Image annotations for biodiversity with benthic landers in the Gully MPA and Scotian Shelf from 2021-2023

Claude Nozères, Laurence H. De Clippele, Jinshan Xu, Barry MacDonald, Camille Lirette, Ellen Kenchington

Ocean and Ecosystem Sciences Division
Maritimes Region
Fisheries and Oceans Canada
Bedford Institute of Oceanography
PO Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2

2024

Canadian Manuscript Report of Fisheries and Aquatic Sciences 3290

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Canadian Manuscript Report of
Fisheries and Aquatic Sciences 3290

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IMAGE ANNOTATIONS FOR BIODIVERSITY WITH BENTHIC LANDERS IN THE
GULLY MPA AND SCOTIAN SHELF FROM 2021-2023

Claude Nozères, Laurence H. De Clippele[1], Jinshan Xu, Barry MacDonald, Camille Lirette,
Ellen Kenchington

Ocean and Ecosystem Sciences Division
Maritimes Region
Fisheries and Oceans Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, N.S.
Canada B2Y 4A2

[1] School of Biodiversity, One Health and Veterinary Medicine
The University of Glasgow
Graham Kerr, 82 Hillhead St, Glasgow, United Kingdom
G12 8QQ

Correct citation for this publication:

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ABSTRACT

Nozères. C., De Clippele, L.H., Xu, J., MacDonald, B., Lirette, C., Kenchington, E. 2024. Image annotations for biodiversity with benthic landers in the Gully MPA and Scotian Shelf from 2021-2023. Can. Manuscr. Rep. Fish. Aquat. Sci. 3290: iv + 99 p.

Benthic landers with cameras were deployed to take time-series photos for several months. The first series in 2021-2022 was in the Sambro Bank Sponge Conservation Area. The second series in 2022-2023 was in Sambro Bank and the Gully Marine Protected Area. Over 54,000 images were reviewed and annotated using the BIIGLE platform, with labels for fishes, crustaceans, molluscs, echinoderms, and other taxa. The context and uses of these annotation labels are documented in this report for reference when performing biodiversity analyses.

RÉSUMÉ

Nozères. C., De Clippele, L.H., Xu, J., MacDonald, B., Lirette, C., Kenchington, E. 2024. Image annotations for biodiversity with benthic landers in the Gully MPA and Scotian Shelf from 2021-2023. Can. Manuscr. Rep. Fish. Aquat. Sci. 3290: iv + 99 p.

Des modules de descente benthiques benthiques équipés de caméras ont été déployés pour prendre des photos de séries chronologiques pendant plusieurs mois. La première série en 2021-2022 a eu lieu dans la zone de Conservation des Éponges du Banc Sambro. La deuxième série en 2022-2023 s'est déroulée sur le Banc Sambro et dans la Zone de Protection Marine du Gully. Plus de 54 000 images ont été examinées et annotées à l'aide de la plateforme BIIGLE, avec des étiquettes pour les poissons, les crustacés, les mollusques, les échinodermes et d'autres espèces. Le contexte et les utilisations de ces étiquettes d'annotation sont documentés dans ce rapport à titre de référence lors de la réalisation d'analyses de biodiversité.

INTRODUCTION

To explore the presence of megafauna in marine conservation areas, a series of benthic lander platforms equipped with cameras were deployed to take time-series photos for several months in two areas. The Sambro Bank Sponge Conservation Area, created to protect the *Vazella pourtalesii* sponge grounds, was investigated at three sites in 2021-2022 and one site in 2022-2023 (Fig. 1). The second area, in the Gully Marine Protected Area, was investigated at two sites in 2022-2023. Details about the locations and the benthic landers are presented in cruise reports (De Clippele et al. 2023, 2024), while the specifics about the image annotations are presented in this report. The purpose of presenting the image annotations is to provide context and comments about how the images were labelled for visual content. This will assist with the subsequent revision of labels as needed for project goals (of taxonomic or functional groups) and help with their interpretation when performing biodiversity analyses.
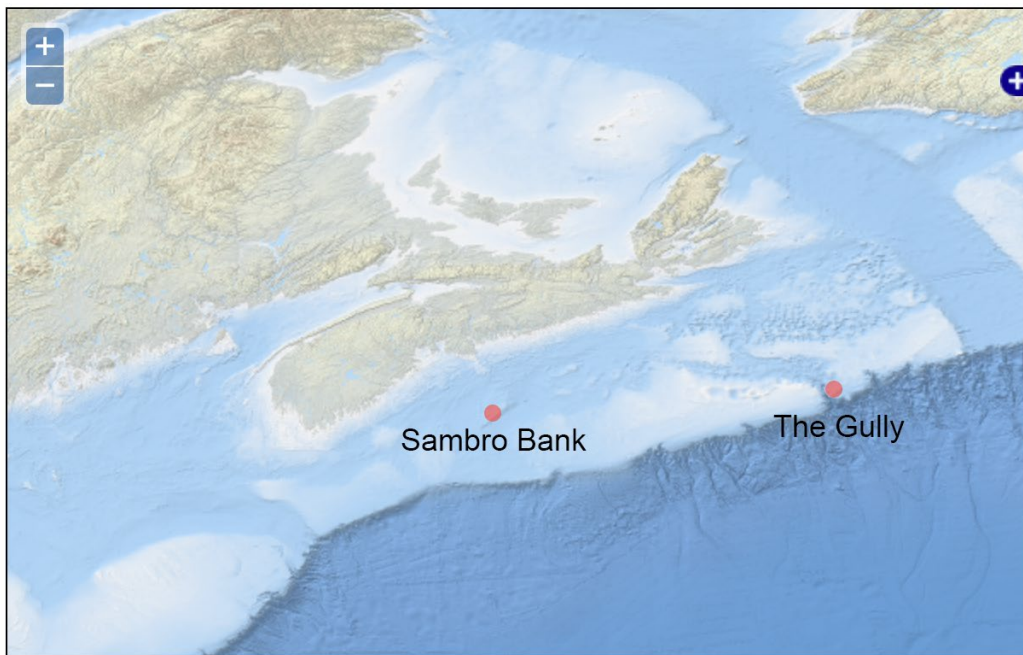

Figure 1. General map depicting locations for Sambro Bank and The Gully. Adapted from: https://www.marineregions.org/gazetteer.php?p=details&id=34408.

Image annotations, or labels, are a set of standardized terms to associate with an object of interest in the image. The labels may apply to the entire image frame or to a portion of the image. A full image label may be useful because of the subject category (benthic, pelagic) or because a subject is in view, but no effort is made to indicate its position in the image. This full image label is known as keyword-tagging in photography, by applying subject terms of interest to a photo so that it can then be retrieved when querying the terms in cataloguing software, making it valuable in photojournalism. Scientific image annotation is interested in the subject label (presence), but also the subject's position, area, and other parameters of the image, enabling measurements of abundance, size and other features.

For underwater images, labels serve to indicate subjects of interest for analysis. The images usually comprise a large sequence taken consecutively, with annotations made of a subject observed in the image frame. In practice, labels are applied where a subject of interest is seen, either as a directed objective (e.g., fish observed) or for novelty detection (change in behaviour or form observed). The concept of novelty detection underlies much of the annotations, as underwater image sets may have large series of 'empty' or views not of interest, depending on a particular project (e.g., zooplankton and substrate vs fish counting). And thus, the primary purpose of labels is to narrow down many thousands of files into a smaller set of 'novelties'. These tagged images can then be reviewed and given specific labels of interests, such as by taxonomic name, form, or behaviour without having to review the entire file set to add these labels. While this may describe how an initial project may begin ('tag anything of interesting'), tagging may also be done with a pre-defined set of labels, usually of species names, referred to as a keyword list or a label tree. For the Sambro Bank project, species names were added to the label tree as they were encountered while reviewing images. The decisions regarding such labels have evolved during the review of the image dataset, and thus there was a need to document the choices and changes made in labels. The first decision was to tag observed fishes, which was expanded to include motile invertebrates (e.g., crustaceans), and is currently being explored for sedentary or less-motile taxa (e.g., sea pens), to inform on differing project objectives. The present document is neither a guide (e.g., Korabik et al. 2021), nor an analysis, but serves to demonstrate the state of annotations in 2024 for observed fauna, both of fishes and invertebrates.

MATERIALS AND METHODS

The underwater photos were obtained from each lander, programmed to capture images with flash lighting every 30 mins, during their deployment from autumn to spring. Three sites were to be investigated during each period, for 2021-2022 and 2022-2023. The cameras were Sony DSC-EX0, capturing 15 MP (4800 x 3200 pixel) images as JPG files. Upon recovery of the landers, the image files were downloaded to a computer and renamed with a unique file number:

(Lander)_(YYYY_MM_DD) (HH_MM_SS) (base file name).JPG
Example: L2_2021_09_16 14_00_12_TL200634.JPG

The files were then uploaded online for annotation using the web tool, https://biigle.de/. The first series grouped all image files from the landers as project Sambro Bank 2021-2022 (https://biigle.de/projects/1435). The second series has three volumes, separated by lander, as project Sambro Bank 2022-2023 (https://biigle.de/projects/2447). The projects are private, for consultation by invitation.

Annotations for motile fauna (i.e., excluding the fixed sea pens) were carried out using circles or rectangles to enclose each observed instance of an organism in view. Each shape is associated with a designated label of the taxon, usually a scientific name but including common names for some such as fishes. Some special annotations were applied to indicate classes, such as juveniles of redfish, hakes, and crabs. Several organisms were not clear in the images, either because they were very small or in the

distant background of the image frame, though sometimes their identification could be presumed from adjacent images or visible behaviour. When too uncertain, these were labelled in a series of temporary 'unknown' classes, that will eventually be placed in a designated taxon. Additional classes of descriptive annotations (e.g., detached sponge, re-positioning sea pen, shadow) were created to flag special instances, but were not used for initial analyses of faunal presences.

