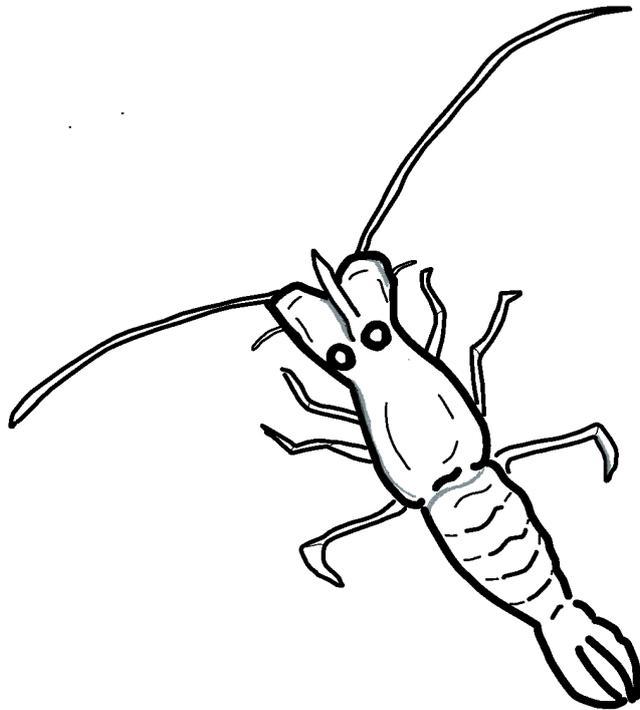


Benthic Megafauna from the North Pacific Abyss

Phylum **Arthropoda**



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

Phylum **Arthropoda**:

SubPhylum **Crustacea**

SubPhylum **Chelicerata**

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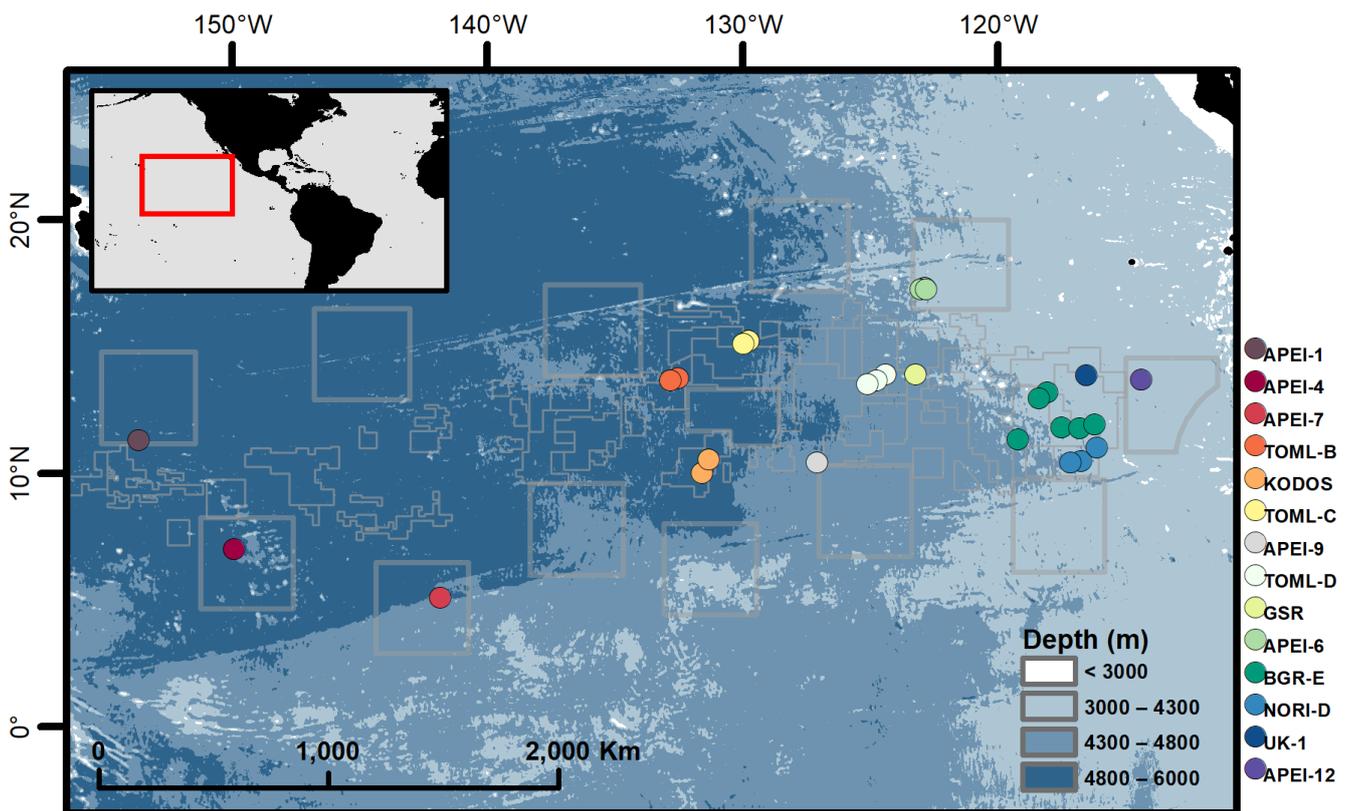
Standardised taxonomic field guide used to develop (please cite as): Simon-Lledó, et al. (2023).

