

Benthic Megafauna from the North Pacific Abyss

Phylum **Cnidaria**

Class **Anthozoa**

Order **Scleralcyonacea**

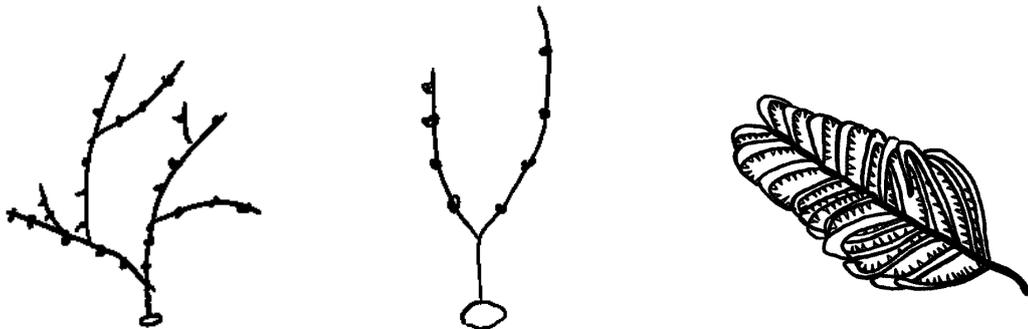
Order **Antipatharia**

Order **Corallimorpharia**

Sub Class **Ceriantharia**

Class **Hydrozoa**

Class **Scyphozoa**



Abyssal Pacific seafloor image-based megafauna morphotype catalogue v.1

Phylum **Cnidaria:**

Class **Anthozoa**

Order **Scleralcyonacea; Antipatharia; Corallimorpharia; Scleractinia**

Sub Class **Ceriantharia**

Class **Hydrozoa & Scyphozoa**

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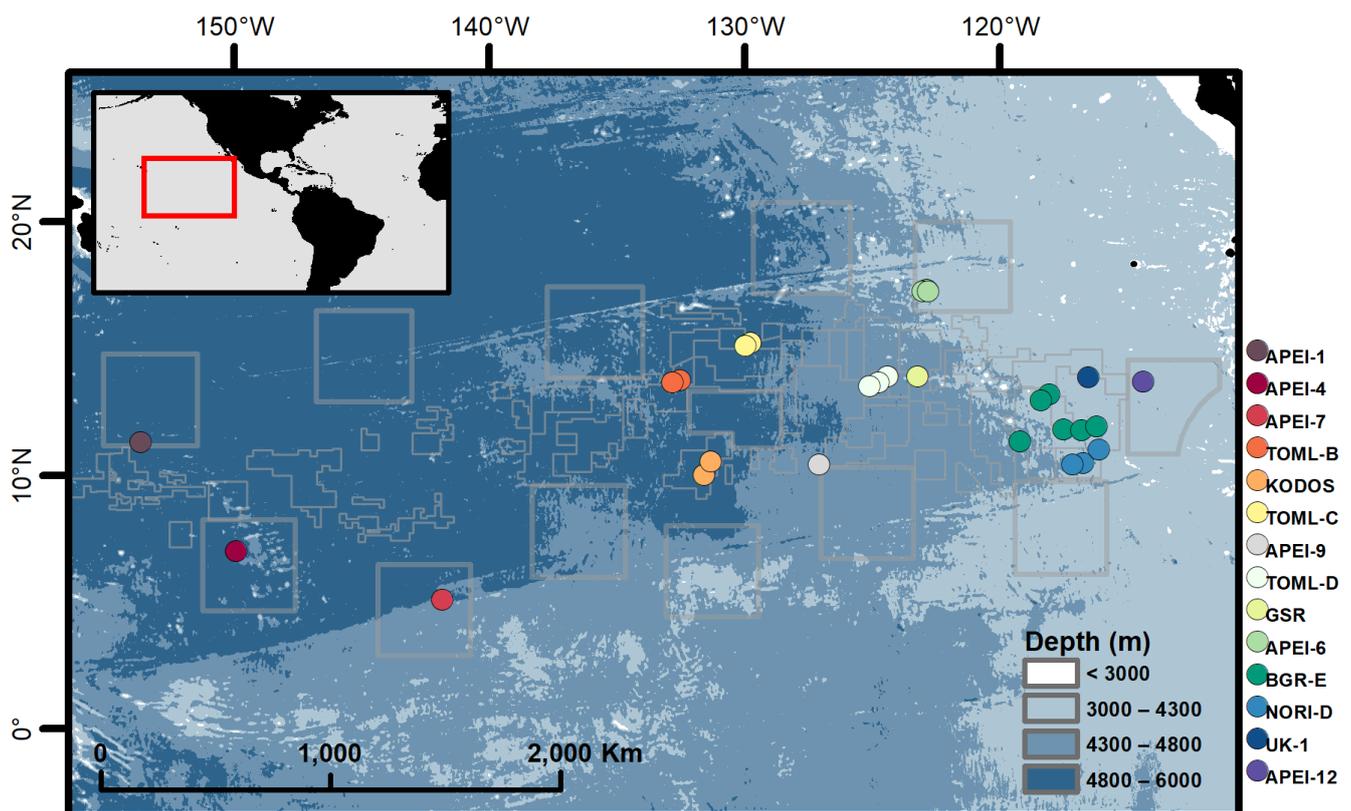
Standardised taxonomic field guide used to develop (please cite as): Simon-Lledó, et al. (2023).