The collection of annotations, of taxonomic names and other classes, is referred to as a label tree in the BIIGLE platform, functioning as a hierarchical set of keywords to apply to the images. The label tree is public on BIIGLE as Sambro Bank, https://biigle.de/label-trees/1969. However, this tree is not yet finalized as uncertain taxa may be confirmed, and the utility of some special classes is to be determined. Annotations were performed in 2023 by a team for the 2021-2022 series, then validated by C. Nozères. The 2022-2023 series was annotated by C. Nozères. Image files are managed by C. Lirette. Full-sized, renamed versions were edited in Adobe Lightroom Classic software to prepare for upload to BIIGLE and provide cropped examples for this report (Appendices).

Along with labels applied based on visual examination of good quality images, some identifications were suggested based on geography and regional captures. A research survey using bottom trawl gear takes place each summer in the Scotian Shelf with captures in areas near the lander sites that could confirm the presences suggested in images (DFO 2023, DFO 2024). Notably for geography, in 2022-2023, only site 1 occurred in Sambro Bank, at 154 m depth, while site 2 (356 m) and site 3 (325 m) were located near the Gully, with differences in taxa to be expected relative to the shallower Sambro Bank site.

RESULTS

While the labels are subject to revision with ongoing reviews, as of May 2024, there were 91 labels in current use for the Sambro Bank tree to annotate the file volumes across the project, with additional labels serving to organize the levels (Table 1). Apart from some special cases, the organizational hierarchy of labels follows the taxonomic hierarchy. Most labels had taxonomic names, usually of fishes and crustaceans, while some had a different utility, to annotate uncertain kinds (poorly visible) or shadows, and behaviours (e.g., swimming, resting, repositioning). Each identified subject had only a single annotation, with no multiple labels, though some were in parent-child relationships. For example, *Cancer* crab contained child label *Cancer*-juvenile. As the zoanthid cnidarian (*Epizoanthus papillosus*) is only observed on small hermit crabs, it is shown here as a child of the label Paguroidea. Fishes are of particular interest and thus were presented together rather than strictly by taxonomy. Some kinds, such as the Redfish and Hakes were observed at markedly different sizes at one site and were labelled in subgroups as juveniles. Large Redfish appeared to vary in behaviour and were divided into groups for swimming or resting. Different sizes of crabs and sea stars also varied from moving to being sedentary (repeated observation at same location) but have not yet been assessed for groupings by behaviour. Information and image examples for each of the labels used in the project are presented in the Appendices.

Table 1. BIIGLE annotations applied in the projects, in order of their hierarchy of the label tree; labels with an asterisk are tentative names still under review for confirmation.

Group	Label
Annelida	Polycladida
Arthropoda	Calanoida
Arthropoda	Munididae (Munid Squat Lobster)
Arthropoda	Munidid-small
Arthropoda	Lithodes maja (Norway King Crab)
Arthropoda	Lithodes maja-small
Arthropoda	Paguroidea sp. (Hermit Crab)
Arthropoda	Paguroid-Epizoanthus
Arthropoda	Homarus americanus (American Lobster)
Arthropoda	Cancer (borealis or irroratus)
Arthropoda	Cancer-juvenile
Arthropoda	Homola minima
Arthropoda	Caridea
Arthropoda	Pandalidae
Arthropoda	Atlantopandalus propinqvus
Arthropoda	Pandalus
Arthropoda	Spirontocaris
Arthropoda	Eusergestes arcticus
Arthropoda	Euphausiidae
Arthropoda	Aega psora*
Arthropoda	Syscenus infelix
Chaetognatha	Chaetognatha
Cnidaria	Pachycerianthus borealis
Cnidaria	Flabellum
Cnidaria	Balticina finmarchica
Cnidaria	Pennatula aculeata
Cnidaria	Siphonophorae
Cnidaria	Solmissus incisa
Cnidaria	Tiaropsis multicirrata
Cnidaria	Ctenophora
Echinodermata	Coronaster briareus
Echinodermata	Henricia
Echinodermata	Hippasteria phyrgiana
Echinodermata	Poraniomorpha hispida
Echinodermata	Pteraster militaris
Echinodermata	Sclerasterias tanneri
Echinodermata	Stephanasterias albula
Fish	American Plaice (Hippoglossoides platessoides)
Fish	Atlantic Cod (Gadus morhua)
Fish	Atlantic Halibut (Hippoglossus hippoglossus)
Fish	Atlantic Wolffish (Anarhichas lupus)

Group	Label
Fish	Blackbelly Rosefish (Helicolenus dactylopterus)
Fish	Buckler Dory (Zenopsis conchifer)
Fish	Cusk (Brosme brosme)
Fish	Fourbeard Rockling (Enchelyopus cimbrius)
Fish	Girard's Hagfish (Myxine limosa)
Fish	Greater Argentine (Argentina silus)
Fish	Haddock (Melanogrammus aeglefinus)
Fish	Kaup's Arrowtooth Eel (Synaphobranchus kaupii)
Fish	Longhorn Sculpin (Myoxocephalus octodecemspinosus)
Fish	Marlin-Spike Grenadier (Nezumia bairdii)
Fish	Monkfish (Lophius americanus)
Fish	Ocean Pout (Zoarces americanus)
Fish	Pollock (Pollachius virens)
Fish	Redfish (Sebastes fasciatus or mentella)
Fish	Redfish-swim
Fish	Redfish-rest
Fish	Redfish-juvenile 1
Fish	Redfish-juvenile 2
Fish	Silver Hake (Merluccius bilinearis-juvenile
Fish	Shortbeard Codling (Laemonema barbatulum)
Fish	Silver Roughy (Hoplostethus mediterraneus)*
Fish	Snailfish (Liparidae-Careproctus reinhardti or Liparis fabricii)*
Fish	Snakeblenny (Lumpenus lampretaeformis)
Fish	Thorny skate (Amblyraja radiata)
Fish	White or Red Hake (Urophycis tenuis or chuss)
Fish	White or Red Hake-juvenile 1
Fish	White or Red Hake-juvenile 2
Fish	Witch flounder (Glyptocephalus cynoglossus)
Mollusca	Bathypolypus bairdii
Mollusca	Rossia*
Mollusca	Diodora cayenensis*
Mollusca	Aldisa zetlandica*
Mollusca	Ziminella salmonacea*
Mollusca	Pleurobranchaea tarda
Porifera	Porifera*
Appendicularia	Oikopleura*
Unknown	Unknown (biota)
Unknown	Unknown anemone (Actiniaria)
Unknown	Unknown fish-juvenile
Unknown	Unknown crustacean (small)
Unknown	Unknown fish (Helicolenus or Sebastes)
Unknown	Unknown fish (Merluccius or Urophycis)
Unknown	Unknown gastropod (small)
Unknown	Unknown jelly (Cnidaria, Ctenophora, Larvacea)
Unknown	Unknown sea star (Asteroidea)

Group	Label
Unknown	Unknown brittle star (Ophiuroidea)
Unknown	Unknown worm (Annelida or Nemertea)
Motility (Situational)	detached sponge (Vazella)
Motility (Situational)	re-positioning (sea pen)
Quality (Determination)	shadow

Many of the reviewed images had no annotations: 34% in 2021-2022 and 53 % in 2022-2023 (Table 2). In 2022-2023, most images from LS 1 (Sambro Bank *Vazella pourtalesii* Sponge Site) had labelled fauna (88%), in contrast to the relatively few images with labels (17%) from LS 2 (Gully Pennatulacea Site). The BIIGLE web tool can produce chart summaries, including the proportional use of each label, displayed here by project year (Fig. 2). Most labels were for undefined shrimp (Caridea), squat lobster, and Redfish.

Table 2. Counts and percentage of images that had labels applied by project and site.

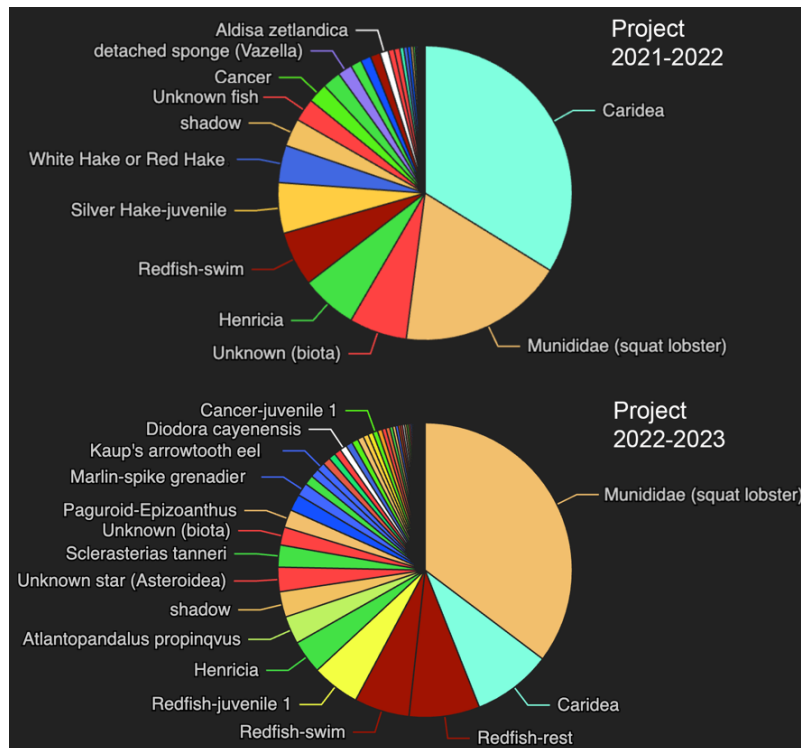| Project	Images with labels	Images with no labels	% labelled
2021-2022	9091	17476	34
2022-2023	17401	15587	53
Sambro Bank LS 1	*10359*	*1468*	*88*
Gully LS 2	*2089*	*9965*	*17*
Gully LS 3	*4946*	*4161*	*54*

Figure 2. Pie charts of BIIGLE labels in project 2021-2022 (above) and 2022-2023 (below), displaying by colour the relative proportion of each assigned label.