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 the authors for more detail).

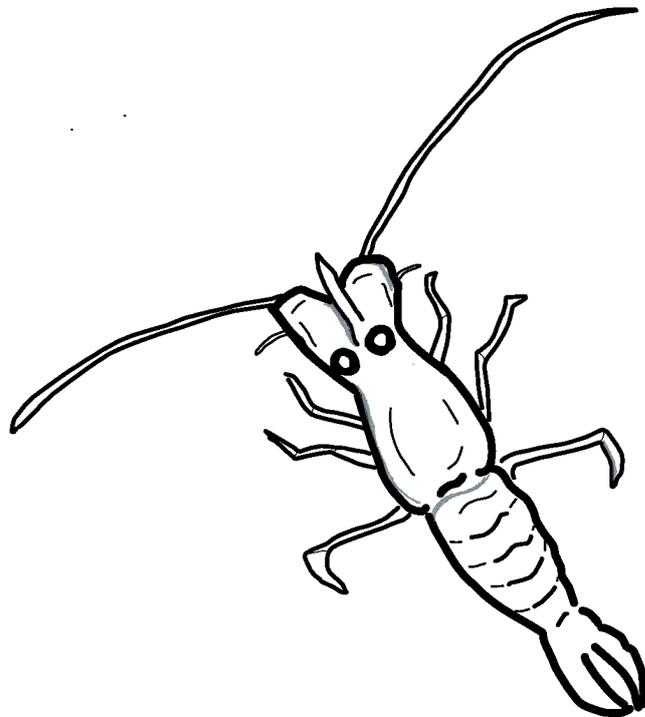


Map of the Clarion Clipperton Zone in the North Pacific basin with detail on locations surveyed with photographic and video cameras mounted on autonomous underwater vehicles (AUVs), remotely operated vehicles (ROVs), and towed cameras; between 2010 and 2021. Areas managed by the International Seabed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

Phylum **Arthropoda**

SubPylum **Crustacea**

Order **Decapoda**



DEC_024

Penaeoidea fam. indet.

Morphology: orange body with dorsally visible darker patch around the middle of the carapace. Long abdominal appendages. Large and orange-translucent oval scaphocerites (antennal scales), e.g. larger than rostrum. Wide 'tail fan' shaped posterior termination (e.g. uropods and telson).

Notes: high ability to swim.



DEC_003

Benthescymidae gen. indet .

Morphology: red body (with dorsally darker patch around the middle of the carapace sometimes visible). Long abdominal appendages. Large and semi-transparent oval scaphocerites. Wide 'tail fan' shaped posterior termination.

Notes: high ability to swim.



