often observed as a brown spot amongst its gelatinous body or 'test' (see *Salpia* spA).



Pyrosoma spA (THA1)
Bottom photograph by David Warbel

Salpia spA (THA2)
Photograph by Mick Travels

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Appendix

Summary of the taxa included in this guide.

These taxa were collected on the 'Southern Champion' in the HIMI region from 2003 to 2008 using research sampling equipment. Benthic organisms in this table are arranged in conventional phylogenetic order and the region in which they were recorded is indicated.

Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
PORIFERA*											
Demospongia											
Porifera spA	●	●	●	●							
Porifera spB	●	●	●	●							
Porifera spC	●	●	●	●				●			
Porifera spD	●			●							
Porifera spE	●	●		●							
Porifera spF	●	●		●							
Porifera spG	●	●		●				●			
Porifera spH	●	●	●	●							
Porifera spI	●	●									
Porifera spJ	●	●		●							
Porifera spK	●	●		●							
Porifera spL	●	●	●	●				●	●		
Porifera spM	●										
Porifera spN	●	●									
Porifera spO	●										
Porifera spP		●									
Porifera spQ	●	●	●	●							
Porifera spR	●	●	●	●							
Porifera spS	●	●									
Porifera spT	●	●		●							
Porifera spU		●		●							
Porifera spV	●	●		●							
Porifera spW		●		●							
Porifera spX			●	●							
Porifera spY		●	●								
Porifera spZ	●	●	●	●							
Porifera spAA	●		●								
Porifera spAB				●							
Porifera spAC	●			●							
Porifera spAD				●							
Porifera spAE		●		●							
Porifera spAF	●	●		●							

* Denotes taxonomic groups incompletely sorted from one or all sampling locations.

Taxon	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
	Geographic areas										
Porifera spAG				●							
Porifera spAH	●			●							
Porifera spAI		●									
Porifera spAJ	●	●									
Porifera spAK	●										
Porifera spAL			●								
Porifera spAM			●								
Porifera spAN	●	●									
Porifera spAO				●	●			●	●	●	
Porifera spAR				●							
Porifera spAS								●			
Dendroceratida											
Darwinellidae											
Dendrilla spA	●	●									
Dendrilla spB	●	●		●							
Poecilosclerida											
Latrunculiidae											
Latrunculia spA	●	●		●	●			●	●	●	
Latrunculia spB	●	●	●		●			●	●		
Hadromerida											
Stylocordylidae											
Stylocordyla borealis	●	●	●	●				●		●	
Suberitidae											
Suberites caminatus	●	●		●	●			●	●	●	
Spirophorida											
Tetillidae											
Cinachyra antarctica		●		●							
Tetilla leptoderma	●	●	●	●			●	●			
Calcarea											
Clathrinida											
Leucettidae											
Leucetta leptoraphis	●		●								
Hexactinellida											
Hexactinellida spA	●	●		●	●						
Hexactinellida spB	●	●	●	●							
Hexactinellida spC								●			●
CNIDARIA											
Anthozoa											
Alyconacea											
Cnidaria sp6	●	●	●	●	●	●	●	●	●	●	●
Cnidaria sp16	●		●	●	●	●	●	●	●	●	●
Cnidaria sp17	●	●	●	●					●		
Cnidaria sp18	●		●	●				●			●
Cnidaria sp19	●		●			●			●	●	
Cnidaria sp20		●	●								
Cnidaria sp21			●								

* Denotes taxonomic groups incompletely sorted from one or all sampling locations.

Taxon	Geographic areas: Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Cnidaria sp25				●	●	●					
Cnidaria sp30	●	●	●	●		●		●	●	●	●
Cnidaria sp35			●							●	●
Cnidaria sp36	●		●								
Cnidaria sp42		●		●				●			
Cnidaria sp43		●	●	●						●	●
Cnidaria sp52						●					
Cnidaria sp55						●					
Cnidaria sp58				●	●		●			●	●
Cnidaria sp62				●							
Cnidaria sp64					●					●	
Cnidaria sp68										●	
Cnidaria sp70											●
Cnidaria sp72										●	●
Gorgonacea											
Cnidaria sp1	●	●		●				●			
Cnidaria sp2	●	●	●	●	●			●	●	●	
Cnidaria sp3	●	●	●	●					●	●	
Cnidaria sp4	●	●	●	●	●			●	●	●	
Cnidaria sp23				●			●				
Cnidaria sp24		●		●	●			●	●	●	●
Cnidaria sp29	●	●	●	●	●	●				●	●
Cnidaria sp34		●									
Cnidaria sp45				●							
Cnidaria sp59				●				●			
Cnidaria sp65									●		
Pennatulacea											
Cnidaria sp14				●							
Cnidaria sp66									●		
Pennatulacea spC										●	
Actiniaria											
Actinaria spA	●	●	●	●				●	●	●	
Actinaria spB	●		●								
Actinaria spC	●	●	●								●
Actinaria spD			●	●	●			●			●
Actinaria spE			●								
Actinaria spF			●	●							
Actinaria spH						●		●	●		
Actinaria spI				●					●		
Actinaria spJ				●							
Actinaria spK					●						●
Actinaria spL								●			
Actinaria spM									●	●	
Capnea											
Capnea georgiana		●	●		●				●	●	●

* Denotes taxonomic groups incompletely sorted from one or all sampling locations.

Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Actiniidae											
Bolocera sp	●		●								
Glyphoperidium bursa			●		●	●				●	●
Actinostolidae											
Actinostolidae sp			●								
Hormathiidae											
Hormathiidae sp	●	●	●	●					●		●
Liponematidae											
Liponema sp	●		●	●				●	●	●	●
Ceriantharia											
Ceriantharia spA			●	●		●			●	●	
Ceriantharia spB		●			●	●		●	●	●	
Scleractinia											
Cnidaria sp40		●		●	●	●			●	●	
Flabellidae											
Flabellum sp.		●	●	●	●	●		●	●	●	●
Hydrozoa*											
Hydrozoa spA	●	●	●	●	●	●	●	●	●	●	●
Hydrozoa spB	●	●	●	●				●	●	●	●
Hydrozoa spC		●	●	●	●						
Hydrozoa spD	●	●	●	●							
Hydrozoa spE	●	●	●	●				●	●	●	
Hydrozoa spF		●	●								
Hydrozoa spG	●	●	●	●							●
Hydrozoa spH		●	●								
Hydrozoa spI	●		●	●							
Hydrozoa spJ	●	●	●	●							
Hydrozoa spK			●								
Hydrozoa spL			●	●							
Hydrozoa spM	●										
Hydrozoa spN	●										
Hydrozoa spO	●	●		●							
Hydrozoa spP	●	●		●	●	●	●	●	●	●	●
Hydrozoa spQ				●							
Hydrozoa spR				●							
Hydrozoa spT							●				
Hydrozoa spU									●		
Hydroidolina											
Hydrocorallinidae spA									●	●	
Stylasteridae											
Errina sp	●	●							●	●	
Scyphozoa			●			●					
Scyphozoa spA											

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Taxon	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
	Geographic areas										
PLATYHELMINTHES											
Platyhelminthes spA	●										
Platyhelminthes spB			●	●	●						
Platyhelminthes spC											●
PRIAPULIDA											
Priapulidae											
Priapulidae spA		●	●							●	
SIPUNCULIDA											
Sipuncula spA		●	●	●							
Sipuncula spB						●					
Sipuncula spC								●			
Sipuncula spD									●		
Sipuncula spE								●			
Sipuncula spF								●			
MOLLUSCA											
Bivalvia											
Bivalvia spA	●	●		●	●			●	●	●	
Bivalvia spC					●						
Bivalvia spD				●				●			
Bivalvia spE								●			
Pholadomyoida											
Cuspidariidae											
Cuspidaria spA	●		●	●	●			●			
Euciroidae											
Euciroa spA		●						●			
Laternulidae											
Laternula spA			●						●	●	●
Myoida											
Hiatellidae											
Hiatella spA	●	●	●					●	●	●	
Veneroida											
Veneroida spA		●									
Cardiidae											
Cardiidae spA	●				●						
Cardiidae spB			●	●	●						
Crassatellidae											
Crassatellidae spA	●		●		●						
Crassatellidae spB	●	●		●	●			●			
Cyamiidae											
Cyamiidae spA	●	●		●	●			●			
Cyamiidae spB	●		●	●							
Kidderia spA		●									
Psammobiidae											
Psammobiidae spA			●								●
Veneridae											
Gouldia (Gouldiopa) spA	●	●		●	●			●			