Carbonate compensation depth drives abyssal biogeography in the northeast Pacific. *Nature Ecology & Evolution*; doi:10.1038/s41559-023-02122-9

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The APSMA image-based taxonomical catalogue

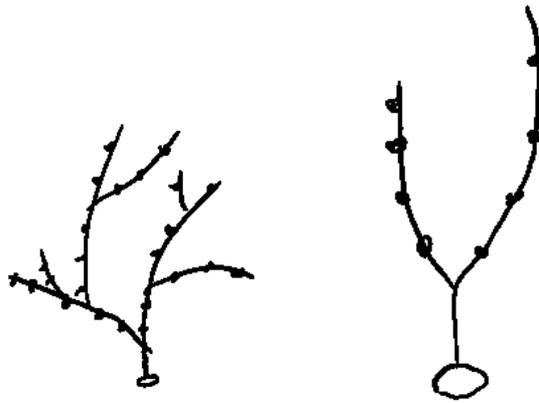
This code-based abyssal megafauna (invertebrates > 1 cm) catalogue was developed by morphological and taxonomical alignment of specimens encountered in seabed imagery collected across multiple seabed locations across the Clarion Clipperton Fracture Zone, in the NE Pacific basin (see map below and main study, Simon-Lledó et al. 2023, for further details). This work was conducted during a range of scientific workshops held between 2016 and 2021, in collaboration with taxonomic experts (see acknowledgements section) and by reference to existing literature (e.g. where available, links to studies describing physically collected specimens are provided in taxon descriptions). The catalogue follows the Horton et al. 2021 open nomenclature (e.g. 10.3389/fmars.2021.620702) to report the taxonomic resolution reached in the identification of each classified metazoan morphotype. Each morphotype was assigned a unique 7 character identification code (i.e. "XXX_nnn"). All taxa identified were deemed as sufficiently different morphologically by taxonomic experts to be confidently considered separate species. Note the catalogue is periodically revised, as new photographed and collected specimens get described, and hence some taxonomic identifications may vary in subsequent versions of this guide. The latest version of the APSMA catalogue is available as label tree for image/video annotation on BIIGLE (biigle.de; please contact authors for more detail).



Map of the Clarion Clipperton Zone in the North Pacific basin with detail on locations surveyed with photographic and video cameras mounted on autonomous underwater vehicles (AUVs), remotely operated vehicles (ROVs), and towed cameras; between 2010 and 2021. Areas managed by the International Seabed Authority: Thick polygons, Areas of Particular Environmental Interest, and; Thin polygons, polymetallic nodule exploration licensed sites.

Class **Anthozoa**

Order **Scleralcyonacea**



ALC_007

Calyptrophora persephone

sp. inc.

Morphology: uniplanar, unbranched upright colonies; with 4 polyps arranged in 2 pairs per whorl, facing upward on stem but in opposite directions (within the same plane). Very regular internodal distance. More detail: doi:10.3897/BDJ.4.e9277; doi:10.1007/s12526-015-0340-x.

Notes: typically found attached to nodules



ALC_009

Callozostron bayeri sp. inc.

Morphology: (opposite) pinnate-branched colonies; with 2-3 branches originating on opposite sides of the stem at the same level. Polyps arranged in pairs or more commonly whorls of three, facing sideways in 3 dimensions. More detail: doi:10.1007/s12526-015-0340-x.

Notes: typically found attached to nodules



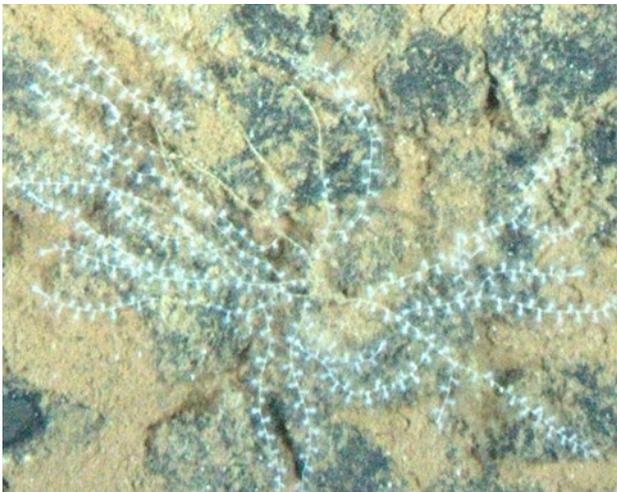
ALC_008

Abyssoprimnoa gemina sp. inc.



Morphology: uniplanar, dichotomously-branched colonies; with paired globose polyps. Many (2-6) thin branches. More detail: doi:10.3897/BDJ.4.e9277; doi:10.1007/s12526-015-0340-x.