The proportions of labels differed by file volume (individual site) in 2022-2023 (Fig. 3). Squat lobster followed by redfish dominated in LS 1, while LS 2 had a more even mix of labels, and LS 3 annotations were mostly for shrimp (Caridea, *Atlantopandalus propinqvus*).
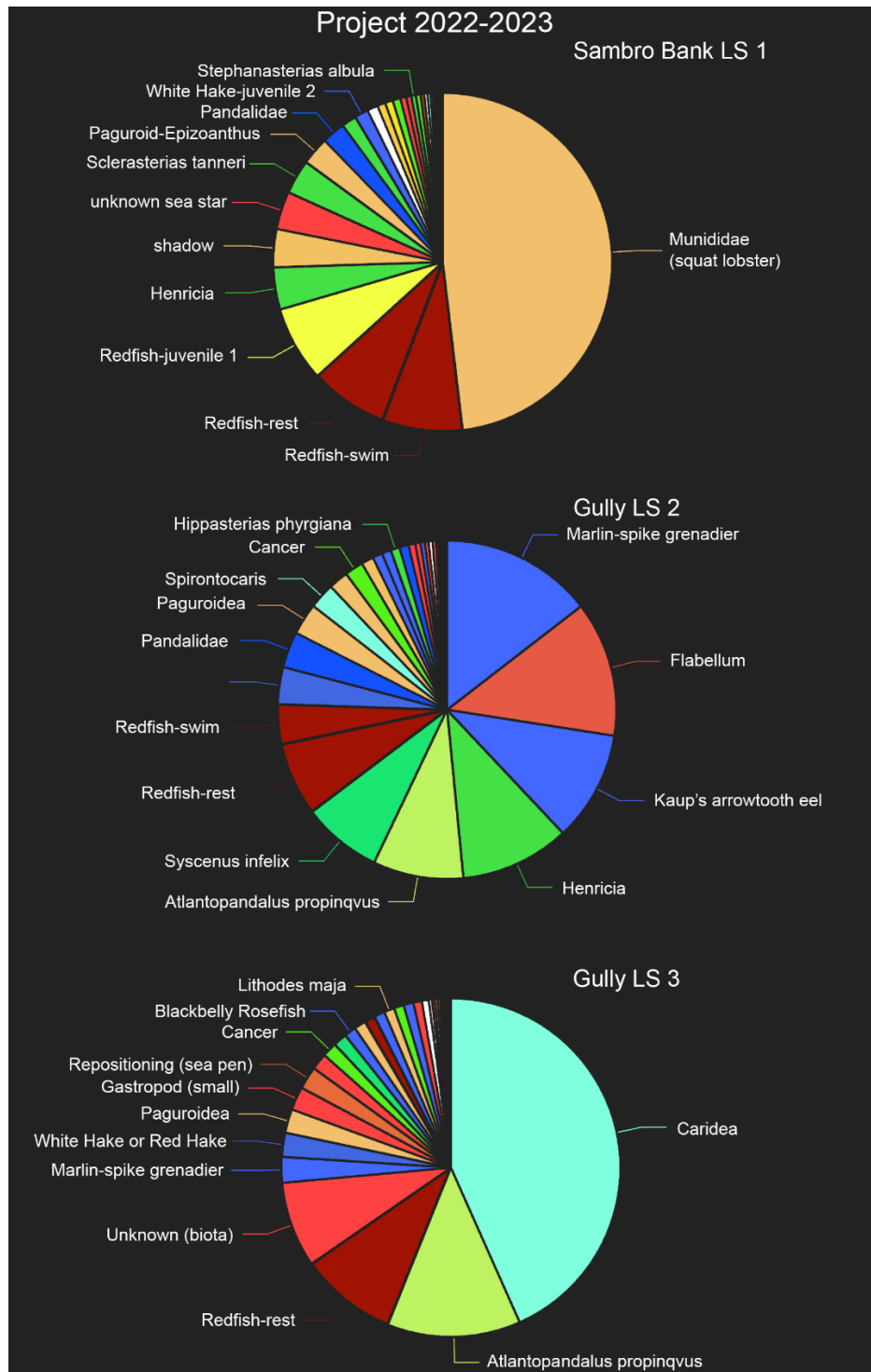

Figure 3. Pie charts of applied labels by lander in 2022-2023, presented for LS 1 (Site 1, top), LS 2 (SITE 2, MIDDLE), AND LS 3 (SITE 3, BOTTOM).

DISCUSSION

The intent of image labels or annotations is to act as placemarks, indicating which images have subjects of interest. In addition, the placemarks may indicate the position and size (area) of the subject in an image field of view. The resulting compilation of markings enables subsequent analyses, such as the presence, abundance, or size of labelled types of organisms viewed across the image files. The ability to conduct future analyses thus depends on the selection and application of labels in images. As a result, several kinds of labels, and categories, were developed while reviewing the images, to document the observed novelties or different organisms seen, that will be discussed below. An additional concern was the type of image data being annotated, i.e., of a fixed space photographed over several months. This is unlike the typical image survey where an area is traversed, and each photo is unique in position and occurrences. The use cases or categories of labels (see Appendices for examples) are discussed below.

Species presences

The label tree applied in the projects assisted in marking examples of taxa. Initially, the purpose was to ascribe a species name to each observed organism in an image, for subsequent analyses of abundance over the time periods across the images taken at each site. Labels of motile organisms (fishes and crustaceans) would be appropriate for analyses of presences if their appearance was 'novel' (new in a single image). However, some taxa were not always identified at the species level, usually because a visually similar kind might also be present in the area. These cases could be labelled in two ways, either to go as a presumptive species (numerically dominant or geographically likely) or to go with a more general level. This decision to do 'either/or' may not be problematic as they are usually treated as same functionally similar. Examples could be for redfish, hake, and crab that could be treated at the level of either genus or species, unless species-specific elements were of interest. The issue of taxonomic level was most evident in the differing levels of shrimp labels. Apart from a sergestoid shrimp, the observations were of caridean shrimp, and most likely of pandalids, based on geography and captures. However, these were often difficult to visually identify, with labels varying from the general (Caridea) to the species level (e.g., *Atlantopandalus propinqvus*). Ecologically, these could be considered together as a single group (suprabenthic shrimp of Caridea). The purpose of the different labels is to help future analyses of diversity, and in case new information can be obtained to corroborate the species. Future evidence could be from local captures or new imagery with higher resolution.

Size classes

The above discussion of species mentions large organisms as these appeared to be moving and not present in subsequent images, however most annotations were of repeated occurrences, especially for smaller taxa, or juvenile organisms. In terms of presences, these individuals were not novel but repeated across images. This could be especially difficult when an organism did not move for long periods or was hidden behind a rock, and were thus known to be present, but not visible or easily seen. A different set of labels was initially considered, to indicate motility or sedentary presences, distinct from the taxonomic names. Instead,

subgroupings were created for juveniles of some fishes and crabs when these were frequent occurrences, that may be of interest for analyses distinct from presences of the parent species label. In several cases, these will coincide with repeated presences, and will need to be reconsidered if another kind of split or label is needed.

Motility

Unlike motile organisms that were often noticed not to move and in need of consideration, there were also instances of sessile taxa, or organisms that occasionally moved, and thus given a special set of labels. Across the projects, there were two kinds of 'moving sessiles': detached *Vazella pourtalesii* sponges and re-positioning sea pens. Cup coral, *Flabellum* sp., is usually also considered sedentary, but was seen moving across the image frame; however, it has not yet been labelled as special.

Unknown

Apart from taxonomy, size, and motility, another challenge encountered in the projects were the poorly visible organisms, especially when small and in the background field of view. Their identification, as a species or a group, was sometimes possible to presume, based on the clearer examples of larger ones or in the foreground, usually of a fish, shrimp, or crab. Partial views (fin, antennae) of organisms could also be presumed based on other images of complete specimens. In other cases, not enough information seemed possible to provide even a confident grouping, and thus a series of 'unknown' labels was created. At the most general level of unknown (biota), the tagged subjects were too poor to recognize, and may even have been organic matter (falling marine snow). Other unknown groupings included small crustaceans (perhaps an amphipod, shrimp, or crab), fish (likely of small hakes), small anemones, small stars, jellies, and worms. As mentioned in the Materials and Methods, these 'unknowns' are to be considered temporary as further reviews might be possible to move these into a taxonomic group. Of note, there were a few occurrences labelled with a general group such as Polycladida, Calanoida, Euphausiidae, and Porifera, instead of being grouped under one of the 'unknown'. It is expected that these are likely of single or similar types but are unlikely to be confirmed.

Shadows

Some presences were noticed from the shadows by small organisms in the photo, for those like shrimp, jellies, and juvenile redfish. However, some shadows, usually of large fishes, were present in the image while the organism itself was outside the frame of view. Based on their characteristic silhouettes, most large shadows were likely of redfish or hakes. While these could have been tagged as species occurrences, their labels were only treated as a category (shadow) at this stage of the projects. Of note, the shadow label was only applied for a shadow when the source organism was not in view. In some cases, only a trace of the source organism was seen, but its shadow revealed the full silhouette and thus confirmed the identification and was labelled as such, but the shadow was not tagged so as not to create duplicates of presences.

Workload and future of annotation

Despite the interest and value of underwater imagery, there is the need to undertake the manual reviewing of images and applying annotations that requires large periods of time, and thus the hopes for more efficiency in the future. Automatic novelty detection with computer software is promising (e.g., Smith et al. 2022), though for this project, it may not yet be useful enough to notice the different kinds of organisms and interactions in an image that a human reviewer can label. From the summary charts of applied labels (Fig. 3), the labelling work can also vary enormously between image sets. For example, nearly all the images from site 1 in 2022-2023 had novel content to be tagged, often of several kinds, while conversely there were relatively few images with organisms noticed in site 2. In terms of human work, site 1 took weeks to process, while site 2 only took a few days, or even only hours, to review, even though they both had about the same total number of images (12,000).

Additional labels may be applied in the future to derive more utility from the image time-series. Thus, while most (usually large) organisms appeared only once in an image, there are many other instances, especially of shrimp and squat lobsters, where the same individual was observed in an image for dozens if not hundreds of sequential images. Distinguishing these 'sedentary' occurrences would help with differing kinds of analyses of behaviour over time. An additional series of labels could be formulated for image quality (overall visibility) or identification quality. In some periods, the images had reduced visibility, making it less likely to label organisms, especially smaller ones. Even when an image was relatively good, organisms could be poorly visible in the background and thus also undercounted, or presently assigned to a grouping under 'unknown'. For some analyses, decisions may be made to exclude these 'poor-quality' records as being uncertain or incomplete, as they could have impacts for measurements of absence/presence.