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Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Nuculoida											
Nuculanidae											
Nuculana spA			●								
Nuculana spB	●	●	●								
Arcidae											
Arcidae spA				●				●			
Limopsidae											
Limopsidae spA	●	●	●	●	●			●		●	●
Limopsidae spB	●	●		●	●			●	●	●	
Limopsidae spC	●			●							
Limopsidae spD				●				●			
Philobryidae											
Hochstetteria meridionalis	●	●									
Ostreoida											
Ostreidae											
Ostreidae spA	●	●		●	●						
Pectinidae											
Cyclopecten spA	●	●	●		●			●			
Cephalopoda											
Octopoda											
Octopodidae											
Benthoctopus levis	●	●	●	●	●			●	●	●	●
Graneledone antarctica	●	●	●	●		●			●	●	
Gastropoda											
Gastropoda spA	●		●		●						
Gastropoda spB			●	●	●			●	●	●	●
Gastropoda spC	●		●		●						
Gastropoda spE					●					●	
Gastropoda spF					●						
Gastropoda spH					●						
Gastropoda spI					●						
Gastropoda spJ				●	●						
Gastropoda spK				●	●						
Gastropoda spL				●							
Gastropoda spM					●						
Gastropoda spN										●	
Gastropoda spO										●	
Opisthobranchia											
Opistobranchia spA			●								
Opistobranchia spB	●				●						
Opistobranchia spC			●								
Opistobranchia spD			●								
Opistobranchia spE	●		●							●	
Opistobranchia spF			●								●
Opistobranchia spG	●		●	●	●						●

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Taxon	Geographic areas: Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Opistobranchia spH	●										
Opistobranchia spJ						●					
Opistobranchia spK					●	●					
Nudibranchia											
Bathydorididae											
Bathydoris sp.									●		
Dorididae											
Austrodoris kerguelenensis	●		●	●							
Prosobranchia											
Archaeogastropoda											
Fissurellidae											
Fissurellidae spA	●	●		●				●	●	●	●
Trochidae											
Trochidae spA	●		●	●	●				●		●
Docoglossa											
Nacellidae											
Nacella spA	●	●	●	●	●	●		●		●	
Neogastropoda											
Buccinidae											
Buccinidae spA	●		●	●						●	●
Buccinidae spB	●	●	●	●				●		●	●
Buccinidae spC	●		●	●	●			●			●
Buccinidae spD			●								
Cancellariidae											
Cancellariidae spA	●		●	●		●		●			
Cancellariidae spB	●		●		●						●
Fasciolariidae											
Fasciolariidae spA	●										
Muricidae											
Enixotrophon spA	●		●	●							
Enixotrophon spB	●										●
Enixotrophon spC	●		●	●	●						●
Enixotrophon spD				●				●			
Nassariidae											
Nassariidae spA	●				●						
Terebridae											
Terebridae spA	●	●			●			●			
Turridae											
Turridae spA	●		●	●	●			●	●	●	●
Turridae spB	●		●	●				●			
Turridae spC	●	●	●		●						
Turridae spD					●						
Volutidae											
Provocator pulcher	●	●		●	●			●	●	●	●
Neotaenioglossa											
Capulidae											

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Taxon	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
						Geographic areas					
Icuncula spA	●	●	●	●	●			●		●	
Trichotropis spA	●		●	●				●	●	●	
Cerithiopsidae											
Cerithiopsidae spA	●	●		●							
Epitoniidae											
Epitoniidae spA	●		●		●			●			
Lamellariidae											
Lamellariidae spA	●	●	●	●	●						
Naticidae											
Naticidae spA	●	●	●	●	●					●	●
Ranellidae											
Fusitriton aurora	●		●								
Polyplacophora											
Polyplacophora spA	●	●	●	●							
Neoloricata											
Lepidopleuridae											
Leptochiton kerguelenensis	●	●		●	●			●	●	●	
Scaphopoda											
Dentaliida											
Dentaliidae											
Dentalium aegeum	●	●	●	●	●		●	●		●	●
ANNELIDA*											
Polychaeta											
Polychaete spA						●					
Polychaeta spB					●						
Polychaete spC					●						
Polychaete spD								●		●	●
Capitellida											
Maldanidae											
Maldanidae sp.			●	●	●	●	●	●		●	
Eunicida											
Lumbrineridae											
Lumbrineridae sp.		●									
Phyllodocida											
Aphroditidae											
Aphroditidae spA	●	●	●	●	●	●		●	●	●	●
Aphroditidae spB						●					
Aphroditidae spC											●
Glyceridae											
Glyceridae sp.			●								
Nephtyidae											
Nephtyidae sp.			●								
Nereididae											
Neanthes kerguelensis	●	●		●							
Phyllodocidae											
Phyllodocidae sp.			●								