Notes: typically found attached to nodules



ALC_002

Primnoisis sp. indet.

Morphology: strongly dichotomously-branched colonies; with single globose polyps arranged facing sideways, alternating side between consecutive polyps. Several (>10) very thin, long branches often interlaced. More detail: doi:10.3897/BDJ.4.e9277.

Notes: typically found attached to nodules

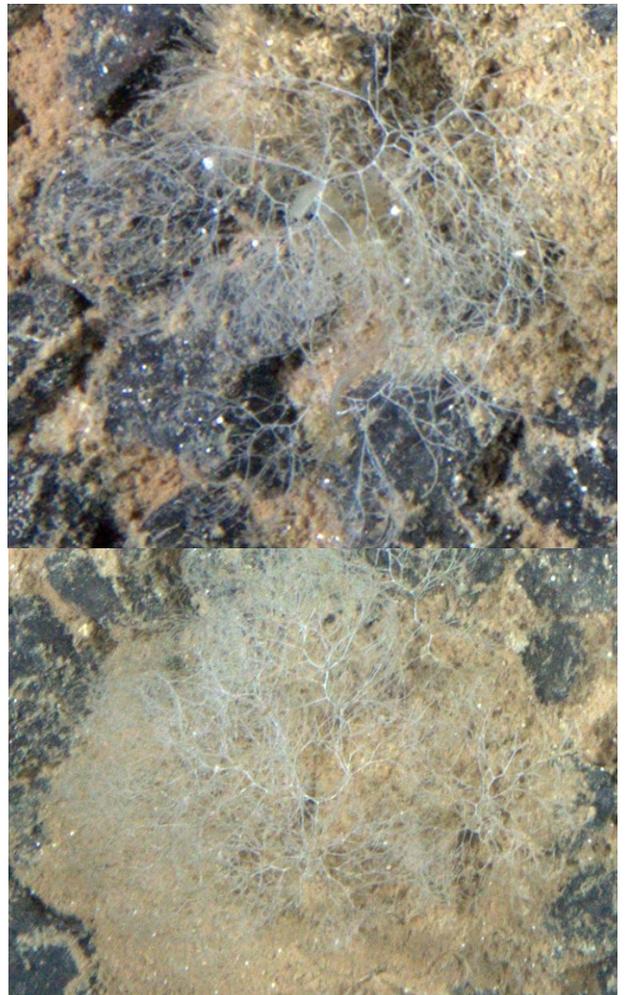


ALC_041

Scleralcyonacea fam. indet

Morphology: strongly dichotomously-branched colonies; polyps are not visible, alternating side between consecutive polyps. Large amount (>40) very thin, long branches largely interlaced.

Notes: unclear morphotype from seabed imagery, e.g. assuming polyps are present but are not visible. Otherwise, taxon might belong to other Anthozoa/Bryozoan group



ALC_018

Mopseidae gen. indet.

Morphology: unbranched colonies; clavate polyps standing perpendicular to the axis, alternating sides. More detail: doi:10.3897/zookeys.1113.82172.

Notes: typically found attached to nodules.



ALC_004

Bathygorgia profunda sp. inc.

Morphology: unbranched or multibranched colonies; with thick axis and large non-retractile polyps arranged with no clear pattern nor facing direction on branches. Relatively large –but often irregular- internode distance. More detail: doi:10.2988/0006-324X-128.2.125.

Notes: typically found attached to nodules or rocks.



ALC_005

Keratoisididae gen. indet.

Morphology: whip-like, upright and unbranched colonies; thick branch with large non-retractile polyps densely aggregated facing alternated sides (between consecutive polyps) along the axis. Can grow large (> 1 m).

Notes: typically found attached to nodules or rocks. This morphotype likely includes a few different species, for instance *Lepidisis* sp. (doi:10.3374/014.062.0202) or *B. abyssicola* (doi:10.2988/0006-324X-128.2.125), differing in polyp morphology and other features not visible in seabed imagery.

ALC_030

Taiaroidae gen. indet.



Morphology: white, anemone-like, burrowing solitary octocoral; with 8 tentacles fully extended horizontally

Notes: always found semi-buried on soft sediment



PEN_014

Umbellula monocephalus sp. inc

Morphology: white, single polyp sea pen with long stalk. Tentacles (8) with few pairs of thin lateral pinnules visible.



PEN_003

Umbellula sp. indet.