DEC_005

Nematocarcinus sp. indet.

Morphology: red slender abdomen and short carapace with long forward-facing antennal scales. Extremely long, very slender ambulatory appendages. Narrow, 'cup' shaped posterior termination.



DEC_008

Hymenopeneaus

sp. indet.

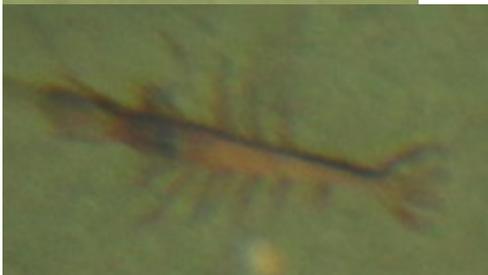
Morphology: orange to light red body; with visible darker patch around the middle of the carapace, dorsally. Short rostrum, slender abdomen, long thread-like ambulatory appendages. Narrow 'tail fan' shaped posterior termination.

Notes: two species are known to exist in the region, *H. nereus* and *H. doris*, but separation is not possible based on seabed imagery. More detail: doi:10.1007/s12526-022-01284-2.

DEC_011

Penaeoidea fam. indet.

Morphology: slender red carapace and longer, pale white slender abdomen. Thread-like ambulatory appendages decreasing in length anteriorly. Abdominal appendages decreasing in length posteriorly. Wide 'tail fan' shaped posterior termination.



DEC_004

Penaeoidea fam. indet.

Morphology: slender orange body (carapace and abdomen). Thread-like ambulatory appendages decreasing in length anteriorly. Abdominal appendages decreasing in length posteriorly. Wide 'tail fan' shaped posterior termination.

DEC_006

Glyphocrangon sp. indet.

Morphology: orange to pale orange body. Large carapace (same length as abdomen and wider) with elongated rostrum and opaque-orange elliptical scaphocerites. Robust abdomen with lateral corrugations apparent. Very narrow 'cup' shaped posterior termination. Large, dorsal and shiny yellow (colour reflecting) eyes, widely separated.



DEC_026

Glyphocrangon sp. indet.

Morphology: white to pale orange body; with visible darker patch around the anterior end of the carapace, dorsally. Long carapace (almost as long as abdomen) with short rostrum and translucent elliptical scaphocerites. Slender abdomen and lacking lateral corrugations. Wide 'tail fan' shaped posterior termination. Large, dorsal, shiny eyes, placed very close.

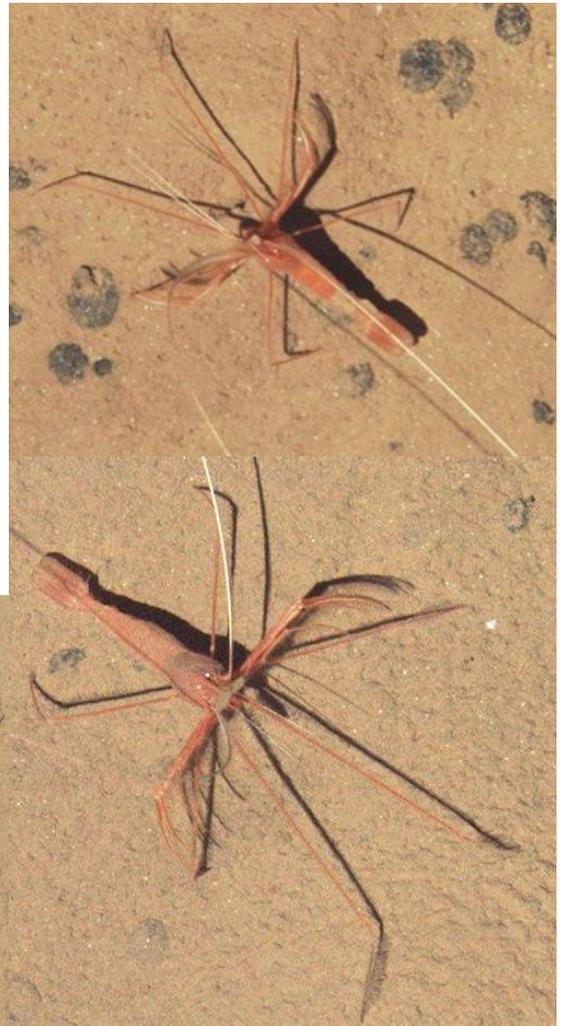
Notes: often found semi-buried in sediment leaving only few antennae, rostrum and eyes exposed.