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Taxon	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
	Geographic areas										
Polynoidae											
Polynoidae sp.			●								
Sigalionidae											
Sigalionidae sp.			●								
Syllidae											
Syllidae sp.	●										
Sabellida											
Sabellidae											
Sabellidae sp.			●			●					
Serpulidae											
Serpula spA	●	●	●	●	●	●	●	●	●	●	●
Terebellida											
Ampharetidae											
Ampharetidae sp.			●								
Flabelligeridae											
Flabelligeridae sp.			●								
Terebellidae											
Terebellidae sp.			●								
BRYOZOA*											
Bryozoa spA								●			
Bryozoa spB										●	
Bryozoa spC								●		●	●
Gymnolaemata											
Cheilostomata											
Klugeflustra spA	●										
Arachnopusiidae											
Arachnopusia inchoata	●										
Arachnopusia spA	●										
Arachnopusia spB			●								
Bitectiporidae											
Schizomavella spA	●										
Buffonellodidae											
Buffonellodes spA	●										
Bugulidae											
Cornucopina spA				●	●						
Calwelliidae											
Malakosaria sinclarii	●			●							
Candidae											
Bugulopsis spA			●								
Caberea darwinii	●										
Notoplites spA			●								
Cellariidae											
Cellaria spA	●										
Cellaria spB			●								
Celleporidae											
Galeopsis bullatus	●										

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Taxon	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
	Geographic areas										
Osthimosia spA	●										
Chaperiidae											
Chaperiopsis spA			●								
Cribrilinidae											
Filaguria spA	●										
Flustridae											
Carbasea ovoidea	●										
Isosecuriflustra angusta		●	●								
Lekythoporidae											
Turritigera spA	●										
Turritigera spB	●									●	
Phidoloporidae											
Reteporella spA	●										
Romancheinidae											
Lageneschara lyrulata	●										
Sclerodomidae											
Cellarinella spA	●	●		●							
Smittinidae											
Pemmatoporella marginata			●								
Smittina anecdota	●		●								
Smittoidea ornatipectoralis	●										
Thrypticocirrus spA	●										
Ctenostomata											
Ctenostomata spA			●								
Stenolaemata											
Cyclostomata											
Entalophoridae											
Entalophoridae spA	●										
Filisparsidae											
Nevianipora spA	●										
Oncousoeciidae											
Oncousoecia spA	●										
BRACHIOPODA											
Articulata											
Articulata spA	●	●	●	●	●			●	●	●	●
Articulata spB		●						●			
Articulata spC				●							
Rhynchonellida											
Hemithyrididae											
Notosaria nigricans pyxidata	●	●		●	●			●			
ARTHROPODA											
Pycnogonida*											
Pantopoda											
Ammotheidae											
Ammothea adunca	●		●						●	●	
Ammothea sp1			●							●	

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Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Ammothea sp3			●								
Ammotheidae sp1			●								
Tanystylum sp1			●								
Austrodecidae											
Austrodecus simulans	●										
Austrodecus sp1		●									
Callipallenidae											
Austropallene brachyara	●										
Austropallene sp1		●									
Oropallene dimorpha	●										
Pseudopallene glutus		●									
Colossendeidae											
Colossendeis enigmatica				●							
Colossendeis lilliei	●							●	●		●
Colossendeis sp1				●					●	●	●
Colossendeis sp2		●		●	●						
Colossendeis spp				●							
Decolopoda australis			●	●	●					●	
Nymphonidae											
Nymphon brachyrhynchum	●		●								
Nymphon sp1	●	●	●	●							
Nymphon sp2		●									
Nymphon sp3	●	●		●							
Nymphon sp4			●								
Pallenopsidae											
Pallenopsis vanhoffeni				●							
Pycnogonidae											
Pycnogonum sp1		●	●						●	●	
Pycnogonum sp2			●								
Cirripedia											
Pedunculata spA	●	●	●	●	●		●	●	●	●	●
Sessilia spA		●	●	●				●	●	●	●
Sessilia spB		●				●					
Malacostraca											
Amphipoda											
Amphipoda spA				●						●	
Amphipoda spB				●	●	●		●		●	
Amphipoda spD				●							
Amphipoda spE				●							
Amphipoda spF				●							
Amphipoda spG					●						
Amphipoda spH						●					
Amphipoda spI				●				●			
Amphipoda spJ				●							
Caprellidae											

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Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Caprellidea spA	●	●	●								
Gammaridae											
Gammaridea spC						●					
Epimeriidae											
Epimeria spA			●	●	●	●					●
Hyperiidae											
Themisto gaudicaudii				●	●	●	●				
Cumacea											
Cumacea spA	●		●	●	●			●			
Decapoda											
Caridea spA			●								
Nephropidae											
Thymopides grobovi				●		●	●				●
Pasiphaeidae											
Pasiphaea spA				●							
Euphausiacea											
Euphausiidae											
Euphausia triacantha				●					●		
Euphausia vallentini				●							
Isopoda											
Isopoda spA	●	●		●		●					
Isopoda spB	●	●	●		●	●		●	●		●
Isopoda spC	●		●								
Isopoda spD	●		●	●	●						
Isopoda spE			●	●							
Isopoda spF	●	●									
Isopoda spG	●										
Isopoda spH		●	●	●	●						
Isopoda spI			●			●					
Isopoda spJ	●			●				●			
Isopoda spK	●	●	●	●							
Isopoda spL	●	●	●	●							
Isopoda spM	●		●								
Isopoda spN	●			●							
Isopoda spO	●	●	●								
Isopoda spP	●		●								
Isopoda spR				●	●						
Isopoda spS										●	
Antarcturidae											
Antarcturus oryx	●	●	●	●	●	●	●	●	●	●	●
Arcturididae											
Arcturides cornutus	●	●	●	●	●			●	●	●	●
Cirolanidae											
Natatolana spA	●		●					●	●	●	
Expanathuridae											