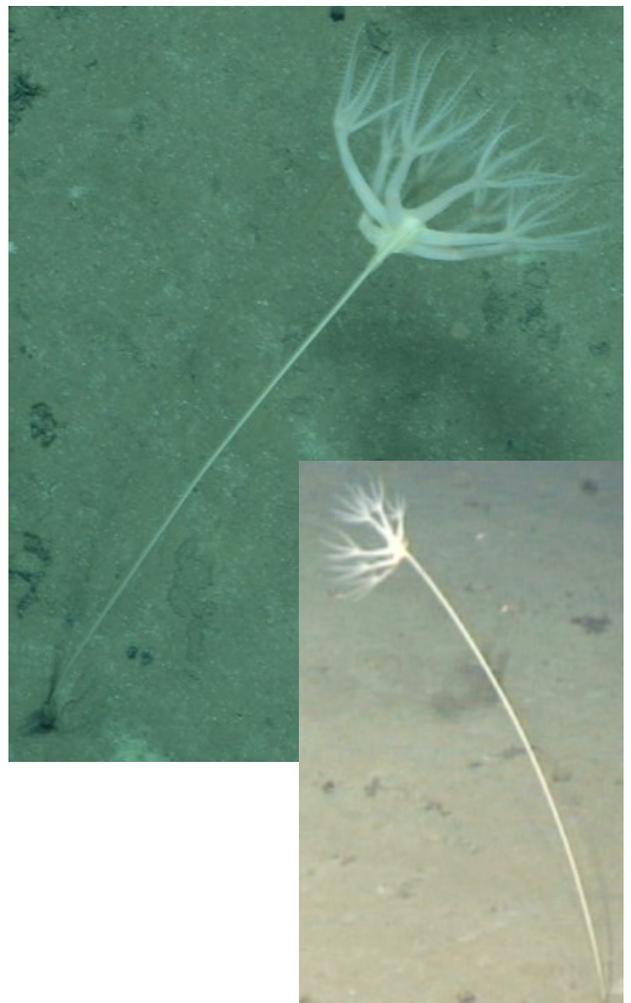


Morphology: white, somewhat translucent, sea pen with long stalk; 3-5 polyps with elongated body (i.e. anthostele). Tentacles (8) with few pairs of thin lateral pinnules visible.

PEN_009

Umbellula sp. indet.

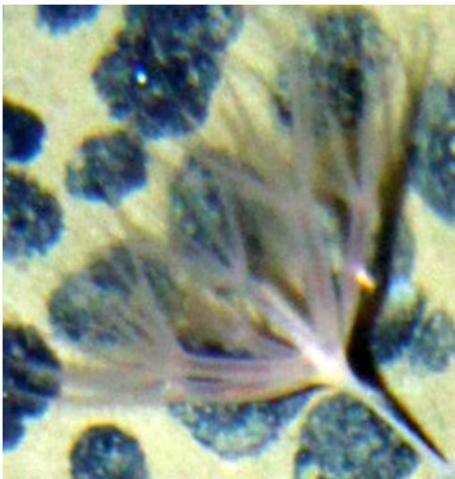
Morphology: white sea pen with very long stalk; 6+ polyps with very elongated body (i.e. anthostele). Tentacles (8) with few pairs of thin lateral pinnules visible.



PEN_020

Umbellula sp. indet.

Morphology: reddish sea pen with short stalk ; 5 polyps with very elongated body, darkening distally.



PEN_010

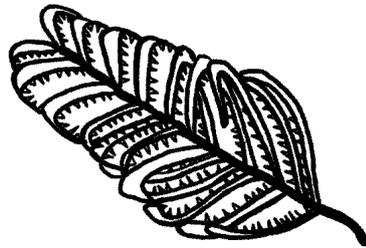
Umbellula lindahli sp. inc.

Morphology: reddish sea pen with long brighter-coloured stalk ; 6+ polyps with very elongated body, darkening distally. Tentacles (8) with few pairs of thin lateral pinnules visible.



Class **Anthozoa**

Order **Antipatharia**

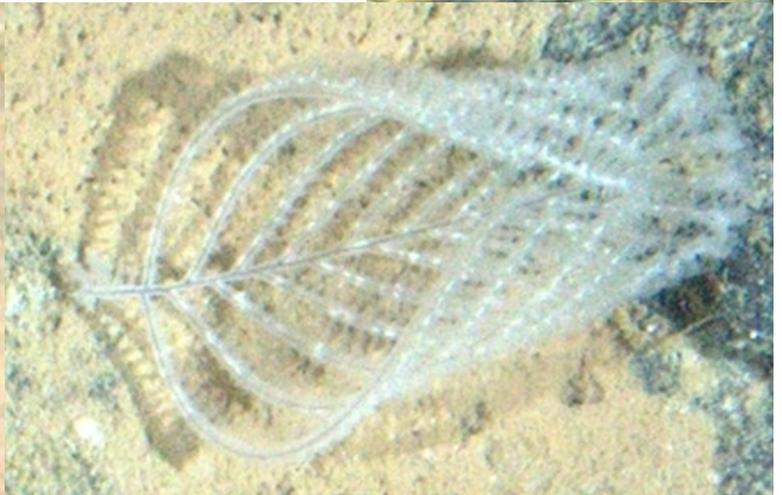


ANT_002

Abyssopathes lyra sp. inc.

Morphology: unbranched, with alternated pinnules arranged along a central branch; small nodal distance. Pinnules grow up-ward facing and fold over central branch. More detail: doi:10.1007/s12526-017-0659-6.

Notes: typically found attached to nodules



ANT_003

Bathypathes gen. inc.