CONCLUSIONS

Documenting the labels applied in an image set helped to explain the choices and decisions using to tag novel observations, of species presences and behaviour. While initially the intent was to give examples of species, the review across all the images revealed the potential use for categories other than taxonomy that may be applied for future analyses. The present document, including the examples in the appendices, represents the annotations in 2024 as they continue to be consulted and refined, before producing other publications as identification guides and statistical analyses.

ACKNOWLEDGEMENTS

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APPENDICES

Example screenshots of types of fishes and invertebrates in label annotations, with notes on identification or category (e.g., size class, quality), and listed with photo filename (see Materials and Methods for filename syntax). Image examples are presented as crops of original images, to highlight the subject. When available, images were shown with a high and a low-quality example on each taxon page. For further information on each name, a link to iNaturalist is provided, a website that hosts example observations and actively maintains the taxonomy of listed kinds.

Appendix 1 – Fishes

Fishes covers the labels used here for aquatic vertebrates of groups Agnatha (hagfish 1 species), Elasmobranchii (skate, 1 species), and Actinopterygii (bony fishes, 24 species or other levels). Subgroupings were also applied for *Sebastes* redfish and *Urophycis* hakes (juvenile 1 and 2), and for swimming or resting in *Sebastes* redfish.

American Plaice (*Hippoglossoides platessoides*)
https://www.inaturalist.org/taxa/221382-Hippoglossoides-platessoides
Identification: Small (juvenile) flatfish, presumed to be of American Plaice, *Hippoglossoides platessoides*, the common species in capture, although the individuals in images were not clear enough to be certain (see arrows). Other possible species include Yellowtail Flounder, *Limanda ferruginea* (small mouth), Witch Flounder, *Glyptocephalus cynoglossus* (small mouth, dark pectoral fin), Winter Flounder, *Pseudopleuronectes americanus* (small mouth, inshore species).

L1_2023_01_01 19_29_55_TL101714

L2_2022_05_08 00_01_33_TL202830

Atlantic Cod (*Gadus morhua*)
https://www.inaturalist.org/taxa/63740-Gadus-morhua
Identification: The dark spots, pale lateral line, and overhanging upper jaw are distinctive.
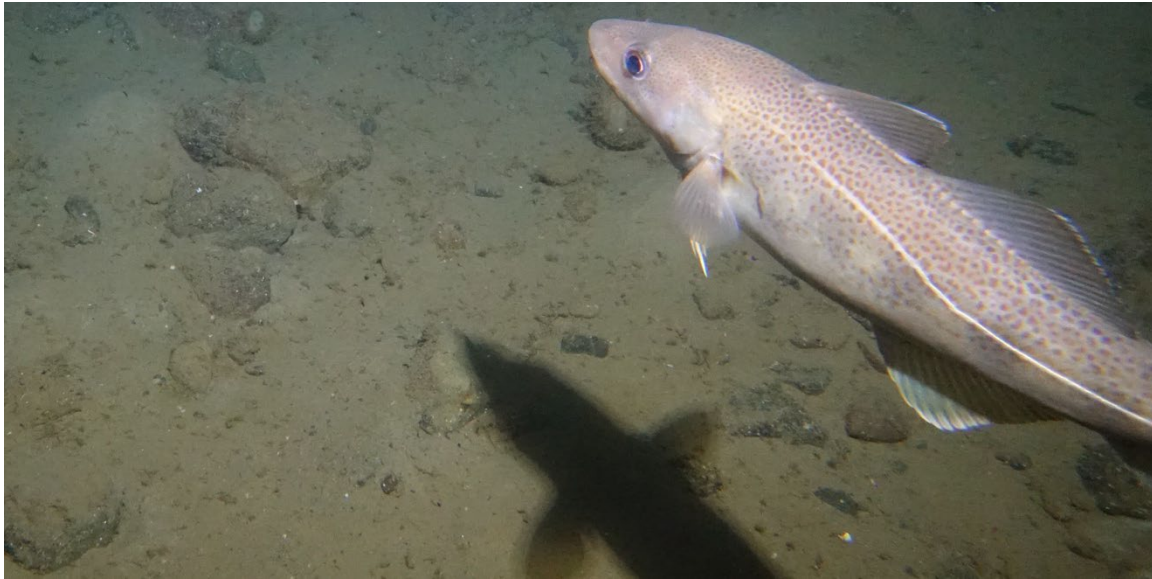
L1_2022_12_01 19_59_54_TL100228

L1_2023_06_03 10_29_58_TL100040

Atlantic Halibut (*Hippoglossus hippoglossus*)
https://www.inaturalist.org/taxa/82349-Hippoglossus-hippoglossus
Identification: A very large flatfish with a large jaw and varied coloration. Juveniles are very rarely observed except nearshore (were not seen in this project).

L2_2023_01_24 22_31_04_TL202554

L2_2023_06_20 05_02_46_TL200171

Atlantic Wolffish (*Anarhichas lupus*)
https://www.inaturalist.org/taxa/213519-Anarhichas-lupus
Identification: A large, dark gray, eel-like fish with a large head and jaw. May be mistaken with zoarcids (overhanging upper jaw).

L2_2021_09_25 14_00_15_TL201066

Blackbelly Rosefish (*Helicolenus dactylopterus*)
https://www.inaturalist.org/taxa/118629-Helicolenus-dactylopterus
Identification: A smaller member of the redfish family, not as abundant or as frequent as
Sebastes sp. Mottled (rather than barring) white and red flanks, golden eyes, and dark cheeks
(blackbelly), distinguishes them from redfish.

L2_2022_10_09 13_30_02_TL206407

L3_2022_11_01 14_59_33_TL307129

Buckler Dory (*Zenopsis conchifer*)
https://www.inaturalist.org/taxa/622017-Zenopsis-conchifer
Identification: A very flat, silvery fish, usually associated with warmer waters, but occasionally captured on the Scotian Shelf, as juveniles inshore and adults offshore.
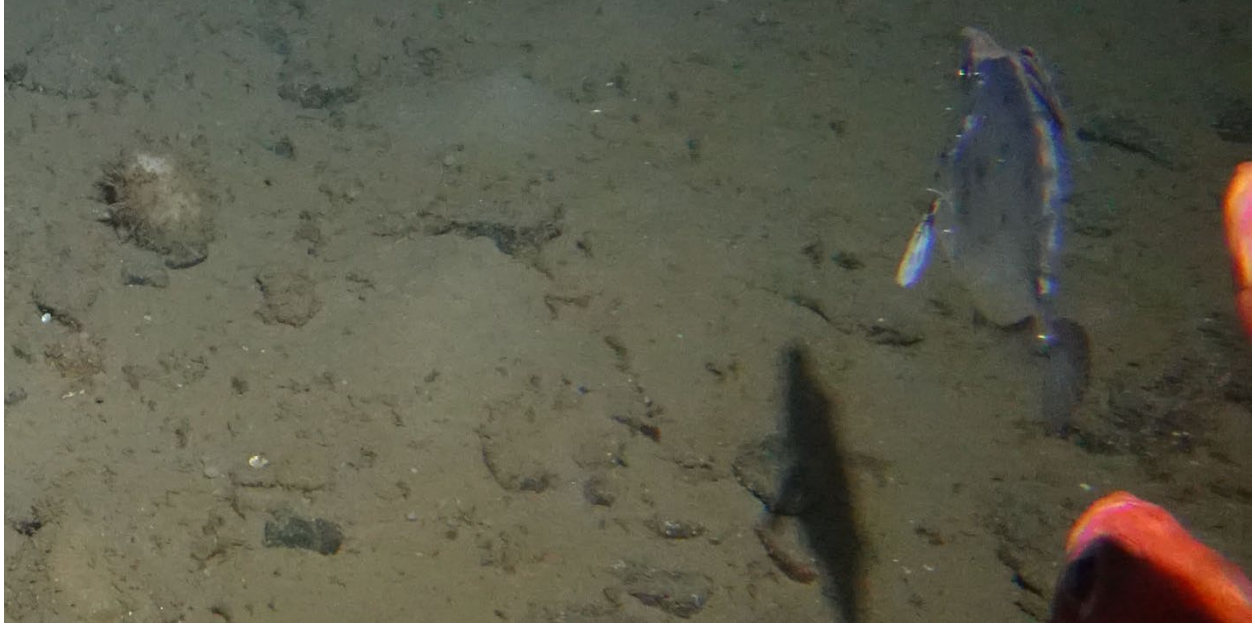
L1_2023_01_02 19_29_55_TL101762

L1_2023_05_10 16_29_56_TL107900

Cusk (*Brosme brosme*)
https://www.inaturalist.org/taxa/215458-Brosme-brosme
Identification: a large and pale, eel-like codfish. The chin barbel distinguishes it from zoarcid eelpouts and wolffishes.
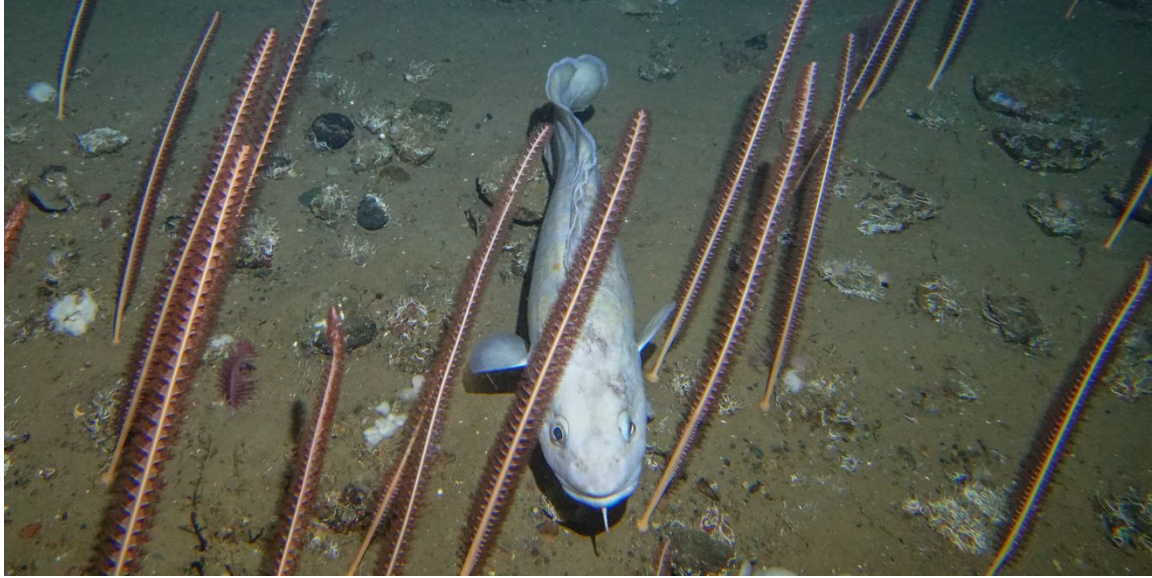
L3_2023_01_05 20_29_34_TL301258

L3_2022_02_11 09_29_09_TL308726

Fourbeard Rockling (*Enchelyopus cimbrius*)
https://www.inaturalist.org/taxa/219127-Enchelyopus-cimbrius
Identification: A small, greyish-beige codfish with a dark spot at posterior end of dorsal fin. Often burrows into the sediment. May be confused with small hakes and codling, but rocklings lack the elongated pelvic fin rays and high first dorsal fin.