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Eisothistos sp.nov.	●										
Panathura spA	●	●	●	●	●			●		●	
Gnathiidae											
Euneognathia gigas	●	●	●	●	●			●		●	
Serolidae											
Ceratoserolis cornuta	●	●	●	●	●	●	●		●	●	●
Serolis gracilis			●	●		●	●	●	●	●	
Sphaeromatidae											
Cymodopsis spA	●	●	●	●	●	●			●	●	
Tanaidacea											
Apseudomorpha spA	●			●	●						
Tanaidacea spA	●		●	●	●						
Nototanaidae											
Nototanais spA	●	●	●	●	●			●	●	●	
Ostracoda											
Ostracoda sp.	●	●	●	●	●	●		●			
ECHINODERMATA											
Asteroidea											
Asteroidea spA	●	●	●	●	●	●	●	●	●	●	
Asteroidea spB	●	●		●				●	●	●	
Asteroidea spC	●	●		●				●	●	●	
Asteroidea spD				●				●			
Asteroidea spE			●								
Asteroidea spF	●		●	●	●			●	●	●	●
Asteroidea spG			●	●							
Asteroidea spI				●				●		●	
Asteroidea spJ				●							
Asteroidea spK				●							
Asteroidea spL				●					●		
Asteroidea spM					●				●		
Asteroidea spN				●							
Asteroidea spS									●		
Asteroidea spT									●		
Asteroidea spU									●		
Forcipulatida											
Asteriidae											
Anteliaster spA		●									
Asteriidae spA	●		●	●	●			●	●	●	●
Smilasterias spA	●	●	●	●	●			●	●	●	●
Labidiasteridae											
Labidiaster annulatus	●	●	●	●	●			●	●	●	●
Paxillosida											
Astropectinidae											
Bathybiaster loripes	●	●	●	●	●	●	●	●	●	●	●
Leptychaster kerguelensis	●	●	●	●	●			●	●	●	●

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Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Benthopectinidae											
Cheiraster (Luidiaster) hirsutus			●	●	●		●	●	●	●	●
Spinulopsida											
Asterinidae											
Tremaster mirabilis	●	●		●	●			●	●	●	
Echinasteridae											
Henricia obesa								●			
Henricia spA	●	●		●	●			●		●	
Rhopiella hirsuta	●	●	●		●			●	●		
Ganeriidae											
Cycethra verrucosa	●	●						●		●	
Poraniidae											
Porania antarctica	●	●	●	●	●			●	●		
Pterasteridae											
Hymenaster spA	●	●	●	●	●			●	●	●	
Pteraster rugatus	●	●		●	●			●	●	●	
Pteraster spB	●	●	●	●	●	●		●	●	●	
Solasteridae											
Cuenotaster involutus	●	●		●				●	●	●	
Solaster regularis subarcuatus	●	●		●				●	●		
Valvatida											
Goniasteridae											
Hippasteria falklandica	●	●		●	●			●	●	●	
Odontasteridae											
Acodontaster elongatus	●	●	●	●	●			●	●	●	●
Odontaster meridionalis	●	●	●	●	●			●	●	●	●
Ophiuroidea											
Ophiuroidea spA	●		●	●	●	●		●			
Ophiuroidea spB			●		●						
Ophiuroidea spC	●	●		●	●			●	●		
Ophiuroidea spD				●	●			●	●		
Ophiuroidea spE					●			●		●	
Ophiuroidea spF				●							
Ophiuroidea spG									●	●	●
Ophiuroidea spH								●			
Ophiurida											
Amphiuridae											
Amphiura (Amphiura) spA	●	●	●	●	●			●	●	●	
Amphiura (Amphiura) spB			●	●	●	●	●	●		●	
Amphiura (Amphiura) spC				●	●		●				
Ophiacanthidae											
Ophiacantha imago	●	●	●	●	●			●	●	●	●
Ophiacantha pentactis	●	●	●	●		●	●	●	●	●	●
Ophiacantha sp		●		●							
Ophiacantha vivipara	●	●	●	●	●			●	●	●	●
Ophiodermatidae											