Morphology: fork-shaped; with 3 very long pinnules originating at the same level from short stalk. Pinnules growing down-ward facing extending horizontally over the seabed.

Notes: typically found attached to nodules

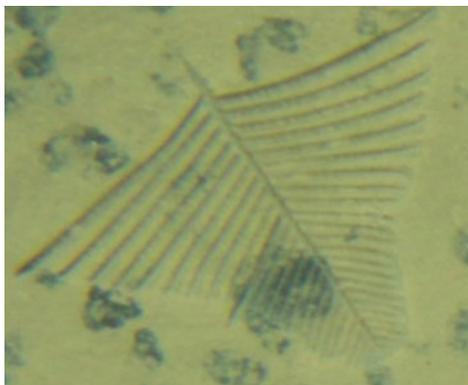


ANT_006

Alternatipathes alternata sp. inc.

Morphology: unbranched, with alternated pinnules arranged along a central branch; small nodal distance. Pinnules grow down-ward facing and curl under central branch and clearly decrease in length distally. More detail: doi:10.1007/s12526-017-0659-6.

Notes: typically found attached to nodules



ANT_011

Schizopathes affinis sp. inc.

Morphology: unbranched, with alternated long pinnules arranged along a central branch; small nodal distance. Pinnules decreasing in length distally; growing downward facing extending horizontally over the seabed. More detail: doi:10.1007/s12526-017-0659-6.

ANT_005

Bathypathes sp. indet.

Morphology: unbranched, short stalked; upright growing central branch with polyps and 2 parallel pinnules per node (> 4 nodes), each facing opposite directions and slightly curving.



ANT_007

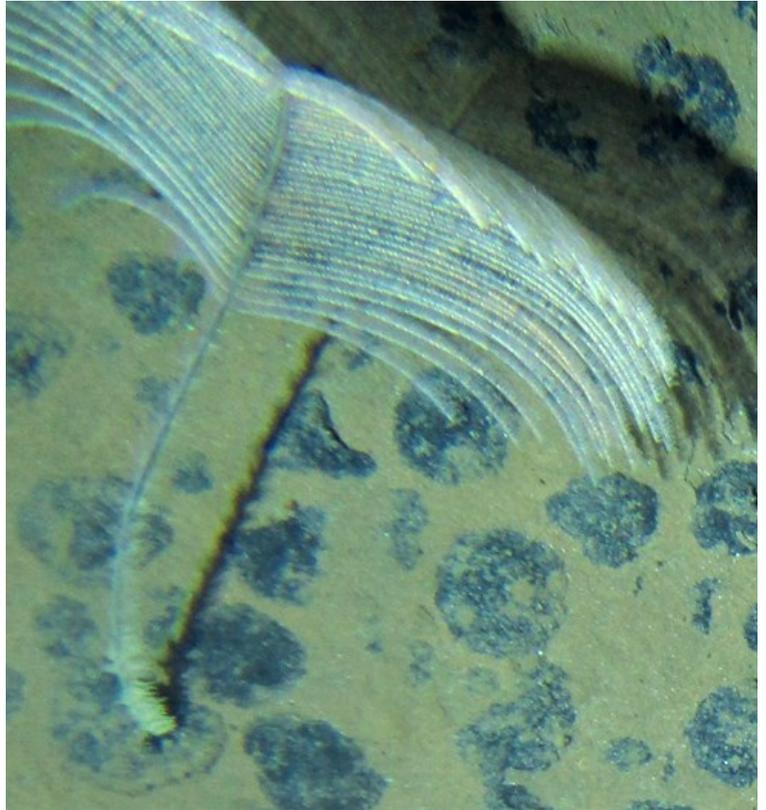
Bathypathes patula sp. inc.

Morphology: unbranched, long stalked; horizontally growing central branch with polyps and 2 parallel pinnules per node (usually > 4 nodes), each facing opposite directions and slightly curving.

ANT_008

Bathypathes sp. indet.

Morphology: unbranched, very long stalked; upright growing central branch with polyps and 2 parallel pinnules per node (> 15 nodes), each facing opposite directions and slightly curving.



Class **Anthozoa**

Order **Corallimorpharia**

COR_009

Corallimorphidae

gen. indet.

Morphology: short, flattened tipped-tentacles arranged in 2 crowns; wide oral disc. Feeding tentacles (outer crown, facing sideways) slightly longer than catch tentacles (inner crown, facing upwards) and wider at the base (e.g. triangular shaped).



COR_005

Corallimorpharia fam. indet.