L2_2022_04_10 13_01_23_TL201514.

L3_2022_04_28 13_28_45_TL303381

Girard's Hagfish (*Myxine limosa*)
https://www.inaturalist.org/taxa/317235-Myxine-limosa
Identification: This pinkish, eyeless, jawless fish might be mistaken for some eels when images are not clear. Sometimes observed emerging from the sediment. Historically, were long misidentified as *Myxine glutinosa*, a genetically distinct Northeast Atlantic (European) species.
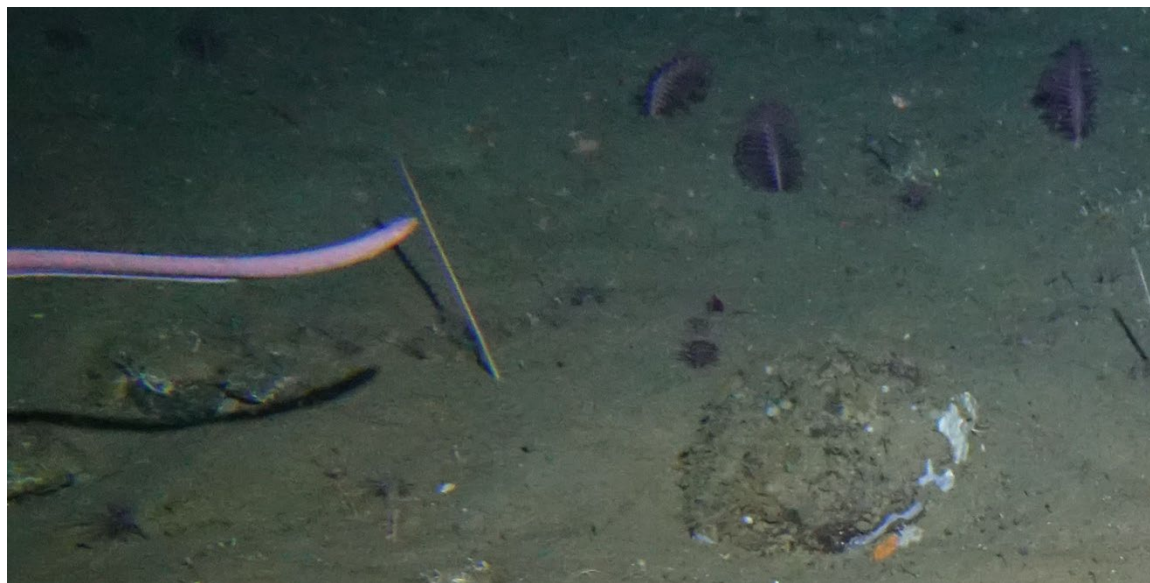
L2_2023_05_03 07_32_11_TL207275

L3_2023_03_18 22_59_40_TL304719

Greater Argentine (*Argentina silus*)
https://www.inaturalist.org/taxa/318007-Argentina-silus
Identification: a pelagic fish with very large eyes and scales, and a very small mouth. May be confused with Silver Hake (*Merluccius bilinearis*).

L3_2022_01_30 18_29_14_TL308169

Haddock (*Melanogrammus aeglefinus*)
https://www.inaturalist.org/taxa/82351-Melanogrammus-aeglefinus
Identification: A grey codfish, with a dark lateral line, a dark spot on the flanks, and an overhanging upper jaw. May be confused with pollock or cod if colouring or jaw is not visible.

L2_2022_10_12 11_30_04_TL206547

L1_2022_11_15 20_59_54_TL108463

Kaup's Arrowtooth Eel (S*ynaphobranchus kaupii*)
https://www.inaturalist.org/taxa/113564-Synaphobranchus-kaupii
Identification: While not easy to see features in images, the species was presumed because it was a common demersal fish and may only be confused with hagfish that is also eel-like in form.

L2_2022_11_01 13_00_15_TL207508

L2_2022_10_10 23_30_03_TL206475

Longhorn Sculpin (M*yoxocephalus octodecemspinosus*)
https://www.inaturalist.org/taxa/47637-Myoxocephalus-octodecemspinosus
Identification: A large sculpin, distinctive with very long cheek (preopercular) spines, that occurs frequently in the region. In most instances, the images were not clear enough to confirm the spines, and its presence was presumed from survey captures, as compared to the shorter spined species of *Myoxocephalus scorpius*.

L1_2023_05_12 15_29_56_TL107994

L1_2023_05_15 13_29_56_TL108134

Marlin-spike Grenadier (*Nezumia bairdii*)
https://www.inaturalist.org/taxa/225943-Nezumia-bairdii
Identification: A common species of macrourid codfish, presumed because of their pointed snout and small size. Very small individuals were also seen, but not annotated separately. Most, but not all, individuals were parasitized by a large isopod, *Syscenus infelix*, which attaches itself behind the host's dorsal fin.

L2_2023_04_08 02_01_53_TL206064

L3_2022_10_11 12_59_33_TL306117

Monkfish (*Lophius americanus*)

https://www.inaturalist.org/taxa/194675-Lophius-americanus
Identification: The large, flattened head of the species is distinctive.

L1_2022_12_22 07_29_55_TL101210

L3_2022_12_28 10_29_35_TL300854

Ocean Pout (*Zoarces americanus*)
https://www.inaturalist.org/taxa/233996-Zoarces-americanus
Identification: Ocean pout may be confused with other pouts (Zoarcidae), though these are distinctive in head shape, colouring and dorsal tail fin. Only juveniles were observed.
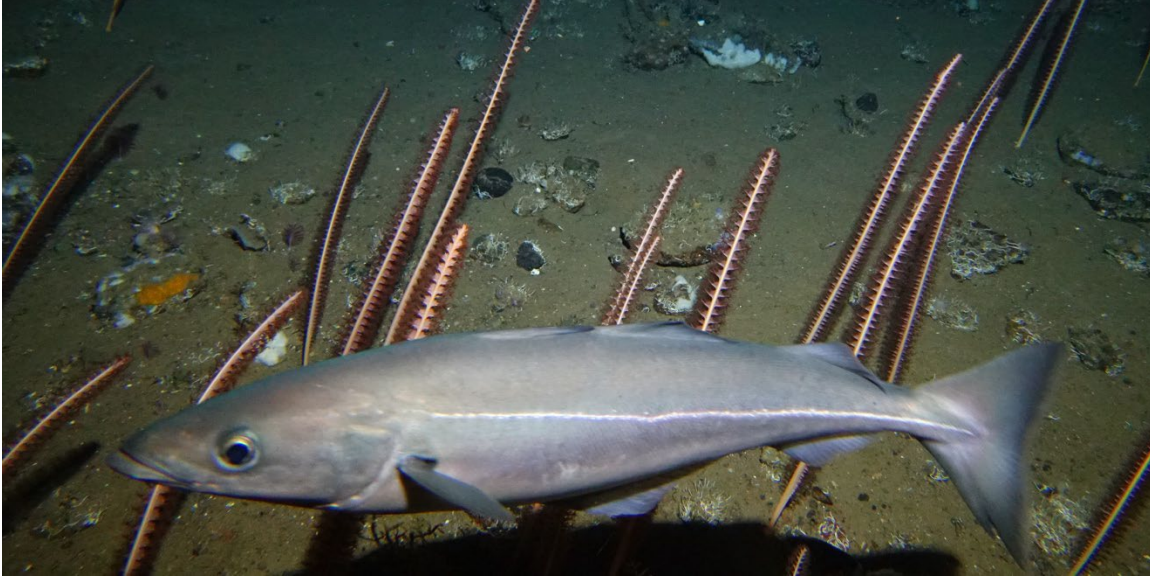

L1_2023_05_30 15_29_56_TL108858

L1_2022_11_15 17_29_55_TL108456

Pollock (*Pollachius virens*)
https://www.inaturalist.org/taxa/228496-Pollachius-virens
Identification: The body with silvery flanks, pale lateral line, forked tail, and protruding lower jaw are distinctive for this species of codfish.

L3_2022_10_22 15_29_33_TL306650

L1_2023_01_22 11_29_55_TL102706

Redfish (*Sebastes* sp.)
https://www.inaturalist.org/taxa/112417-Sebastes-fasciatus (example of Acadian Redfish)
Identification: Acadian Redfish (*S. fasciatus*) and Deepwater Redfish (*S. mentella*) cannot be reliably distinguished solely by photos, however, there is some environmental separation by species. In the Sambro Bank area, only *S. fasciatus* is presumed to occur, with *S. mentella* in the deeper Laurentian Channel to the east, and thus may occur at the Gully sites in 2022-2023. These were subdivided into groupings for swimming or hovering and resting individuals.