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Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Ophioderma brevispinum	●		●	●	●	●	●	●	●	●	●
Ophiuridae											
Ophiocten amitinum	●	●	●	●	●	●				●	●
Ophiomisidium speciosum	●	●		●	●			●			
Ophionotus hexactis			●			●			●	●	●
Ophiura ambigua	●	●	●	●	●		●	●	●	●	●
Ophiura sp1	●		●	●	●	●	●	●	●	●	●
Ophiurolepis carinata	●	●	●	●	●			●	●	●	●
Phrynophiurida											
Asteronychidae											
Asteronyx loveni				●	●	●	●	●	●	●	●
Gorgonocephalidae											
Astrotoma agassizii				●		●			●	●	
Gorgoncephalus chilensis		●	●	●	●	●	●	●	●	●	●
Crinoidea											
Comatulida											
Antedonidae											
Promachocrinus kerguelensis	●	●		●	●			●	●	●	
Solanometra antarctica	●	●	●	●	●	●		●	●	●	●
Echinoidea											
Echinoida											
Echinidae											
Dermechinus horridus		●									
Sterechinus spA	●	●	●	●	●	●		●	●	●	●
Spatangoida											
Schizasteridae											
Abatus cordatus			●							●	
Brisaster antarcticus	●	●	●	●	●	●	●	●	●	●	●
Cidaroida											
Cidaridae											
Ctenocidaris nutrix	●	●	●	●	●			●	●	●	
Holothuroidea											
Holothuridae spA					●						
Holothuridae spB				●	●	●		●	●	●	●
Holothuridae spC					●						
Holothuridae spD				●							
Holothuridae spE				●	●					●	
Holothuridae spF				●							
Holothuridae spH										●	
Apodida											
Chiridotidae											
Paradota marionensis	●										
Molpadiida											
Molpadiidae											
Molpadia musculus	●			●	●			●			
Molpadiidae sp.nov.			●	●	●	●	●				

* Denotes taxonomic groups incompletely sorted from one or all sampling locations.

Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Aspidochirotida											
Synallactidae											
Pseudostichopus peripatus	●	●		●	●						
Pseudostichopus sp.nov.				●	●						
Synallactes sp.nov.				●		●					
Dactylochirotida											
Dactylochirotida sp.nov.				●		●	●	●			
Dendrochirotida											
Cucumariidae											
Cucumaria kerguelensis	●		●	●	●					●	
Cucumaria sp.nov.	●										
Heterocucumis godeffroyi	●	●	●	●							
Pseudocnus laevigatus	●	●	●	●	●			●	●	●	●
Staurocucumis liouvillei	●	●	●	●	●			●	●	●	●
Trachythyone muricata			●	●	●	●					●
Psolidae											
Psolidium poriferum	●	●	●	●	●			●	●	●	●
Psolus ephippifer	●	●		●				●		●	
Psolus paradubiosus	●	●		●	●			●	●	●	
HEMICHORDATA											
Pterobranchia											
Pterobranchia spA	●	●	●	●	●			●	●	●	
Pterobranchia spB	●			●	●			●	●	●	
CHORDATA											
Ascidiacea*											
Ascidiacea spB			●								
Ascidiacea spF								●		●	●
Ascidiacea spG								●			
Ascidiacea spH					●				●		
Ascidiacea spA	●	●									
Ascidiacea spC	●			●						●	
Ascidiacea spD	●			●							
Ascidiidae											
Ascidia challengeri	●	●		●							
Ascidia spA	●	●							●		
Diazonidae											
Tylobranchion speciosum			●		●					●	
Didemnidae											
Didemnidae spA	●	●									
Didemnidae spp	●	●	●	●							
Holozoidae											
Sycozoa sigillinoides	●			●	●	●			●	●	
Polyclinidae											
Aplidiopsis discoveryi			●			●					
Polyclinidae spA	●	●	●	●							
Polyclinidae spB	●	●	●	●							

* Denotes taxonomic groups incompletely sorted from one or all sampling locations.

Taxon	Geographic areas										
	Aurora Bank	Coral Bank	Western Plateau	Southern Shell Bank	Shell Bank	North-east Plateau	West of North-east Plateau	Pike Bank	Plateau South-east	Plateau Deep East	Gunnari Ridge
Polyclinidae spC	●	●						●			
Polyclinidae spD	●	●	●	●				●			
Pleurogona											
Molgulidae											
Eugyra kerguelenensis	●										
Molgula kerguelenensis	●	●		●							
Molgula malvinensis	●	●	●	●							
Molgula pedunculata	●	●	●	●	●			●	●	●	●
Molgula sluiteri	●										
Molgulidae spA	●	●									
Molguloides spA	●	●									
Pyuridae											
Pyura spB		●									
Pyura vittata	●	●		●				●	●	●	
Styelidae											
Cnemidocarpa verrucosa	●	●	●		●		●	●	●	●	
Oligocarpa megalorchis	●		●								
Polyzoinae spA	●	●									
Polyzoinae spB	●	●	●	●							
Styela nordenskjoldi	●	●		●							
Styela spA	●	●									
Styela spB	●	●	●	●							
Styelinae spA	●	●		●							
Styelopsis spA	●	●		●							
Thaliacea											
Salpida											
Salpida spA						●					

* Denotes taxonomic groups incompletely sorted from one or all sampling locations.