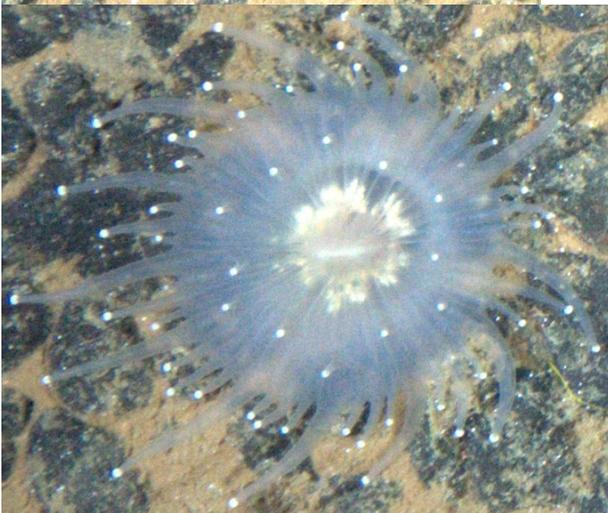
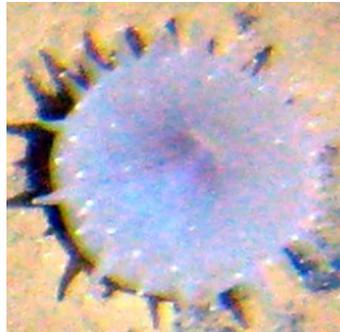
Morphology: very long, translucent and flattened tipped-tentacles, arranged in one row; small oral disc. Elongated tentacles, narrowing distally.

Notes: singleton morphotype, uncertain classification; tipped-tentacles suggest Corallimorpharia (rather than Actiniaria) but specimen collection needed to further verify.

COR_006

Corallimorphus sp. indet.

Morphology: wide, circular cross-section, tipped-tentacles, arranged in 2 crowns; very wide oral disc. Feeding tentacles (outer crown, facing sideways) about 3 times longer than catch tentacles (inner crown, facing upwards), which are arranged in two circles. Whitish, opaque skin. Developed pedal disc and column.



COR_001

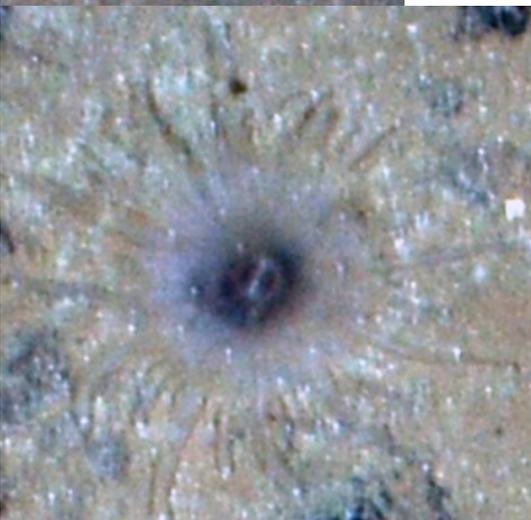
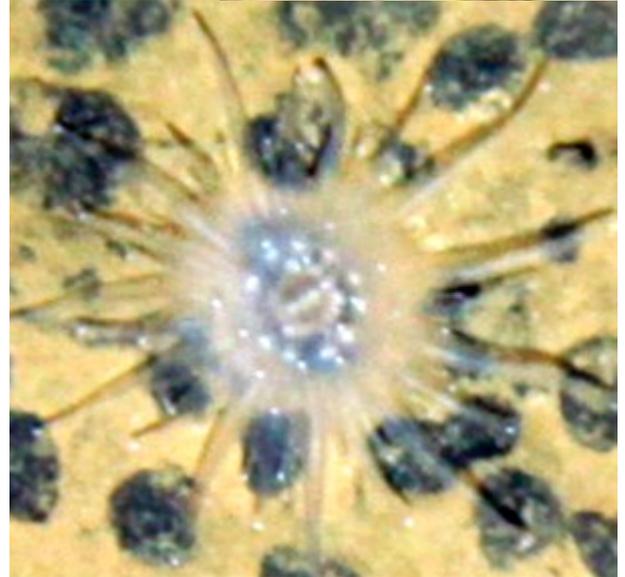
Corallimorphus sp. indet.

Morphology: elongated, circular cross-section, tipped-tentacles, arranged in 2 crowns; wide oral disc. Feeding tentacles (outer crown, facing sideways) arranged alternating shorter and longer tentacles, respectively 2-3 times longer than catch tentacles (inner crown, facing upwards), which are arranged in a single circle. Translucent to blue-ish (light-reflecting) skin; internal mesenteries and pharynx visible. Developed pedal disc and column.

COR_003

Corallimorpharia fam. indet.

Morphology: elongated, circular cross-section, tipped-tentacles, arranged in 2 crowns; wide oral disc. Feeding tentacles (outer crown, facing sideways) about 5+ times longer than catch tentacles (inner crown, facing upwards). Transparent skin; all internal organs visible. Very reduced pedal disc and column.



COR_007

Corallimorpharia fam. indet.

Morphology: elongated, circular cross-section, tipped-tentacles, arranged in 2 crowns; wide oral disc. Feeding tentacles (outer crown, facing sideways) about 4+ times longer than catch tentacles (inner crown, facing upwards). Somewhat translucent to blueish (light-reflecting) skin, darkening towards the oral disc centre. Very reduced pedal disc and column.