L2_2023_02_26 20_01_25_TL204133 (swimming)

L3_2023_03_28 12_59_41_TL305179 (resting – see white arrows pointing to fish in background)

Size: Different classes were noticed in 2022-2023 for Sambro Bank site 1, including very small individuals (perhaps 4-10 cm in length) that may be of young-of-year and 1+ year. Other sites had mostly larger juvenile (3+) or adult individuals that were all labelled as the same class. These age classes were estimated by relative size and colour, with very small ones being darkish grey (Juvenile-1) and small ones being red (Juvenile-2) but with immature faces and fins.

Redfish (Juvenile-1): estimated to between 0+ and 1+ yr

L1_2023_06_10 12_29_57_TL100379

Redfish (Juvenile-2): estimated to be 2+ yr

L1_2023_05_31 11_59_58_TL108899

Shortbeard Codling (*Laemonema barbatulum*)
https://www.inaturalist.org/taxa/317178-Laemonema-barbatulum
Identification: Large eye, dark edges of fins. May be confused with *Urophycis* sp. hakes that have more elongated pelvic fin rays and *Lepidion* sp. codlings that have an indented anal fin.

L3_2023_03_19 20_29_40_TL304762

L3_2022_10_15 11_59_33_TL306307

Silver Hake (*Merluccius bilinearis*)
https://www.inaturalist.org/taxa/224886-Merluccius-bilinearis
Identification: A silvery fish with a slim profile and large jaw. All observations were of juveniles either resting or hovering near the seabed, appearing mottled when in the foreground and silvery when in the far background.

L1_2021_09_28 19_00_17_TL102849

L2_2022_03_27 21_01_19_TL200858.JPG

Silver roughy (*Hoplostethus mediterraneus*)

https://inaturalist.ca/taxa/120620-Hoplostethus-mediterraneus

Identification: A small, round silvery fish. While the images were of poor quality, the species is presumed from specimens (e.g., https://inaturalist.ca/observations/136342059). Further captures may be necessary for confirmation as the larger, deeper water species *H. atlanticus* was the only kind named in other surveys along the break of the Scotian Shelf (https://obis.org/taxon/125706).

L3_2023_01_16 11_29_35_TL301768

L3_2023_03_12 14_59_40_TL304415

Snailfish (Liparidae)

Identification: A small, gelatinous fish, perhaps the Sea Tadpole *Careproctus reinhardti* (https://inaturalist.ca/taxa/216119-Careproctus-reinhardti), a pinkish fish, or the Gelatinous Snailfish, *Liparis fabricii* (https://inaturalist.ca/taxa/223893-Liparis-fabricii), a deepwater, arctic species with dusky skin. To be confirmed from survey captures.

L3_2022_10_22 00_29_33_TL306620

L3_2022_10_26 21_29_33_TL306854

Snakeblenny (*Lumpenus lampretaeformis*)
https://inaturalist.ca/taxa/224163-Lumpenus-lampretaeformis
Identification: a very elongated, yellowish-brown fish. Related species are not as elongated but may be confused with small silver hake or flatfish in poor-quality images.

L2_2021_11_12 12_30_31_TL203367

L2_2021_12_25 14_30_45_TL205432

Thorny skate (*Amblyraja radiata*)
https://inaturalist.ca/taxa/48402-Amblyraja-radiata
Identification: A single, middle row of thorns is indicative of this skate, as compared to Winter Skate (*Leucoraja ocellata*), Small Skate (*Leucoraja erinacea*) and Round Skate (*Rajella fyllae*) that might also be expected in the region.

L2_2023_03_13 12_31_35_TL204838

L2_2023_03_12 17_31_34_TL204800

White or Red Hake (*Urophycis* spp.)
https://inaturalist.ca/taxa/83849-Urophycis
Identification: The phycid codfishes are difficult to distinguish externally, though White Hake (*Urophycis tenuis*, https://inaturalist.ca/taxa/233277-Urophycis-tenuis), may attain larger sizes and are found at greater depths offshore than Red Hake (*Urophycis chuss*, https://inaturalist.ca/taxa/83846-Urophycis-chuss). May be confused with Codling (*Lepidion lepidion)* or Rockling (*Enchelyopus cimbrius*), but these species lack the elongated pelvic fin rays.

L2_2023_02_28 01_31_27_ TL204192
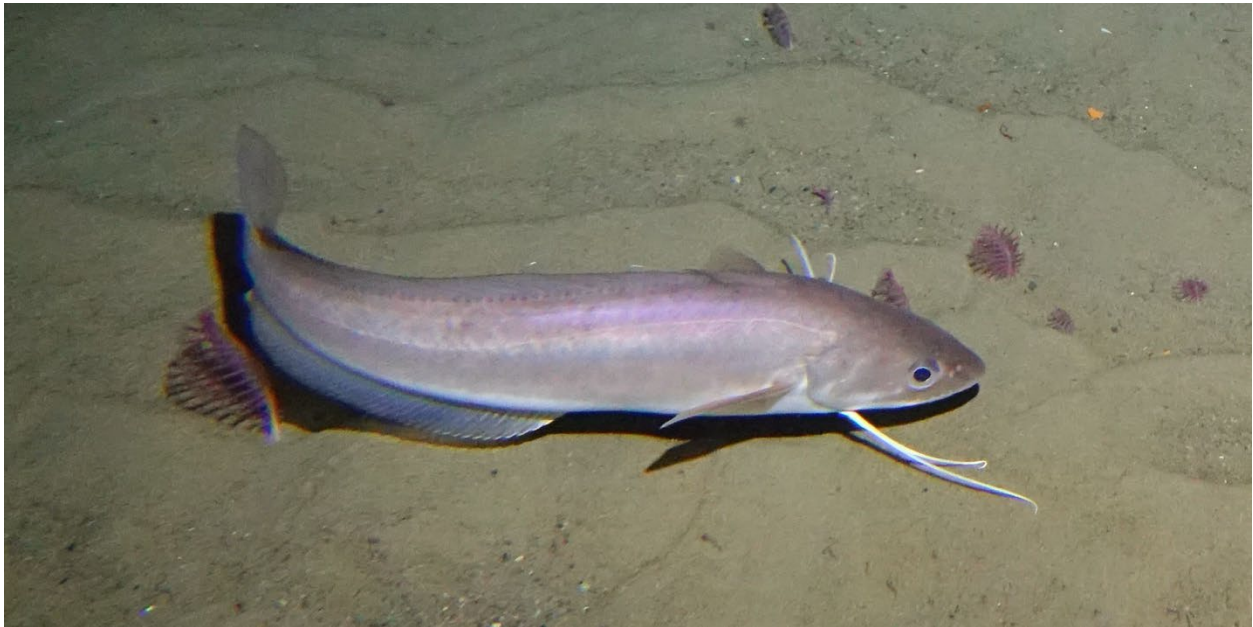
L2_2023_02_20 16_31_21_ TL203838

Size: as with Silver Hake and Redfish, juveniles were seen in 2022-2023 at Sambro Bank site 1
Very small ones (juvenile 1) were usually seen stationary in holes or near rocks, while others
(juvenile-2) appeared to swim nearby.

White Hake-juvenile 1

L1_2023_01_01 16_59_55_TL101709

White Hake-juvenile 2

L1_2022_12_29 17_29_55_TL101566

Witch Flounder (*Glyptocephalus cynoglossus*)
https://inaturalist.ca/taxa/220480-Glyptocephalus-cynoglossus
Identification: the dark pectoral fin is distinctive for this flatfish.

L1_2021_09_13 21_00_12_TL102133

Appendix 2 – Invertebrates

While all fishes were a single group in the label tree, invertebrates were organized in several groups by taxonomic classification and labelled by taxonomic names, with common names (when available) shown for convenience here. The examples are presented by common grouping and name. Because many specimens were small, some examples are presented from many images of the annotated group in BIIGLE instead of 1 or 2 images. A few kinds were presumed in identifications, especially when poorly visible, to be revised in the future.

Annelida – Platyhelminthes – **Polycladida**
https://www.inaturalist.org/taxa/52318-Polycladida
Identification: a broad, oval shape of a free-living flatworm. Likely *Plehnia ellipsoides*, that is encountered swimming in deepwater, rather than the nearshore *Notoplana atomata* (Hyman 1940, https://repository.si.edu/bitstream/handle/10088/16366/1/USNMP-89_3101_1941.pdf).

L3_2022_11_28 19_29_34_TL308433

Arthropoda – Crustacea – Copepoda – **Calanoida**
https://www.inaturalist.org/taxa/85507-Calanoida
Identification: presumed type of zooplankton from the small ovals with tail and antennae.

Arthropoda – Crustacea – Decapoda – Anomura – **Munididae (Squat Lobster)**
https://www.inaturalist.org/taxa/1427730-Iridonida-iris (example of a munid)
Identification: a squat lobster with long clawed arms. The species *Iridonida iris* is presumed for the area but will need to be confirmed as others like *Garymunida longipes* are also present.

L2_2021_09_15 21_30_12_TL200601

Arthropoda – Crustacea – Decapoda – Anomura – **Munid-small**
Identification: may be sedentary or hidden and are only noticed from their pincers and shadows.

L1_2022_10_20 09_59_53_TL107194

Arthropoda – Crustacea – Decapoda – Anomura – *Lithodes maja* **(Norway King Crab)**
https://www.inaturalist.org/taxa/447323-Lithodes-maja
Identification: a reddish-orange, spiny crab that can attain large sizes.

L2_2023_04_07 01_01_52_TL206014

L3_2023_04_06 22_29_43_TL305630

Arthropoda – Crustacea – Decapoda – Anomura – ***Lithodes maja*-small**
Identification: a small, reddish-orange, spiny crab, not as pale or oval-shaped as *Cancer* sp.

Arthropoda – Crustacea – Decapoda – Anomura – **Paguroidea (Hermit Crab)**
https://inaturalist.ca/taxa/47398-Paguroidea
Identification: a crab carrying a gastropod shell. Perhaps of *Pagurus*, but others like *Oncopagurus* also occur. Another special label was made for small ones carrying zoanthids.