Glossary

Abdomen – In invertebrates the abdomen is the most distal section of the body which lies behind the thorax or cephalothorax.

Abdominal – Of or relating to the abdomen.

Aboral – Opposite the mouth; e.g. the surface opposite the mouth of a sea star (top surface).

Antenna(e) – A projecting, usually filamentous organ equipped with sensory receptors.

Anterior – The front end or toward the front end of the body.

Aristotle's lantern – The mouth parts or chewing organ on the oral surface of a sea urchin. The name comes from Aristotle's accurate description in his 'History of Animals'

Arthropod(s) Animals from the phylum Arthropoda characterized by the possession of a segmented body with appendages on at least one segment. This include the sea spiders, crustaceans and others.

Benthic – Organisms caught on or close to the bottom of the ocean.

Bilateral symmetry – In bilateral symmetry (also called plane symmetry); only one plane will divide an organism into roughly mirror image halves (with respect to external appearance only).

Biomass – The total mass of living matter within a particular area.

Bivalve(d) – Organisms whose body is enclosed in two opposing shells hinged dorsally. This includes the bivalves, ostracods and brachipods.

Carapace – A bony or chitinous shield covering the back of an animal.

Calcareous – Calcareous coatings, or calcareous deposits, are mixtures of calcium carbonate. Some crustaceans and molluscs have hard external shells containing calcium carbonate.

Capitulum – Name given to the body of a barnacle.

CCAMLR – Convention for the Conservation of Antarctic Marine Living Resources

Cephalized – An animal body form with a head end.

Cheliped(s) – The legs of prawns/shrimps which bear claws or chela.

Chitin(ous) – An insoluble horny polysaccharide consisting of modified glucose molecules containing an N-acetyl group and often bound to protein to form a glycoprotein. Abundant in the exoskeleton of arthropods

Chordate(a) – Chordates (phylum Chordata) are a group of animals that includes the vertebrates, together with several closely related invertebrates. They are united by having, at some time in their life cycle, a notochord (primative backbone), a hollow dorsal nerve cord, pharyngeal slits, an endostyle, and a post-anal tail.

Clade – A clade is a taxonomic group comprising a single common ancestor and all the descendants of that ancestor.

Cnidocyte – A type of venomous cell unique to the phylum Cnidaria. Each cnidocyte cell contains an stinging organelle called a cnidocyst or nematocyst.

Depauperate – A group lacking many species in a particular habitat or region. Especially common to biogeographically isolated islands like Heard Island.

Detritus – Matter produced by the decay or disintegration of an organic substance.

Dorsal – The upper surface of a bilateral animal. Opposite to the ventral surface.

Dorsoventrally flattened – Body wider than it is high; e.g. isopods.

Emaciate(d) – To make or become extremely thin, especially as a result of starvation; i.e. pycnogonids look emaciated.

Endoskeleton – An internal supporting skeleton, derived from the mesoderm, that is characteristic of vertebrates and certain invertebrates.

Endostyle – a ciliated, mucus secreting groove in the ventral surface of the pharnyx in Urochordates which aids in transporting food.

Exoskeleton – External, calcareous, chitinous, or other hard material covering the body surface and providing protection or support.

Furrow(s) – A rut, groove, or narrow depression, i.e. a deep wrinkle in the outer surface of an anemone.

Gorgonin – A complex protein that makes up the horny skeleton of horny corals in the order Gorgonacea.

Hemichordate(a) – A phylum of worm-shaped marine animals, generally considered the sister group of the echinoderms. Includes the pterobranchs.

Homogeneity – The quality of being uniform throughout in composition or structure

HIMI – Heard Island and McDonald Islands.

Indigenous – Originating and living or occurring naturally in an area or environment.

Lophophore – A microscopic crown of tentacles which forms a specialized feeding structure surrounding the mouth of the each solitary zooid in a bryozoa colony.

Lateral – Pertaining to the side(s) of an organism or structure, away from the centre or midline.

Laterally flattened – Body higher than it is wide; e.g. amphipods.

Macrofauna – Benthic or soil organisms which are at least one millimetre in length.