DEC_009

Bathystylodactylus echinus

Morphology: orange body; wide carapace and bell-shaped, sharp-edged 'tail'. Extremely long (> body length) first pereopod pair, ending in brush-like appendages fringed with many long setae. See also: doi:10.1007/s12526-022-01284-2.

Notes: often found creating large sediment mounts with brush-shaped appendages. They appear to custody these mounts even when closely approached by ROVs.



DEC_007

Munidopsis kensmithi sp. inc.

Morphology: pale-white squat lobster with 3 pairs of ambulatory appendages. Short robust pincers; granules on the dorsal surface of body and pereiopods. No pigment in eyes and narrow rostrum. More detail: doi:10.1007/s12526-022-01284-2

Notes: body surface and pereiopods often covered by sediment

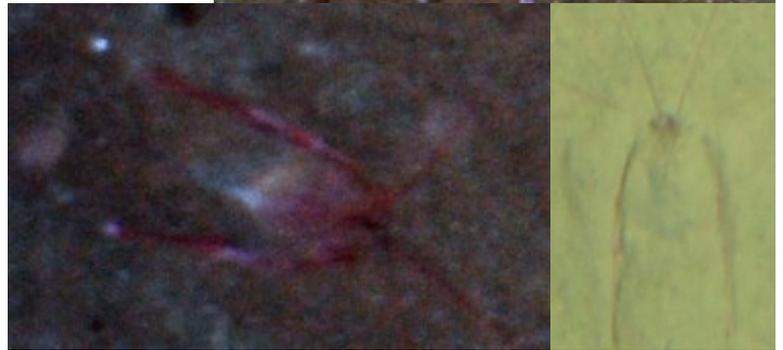


DEC_023

Polychelidae gen. indet.

Morphology: dark red ovoid and dorsoventrally flattened body. Very long first pereopod pair. Rostrum is very short and eyes are absent.

Notes: typically found semi-buried in sediment leaving only antennae and the first pair of large pereopods exposed.



DEC_027

***Parapagurus microps* sp. inc.**

Morphology: hermit crab with orange body. Only the first 2 pairs of ambulatory appendages are used for moving and are usually visible (i.e. exposed outside the shell they occupy). Right cheliped larger than left one. More detail: doi:10.1007/s12526-022-01284-2.

Notes: usually found carrying a large gastropod shell and covered in thin layer of sediment. Can sometimes carry anemones too.



DEC_001

Cerataspis monstrosus sp. inc.

Morphology: bright red body. Wide carapace (wider than abdomen) with elongate rostrum and large oval opaque-red scaphocerites, somewhat lateral-facing. Long abdominal appendages. Wide 'tail fan' shaped posterior termination. More detail: doi:10.3897/BDJ.5.e14598.

Notes: Size and shape of abdominal appendages grant *C. monstrosus* a high ability to swim.



(other) Phylum **Arthropoda**

SubPylum **Crustacea**

(non Decapoda)

ART_001

Munnopsidae gen. indet.

Morphology: white body; with 3 very long, thread-like ambulatory appendages (used for swimming) and a pair of forward-facing, long antennae

Notes: it is usually not possible to distinguish *Munneurycope* sp specimens from similar Munnopsididae or even Storthyngurinae in seabed imagery, see e.g. 10.1007/s12526-020-01061-z.



ART_027

Munnopsidae gen. indet.

Morphology: pale white to grey body; with 3 very long, thread-like ambulatory appendages (used for swimming; the 1st and 3rd appendage exhibit lobes) and a pair of forward-facing, long antennae

ART_004

Eurythenes sp. indet.