L2_2023_04_26 20_32_06_TL206965.jpg
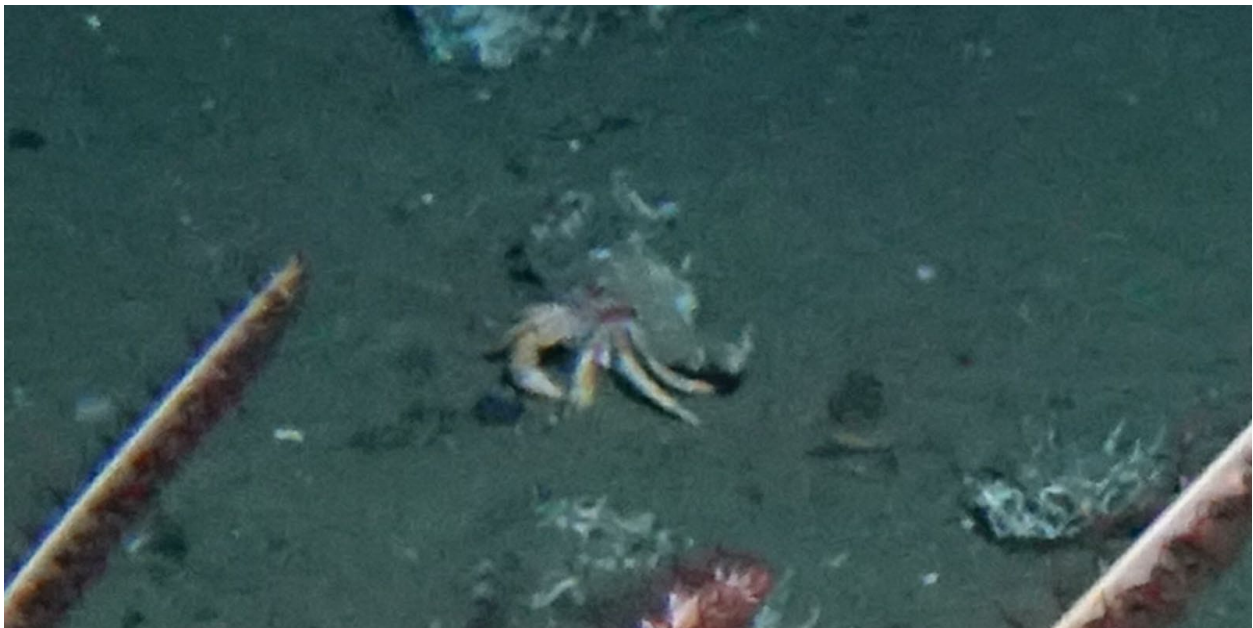
L3_2022_11_01 02_59_33_TL307105

Arthropoda – Crustacea – Decapoda – Anomura – **Paguroidea-*Epizoanthus***
https://inaturalist.ca/taxa/869537-Epizoanthus-papillosus
Identification: a special category of paguroid hermit crab (cf. *Oncopagurus*), carrying polyps of a cnidarian zoanthid (*Epizoanthus papillosus*). These were most often seen on a *Vazella pourtalesii* sponge in a corner of the view frame and thus of poor image quality. Because the zoanthids were only seen on the hermit crabs, these were labelled in the hierarchy here with their crustacean host.

Arthropoda – Crustacea – Decapoda – Astacidea – *Homarus americanus* **(American Lobster)**
https://www.inaturalist.org/taxa/61383-Homarus-americanus
Identification: a distinctive, very large decapod, though sometimes only seen in partial view.

L1_2022_10_18 04_59_53_TL107088

Presence presumed from a very large antenna seen in bottom-left corner of an image.

L1_2022_10_18 04_29_53_TL107087

Arthropoda – Crustacea – Decapoda – Brachyura – *Cancer* sp. (*C. borealis, C. irroratus*)
https://www.inaturalist.org/taxa/47827-Cancer
Identification: fine serrations on the carapace were visible in a few specimens, indicating Jonah Crab (*Cancer borealis*), but Rock Crab (*Cancer irroratus*) has been also found in a few captures from the area, and therefore these were grouped to genus.

L1_2023_04_25 15_29_56_TL107178

L3_2023_03_08 03_29_40_TL304200

Arthropoda – Crustacea – Decapoda – Brachyura – *Cancer*-juvenile 1
Identification: a small, whitish, oval-bodied crab, often sedentary or in hiding.

Arthropoda – Crustacea – Decapoda – Brachyura – ***Homola minima***
https://inaturalist.ca/taxa/1074525-Homola-minima
Identification: a small, squarish crab, always seen carrying a white mass (labelled as Porifera) on its rear legs, a characteristic behaviour of this family.

L1_2023_05_24 05_29_56_TL108550

L3_2022_11_17 23_59_33_TL307915

Arthropoda – Crustacea – Decapoda – **Caridea**
https://www.inaturalist.org/taxa/342912-Caridea
Identification: small, poorly visible shrimp, often sedentary or with small movements across several images, and may be revealed by the bright reflection of a pair of eyes. Presumed to be pandalid shrimp (*Atlantopandalus, Dichelopandalus, Pandalus*), though may include crangonid (*Sabinea, Pontophilus*) or thorid (*Eualus, Lebbeus, Spirontocaris*) kinds that occur in captures.

Arthropoda – Crustacea – Decapoda – Caridea – **Pandalidae**
https://www.inaturalist.org/taxa/47710-Pandalidae
Identification: poorly visible shrimp, likely of *Pandalus* (*borealis* or *montagui*), but possibly of *Dichelopandalus leptocerus* or *Atlantopandalus propinqvus*. Often sedentary across several images. To be reviewed with genus *Pandalus* and revised for later analyses.

Arthropoda – Crustacea – Decapoda – Caridea – Pandalidae – ***Pandalus* sp.**
https://www.inaturalist.org/taxa/47709-Pandalus
Identification: poorly visible shrimp, possibly of *Pandalus borealis* or *Pandalus montagui*, but *Dichelopandalus leptocerus* may be possible. To be reviewed with family Pandalidae and revised for later analyses.

Arthropoda – Crustacea – Decapoda – Caridea – Pandalidae – ***Atlantopandalus propinqvus***
https://www.inaturalist.org/taxa/459518-Atlantopandalus-propinqvus
Identification: large, reddish-barred shrimp with a long, upturned rostrum, often observed as sedentary or partially hiding in several images.

Arthropoda – Crustacea – Decapoda – Caridea – Thoridae – ***Spirontocaris* sp.**
https://www.inaturalist.org/taxa/424250-Spirontocaris
Identification a small shrimp without the long rostrum of pandalids, usually seen hiding next to an anemone, which is typical behavior for the genus, but will need confirmation if not another kind.

Arthropoda – Crustacea – Decapoda – Dendrobrachiata – Sergestidae – **_Eusergestes arcticus_**
https://www.inaturalist.org/taxa/459579-Eusergestes-arcticus
Identification: a deepwater pelagic shrimp, distinctive with a red carapace and whitish tail.

L2_2023_03_15 07_31_36_TL204924.JPG

Arthropoda – Crustacea – Euphausiacea – **Euphausiidae**
https://www.inaturalist.org/taxa/195134-Euphausiidae
Identification: a relatively large krill, very likely to be of *Meganyctiphanes norvegica*, similar to sergestid shrimp, but the carapace has a smaller red area, interspersed with yellow, and larger black eyes. May need confirmation and revision to either species or to unknown crustacean.

Arthropoda – Crustacea – Isopoda – Aegidae – ***Aega psora***
https://www.inaturalist.org/taxa/796470-Aega-psora
Identification: a large, facultative ectoparasite of fishes (usually cods and halibut), sometimes seen on the sea floor. The identification is presumed based on the regional common species and rounded shape, though others (e.g., https://inaturalist.ca/observations/90600045) might be possible. To be reviewed.

L2_2023_03_16 22_01_37_TL205001.JPG

Arthropoda – Crustacea – Isopoda – Aegidae – ***Syscenus infelix***
https://www.inaturalist.org/taxa/692137-Syscenus-infelix
Identification: a blind, long-tailed, pinkish aegid ectoparasite that is specific to *Nezumia bairdii*. Was only ever observed attached behind the dorsal fin of this small macrourid fish. The only other similar species is *Syscenus atlanticus*, which occurs in deeper waters.

Chaetognatha
https://www.inaturalist.org/taxa/151827-Chaetognatha
Identification: a gelatinous zooplankton with an elongated body, perhaps of family Sagittidae.

Cnidaria –Anthozoa – Ceriantharia – *Pachycerianthus borealis*
https://inaturalist.ca/taxa/460113-Pachycerianthus-borealis
Identification: a burrowing sea anemone with many tentacles in two cycles, an inner and outer ring. While sedentary, several images were labelled as an indicator of activity, to be reviewed for future analyses.