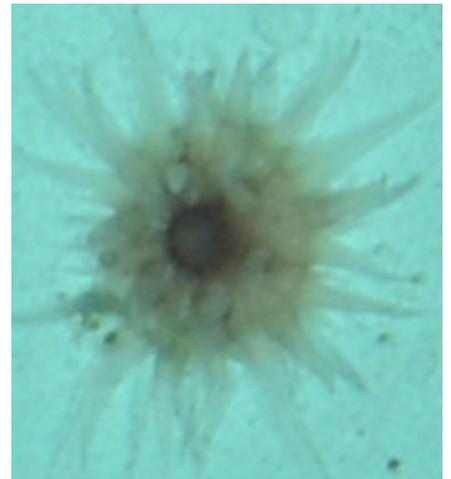
Class **Anthozoa**

Order **Scleractinia**

SCL_003

Fungiacyathus fragilis sp. inc.

Morphology: solitary, unattached polyp; with tapered, brownish translucent tentacles, longer than half the corallum diameter and arranged in two or three cycles. Corallum is light brown distally and darker proximally; with flat base. More detail: doi:10.3897/zookeys.1113.82172.



SCL_005

Fungiacyathidae gen. indet.

Morphology: solitary, unattached polyp; with tapered, transparent tentacles, longer than half the corallum diameter and arranged in two cycles. Transparent corallum with reddish-orange stripes; over visible (white) mesenteries.

SCL_002

Deltocyathiidae gen. indet.

Morphology: bright white, solitary, hard substratum attached polyp; conical column, wide oral disc with transparent tentacles -often not visible in seabed imagery. Relatively large size (oral disc diameter >3 cm)

Notes: found always attached to large rocks



SCL_004

Deltocyathus sp. indet.

Morphology: bright white, solitary, hard substratum attached polyp; conical column, wide oral disc with transparent tentacles –typically not visible in seabed imagery. Small size (oral disc diameter <2 cm) and highly light-reflecting.

Notes: found always attached to nodules

Class **Anthozoa**

SubClass **Ceriantharia**

CER_001

Spirularia fam. indet.

Morphology: tube-dweller, tube fully-buried, with tentacles extended at the level of the sediment surface. Very long, conical, tapering, reddish brown tentacles; darkening towards the centre of oral disc. More detail: doi:10.3897/zookeys.1113.82172.



CER_005

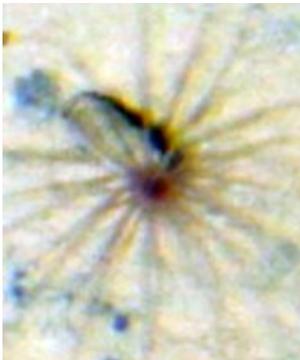
Ceriantharia order. indet.

Morphology: semi-buried, with tentacles extended above the sediment. Very long, conical, tapering, transparent tentacles.

CER_002

Ceriantharia order. indet.

Morphology: tube-dweller, tube semi-buried, with tentacles extended at half the tube length above the sediment. Very long, thin, tapering, grey tentacles; reddish oral disc.



CER_003

Ceriantharia order. indet.

Morphology: tube-dweller, only tube base slightly buried, with tentacles extended at almost the full tube length above the sediment. Very long, conical, tapering, reddish brown tentacles; darkening towards the centre of oral disc.

CER_008

Ceriantharia order. indet.

Morphology: tube-dweller, tube semi-buried, with tentacles extended at half the tube length above the sediment. Very long, thin, tapering, white tentacles and oral disc.



CER_009

Ceriantharia order. indet.

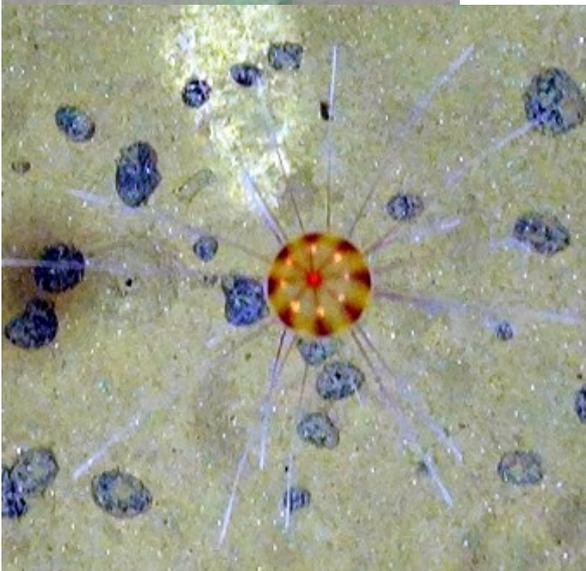
Morphology: tube not visible under wide globular oral disc, with tentacles extended somewhat above the sediment. Very long, thick, tapering, grey tentacles; dark and oral disc.

Class Hydrozoa

HYD_003

Rhopalonematidae gen. indet.

Morphology: reddish exumbrella contour, divided by 8 oral-aboral transparent radial canal lines; exumbrella with transparent aboral end (circle in middle). Very thin short tentacles densely distributed along the velum.



HYD_004

Crossota sp. indet.