Mantle – The fleshy (muscular) tubular or sac-like body of molluscs; i.e. the sac-like body of the octopus.

Membrane(ous) – A thin, pliable layer of tissue covering surfaces or separating/connecting regions, structures, or organs of an animal or a plant. Membranous; relating to, made of or similar to a membrane, "membranous lining".

Morphology(ies) – The form or structure of an organism or one of its parts; i.e. the morphology of a crustacean.

Morphospecies – Species distinguished solely on the basis of external morphology.

Nematocyst – Stinging organ in cnidarians.

Nodule(s) – A small, usually hard mass of tissue in or on the body.

Oral – Surface containing the mouth. Opposite to the aboral surface; e.g. bottom side of a sea star.

Papillated – To have a covering of small, round or cone-shaped projections like minute pimples on the surface of the body; e.g. like the surface of our tongue.

Parapodia(ium) – Fleshy appendages ('legs') of a polychete annelid that function in locomotion and breathing.

Parasitic – An organism that relies on or requires another organism for support and supply; e.g. a leech.

Pelagic – Organisms that live in open water not close to the bottom.

Pentamerous – Five-part symmetry; i.e. a sea star with 5 radially projecting arms.

Pereiopod(s) – The primarily walking legs of prawns/shrimps, often armed with a claw (chela), sometimes referred to as chelipeds.

Pereon – The largest division of the body in the isopods.

Pleopod(s) – The primarily swimming legs of crstaceans; also used for brooding the eggs (except in prawns), catching food (then swept to the mouth), and can sometimes bear their own gills.

Posterior – Toward the tail-end of an organism.

Polyp(s) – A cnidarian in its solitary sessile stage. Polyps have hollow, tube-shaped bodies with a central mouth on top surrounded by tentacles; e.g. an anemone.

Proboscis – The slender, tubular feeding and sucking organ of certain invertebrates, such as insects, worms, and molluscs.

Radially symmetrical – Meaning that whichever way an animal is cut along its central axis, the resulting halves would always be mirror images.

Radula – A flexible tonguelike organ in certain molluscs, having rows of horny teeth on the surface.

Rostrum – A spike-like anterior extension on the dorsal surface of the carapace of crustaceans

Segmented – Having the body divided into successive segments, as in polycheate worms or prawns.

Sessile – Permanently attached or fixed to a substrate; not free-moving; e.g. a sessile barnacle.

Seta(e) – A stiff hair, bristle, or bristle like process or part on an organism. In this guide, setae are observed on the bodies of many polychaete worms and are used for locomotion.

Siliceous – Containing, resembling, relating to, or consisting of silica; i.e. siliceous sponges.

Siphon – A tubular organ, especially of aquatic invertebrates such as squids, clams or sea squirts, by which water is taken in or expelled.

Speciose – Rich in number of species.

Spicule – A small needlelike structure or part, such as one of the silicate or calcium carbonate processes supporting the soft tissue of certain invertebrates, especially sponges.

Taxonomy – The science of naming, describing, and classifying organisms.

Telson – The last division of the body of a crustacean. Together with the uropods, the telson forms the tail fan of lobsters, shrimp and other decapods.

Thorax – The middle region of the body of an arthropod between the head and the abdomen.

Thoracic – Of, relating to, or situated in or near the thorax: i.e. the thoracic appendage.

Translucent – Surface which allows light to pass through, but not transparent.

Tubercle(s) – A small rounded projection, swelling, or lump, as on the abdomen of lithodid crabs.

Univalve(d) – A gastropod, especially one with a single shell, such as a snail, cone, whelk, abalone, or limpet.

Uropod – One of the last pair of posterior abdominal appendages of certain crustaceans, such as the lobster or shrimp.

Ventral – Pertaining to the lower surface of an animal. Opposite the dorsal surface.

WG-FSA – CCAMLR's Working Group on Fish Stock Assessment.

Zooid – One of the distinct individuals forming a colonial animal such as a bryozoan or hydrozoan.

Little is known about the deep sea benthic invertebrate diversity in the territory of Heard Island and McDonald Islands (HIMI). In an initiative to help further our understanding, invertebrate surveys over the past seven years have now revealed more than 500 species, many of which are endemic. This is an essential reference guide to these species. Illustrated with hundreds of representative photographs, it includes brief narratives on the biology and ecology of the major taxonomic groups and characteristic features of common species. It is primarily aimed at scientific observers, and is intended to be used as both a training tool prior to deployment at-sea, and for use in making accurate identifications of invertebrate by catch when operating in the HIMI region. Many of the featured organisms are also found throughout the Indian sector of the Southern Ocean, the guide therefore having national appeal.

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Australian Antarctic Division
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