Morphology: large white to reddish amphipod, darker coloured in posterior end (uropod and telson) and head deeper than long. More detail: doi:10.3897/BDJ.5.e14598.

Notes: owing to their relatively small size and wide complexity in ventral morphological features, it is generally not possible to identify most amphipod taxa from vertical imagery. But the genus *Eurythenes* can be determined owing to their large size (> 2cm), large eyes, and mobile scavenging habit.



ART_007

Amathillopsis sp. indet.

Morphology: bright white body with violet to reddish ventral appendages. Short rostrum, prominent first antennae pair ('horn' shape), and posterior of body strongly carinate with dorsal projections. More detail: doi:10.3897/zookeys.1031.62391.

Notes: distinctive clinging habit; attaching to worm tubes and sponge stalks by posterior pereopods. Typically found in pairs.

ART_040

Amphipoda fam. indet.



Morphology: red (sometimes pale red) amphipod with short, brighter coloured rostrum; usually only the first pair of thin antennae and posterior ambulatory legs are dorsally visible from vertical-facing seabed images.

Notes: typically found partially buried in small holes that they likely dig themselves in the sediment

ART_015

Neotanaidae gen. indet.

Morphology: bright white body with robust chelipeds and prominent antennules, with long uropods.

Note: most tanaid families are not possible to resolve on seabed images but this is a large-sized morphotype.

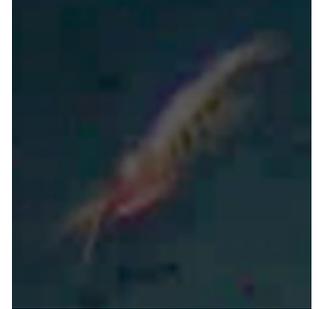


ART_014

Gnathophausiidae gen. indet.

Morphology: shiny red body; with dorsally protruding red pigmented eyes and two pairs of antenna (about half of the body in length)

Notes: usually found swimming



ART_008

Mysidae gen. indet.

Morphology: white body; with dorsally visible dark pigmented eyes and two pairs of antenna (the first pair, longer than the body length)

Notes: usually found dwelling on sediment on the seabed surface

ART_010

Scalpellidae gen. indet.

Morphology: pale white barnacle with elongated capitulum, longer than wide, short peduncle and covered by large scales.

Notes: typically found attached to sponge stalks or nodules. Although different species of scalpellids have been described at the CCZ (e.g. *Trianguloscalpellum* sp, *Catherinum* sp, see: doi: 10.3897/zookeys.1113.82172), classification beyond family level from seabed imagery is rarely possible (only in exceptionally large specimens).



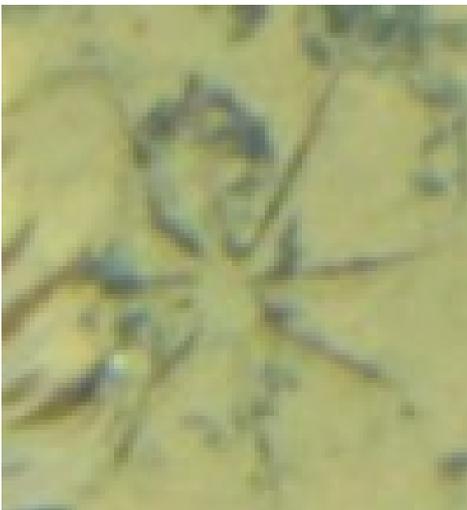
SubPhylum **Chelicerata**

Class **Pycnogonida**

ART_020

Pantopoda fam. indet.

Morphology: brown to pale yellow sea spider (i.e. 4 pairs of walking legs); with thin trunk, long ovigers (longer than body length; e.g. cephalon + trunk), and very long walking legs (>5 times the body length)



ART_028

Pantopoda fam. indet.

Morphology: brown coloured sea spider (i.e. 4 pairs of walking legs); with wide trunk, short ovigers, and relatively short walking legs (only slightly larger than body length)

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