Morphology: lite yellow translucent exumbrella, reflecting colours of internal organs; 8 thin red oral-aboral radial canal lines connecting below with wider and darker red gonads. Brighter red small circle at the aboral end of the exumbrella connecting radial canals. Few (~25) slim, very long tentacles along the velum.

HYD_008

Rhopalonematidae gen. indet.

Morphology: red translucent exumbrella with darker aboral end, likely reflecting internal organ's colour. Very thin short tentacles densely distributed along the velum.



HYD_015

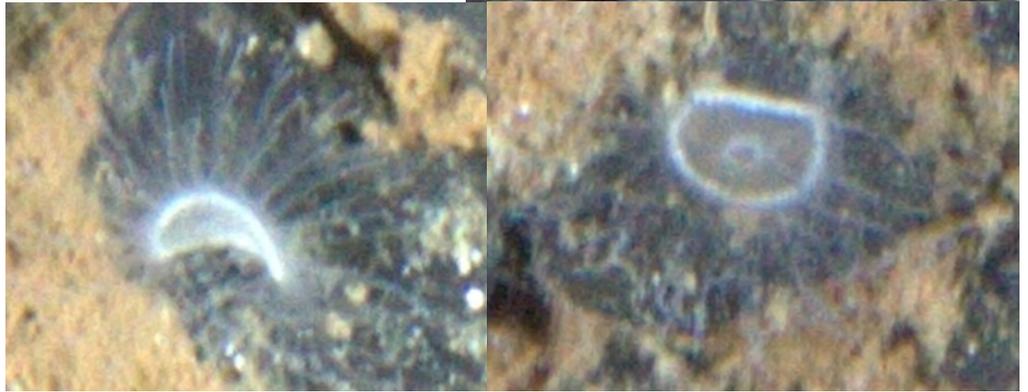
Rhopalonematidae gen. indet.

Morphology: fully transparent exumbrella, tentacles, and internal organs; with light orange coloured ring canal and oral end of the radial canal.

HYD_021

Trachymedusae fam. indet.

Morphology: flattened body with transparent exumbrella and bright white ring canal. Many (>100) tentacles distributed along the velum.



HYD_009

Branchiocerianthus sp. indet.

Morphology: growing on thick brown stalk; with many (>100) white, thin and long tentacles surrounding a central bright red hydranth (and sporosacs under).

Notes: can grow on sponge stalks



HYD_020

Agalmatidae gen. indet.

Morphology: siphonophore colony with globular and transparent anterior pneumatophore and nectosome zooids; holding a white to reddish (posterior) siphonosome.

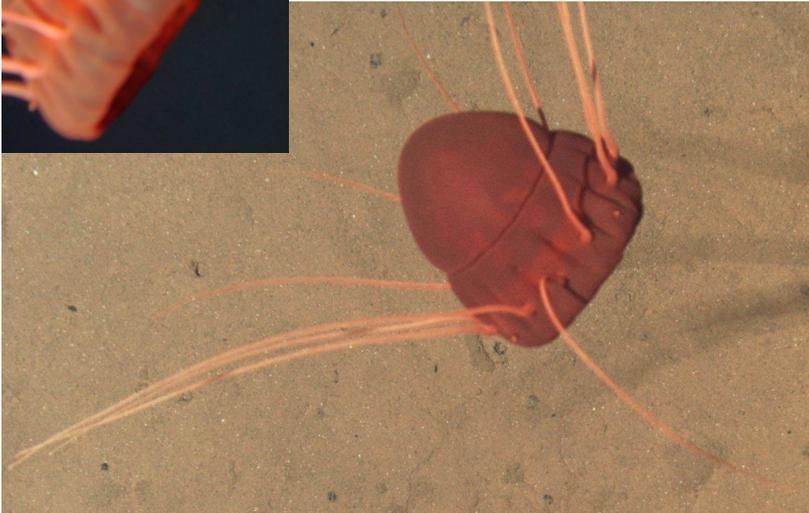
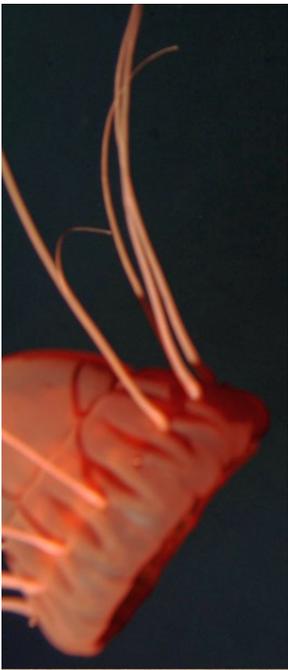


Class **Scyphozoa**

SCY_004

Periphylla periphylla

Morphology: red conical bell with 12 elongated lighter coloured tentacles growing (slightly above and) around the edge of the bell oral



SCY_005

Poralia refuscens

Morphology: red globular bell covering red and shorter oral arms; few slim white tentacles growing around the oral edge of the bell



SCY_009

Ulmaridae gen. indet.

Morphology: dark red bell and brown tentacles; with white line evident around the oral arms

Notes: can be found capsized on the sediment (see e.g. doi:10.3897/zookeys.1113.82172)



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