Cnidaria – Anthozoa – Scleractinia – ***Flabellum***
https://inaturalist.ca/taxa/459957-Flabellum-alabastrum (example of *Flabellum alabastrum*)
Identification: a hard coral, but unattached to substrate. A few individuals were observed moving across the field of view over a long sequence of images. The presumed common species is *Flabellum (Ulocyanthus) alabastrum*, but others (e.g., *Flabellum (Ulocyanthus) macandrewi*) also occur, and images may not have been clear enough for confirmation.
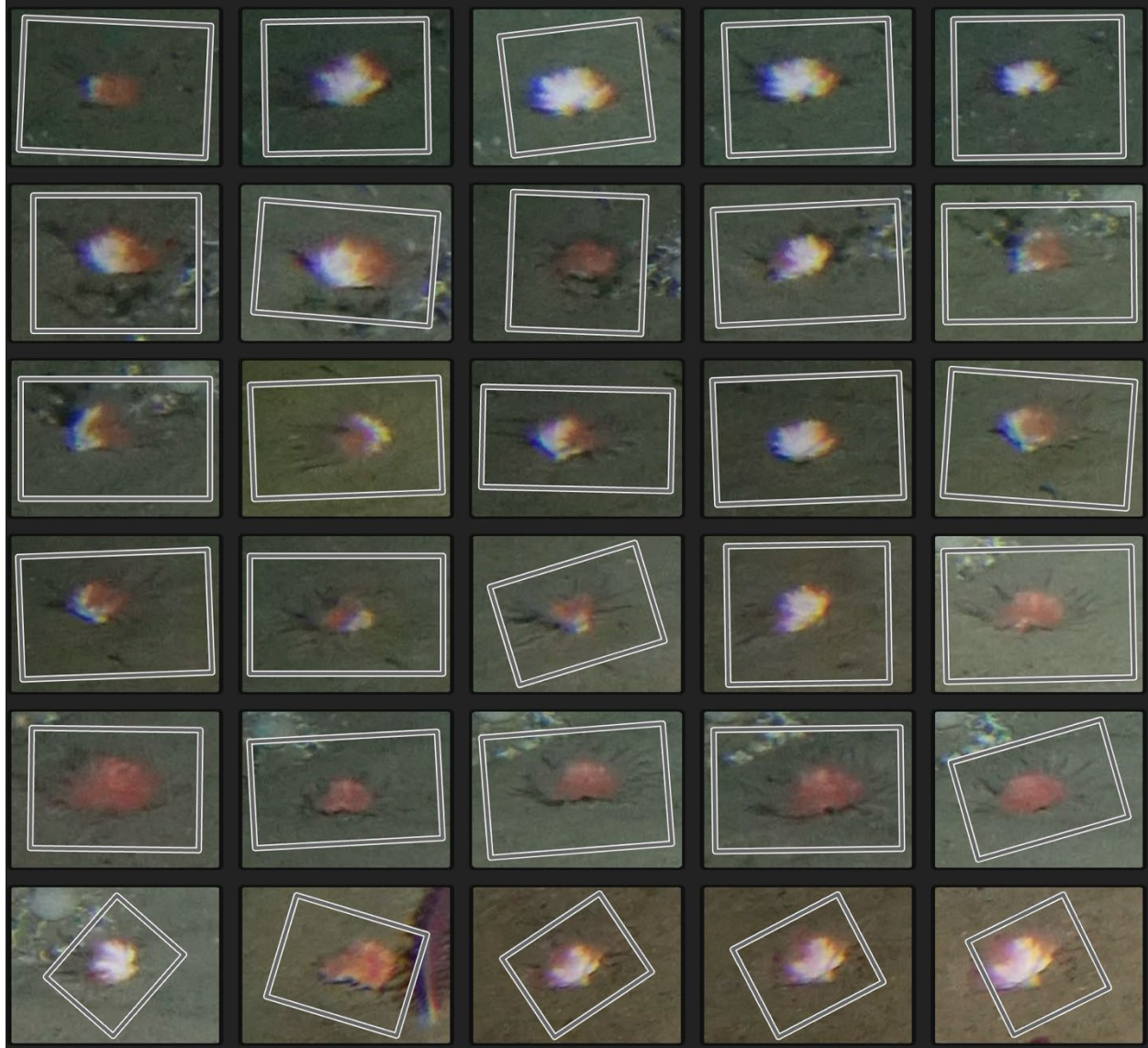
Cnidaria – Anthozoa – Scleralcyonacea – Pennatuloidea – ***Balticina finmarchica***
https://inaturalist.ca/taxa/1283182-Balticina-finmarchica
Identification: a reddish, very tall and slender sea pen. As sedentary fauna, with a fixed number seen in each image, this species label was currently only used as a placeholder for 1 image but may be useful for future analyses that will examine the orientation of the colonies in the water currents over time. A moving colony was tagged with a separate label: re-positioning (sea pen).

L3_2022_10_05 23_29_33_TL305850

Cnidaria – Anthozoa – Scleralcyonacea – Pennatuloidea – ***Pennatula aculeata***
https://inaturalist.ca/taxa/460108-Pennatula-aculeata
Identification: a small, mauve-coloured sea pen. As sedentary fauna, this species label was currently only used as a placeholder to count colonies in 5 images but may be useful for future analyses that will examine the number and orientation of the colonies in the water currents over time. A moving colony was tagged with a separate label: re-positioning (sea pen).

An example of tagged (orange polygons) *Pennatula aculeata* sea pen colonies.
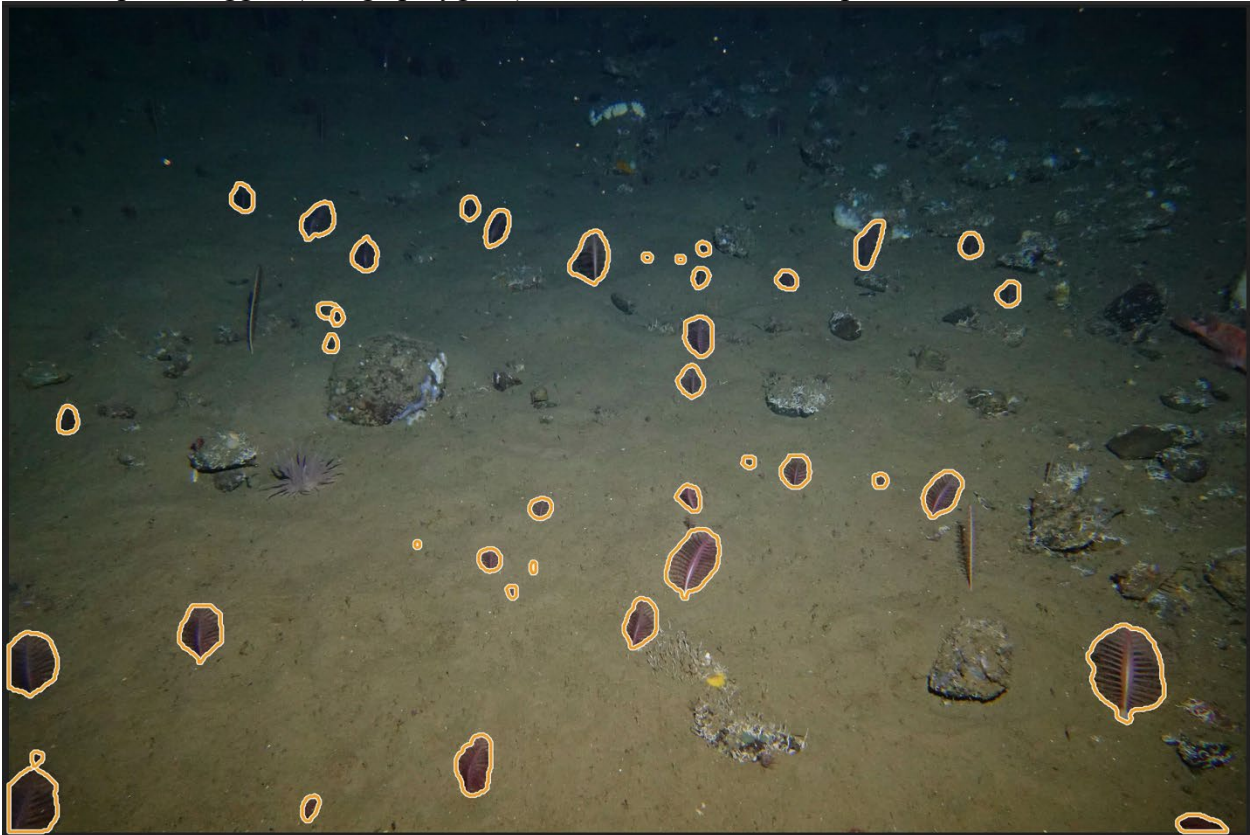
L2_2022_10_05 19_00_00_TL206227

Cnidaria – Hydrozoa – ***Solmissus incisa***
https://inaturalist.ca/taxa/293279-Solmissus-incisa
Identification: the 'dinner-plate' jelly appears as a disk, often with tentacles facing upwards.

L3_2023_03_05 20_29_39_TL304090.JPG

Cnidaria – Hydrozoa – ***Tiaropsis multicirrata***
https://inaturalist.ca/taxa/549997-Tiaropsis-multicirrata
Identification: a small hydrozoan jelly with a cross-shaped middle, sometimes abundant in the region, e.g., https://inaturalist.ca/observations/169697174. May be confused with the larger medusae of *Staurostoma mertensii* and *Ptychogena lactea*.

L3_2022_03_05 08_29_02_TL300779.JPG

Ctenophora
https://inaturalist.ca/taxa/51508-Ctenophora
Identification: an oval, gelatinous zooplankter with several longitudinal rows. Species may include *Beroe cucumis, Dryodora glandiformis*, *Mnemiopsis leidyi* and *Bolinopsis infundibulum*. A smaller, spherical species, *Pleurobrachia pileus*, did not seem to be in evidence. May be confused with hydromedusae, bracts of siphonophores, or mucus nets of Larvacea (e.g., *Oikopleura*).

L2_2023_03_17 15_31_38_TL205036

L2_2022_11_06 09_30_18_TL207739

Echinodermata – Asteroidea – *Coronaster briareus*
Identification: a large, multi-armed sea star, distinctive from all other regional species, and also new in this northern distribution. A specimen was seen on the lander during the recovery in 2023, and another one was captured by Andrew Darcy (DFO-Gulf Region) on a nearby survey in 2023 (https://www.inaturalist.org/observations/177687291)

L1_2023_06_04 15_59_57_TL100099

L1_2023_06_04 13_59_57_TL100095

Echinodermata – Asteroidea **– *Henricia* sp.**
Identification: a five-armed sea star, uniform white or yellow in coloration. Several species are possible, requiring microscopy or genetics to distinguish between them. May be confused with *Sclerasterias tanneri* when image quality is poor, such as in the background of the image frame.

L1_2023_01_21 15_29_55_TL102666

L3_2022_04_15 06_28_49_TL302743

Echinodermata – Asteroidea **– *Hippasteria phrygiana***
https://www.inaturalist.org/taxa/464048-Hippasteria-phrygiana
Identification: a large, five-armed, orange-red sea star with blunt spines.

L3_2022_11_19 06_59_33_TL307977

L2_2023_04_18 02_32_00_TL206545

Echinodermata – Asteroidea **– *Poraniomorpha hispida***
https://www.inaturalist.org/taxa/797959-Poraniomorpha-hispida
Identification: a small star, nearly pentagonal in shape. May be confused with *Pteraster militaris* (longer arms), *Porania pulvillus* (red) or *Ceramaster granularis* (pink-red in coloration).
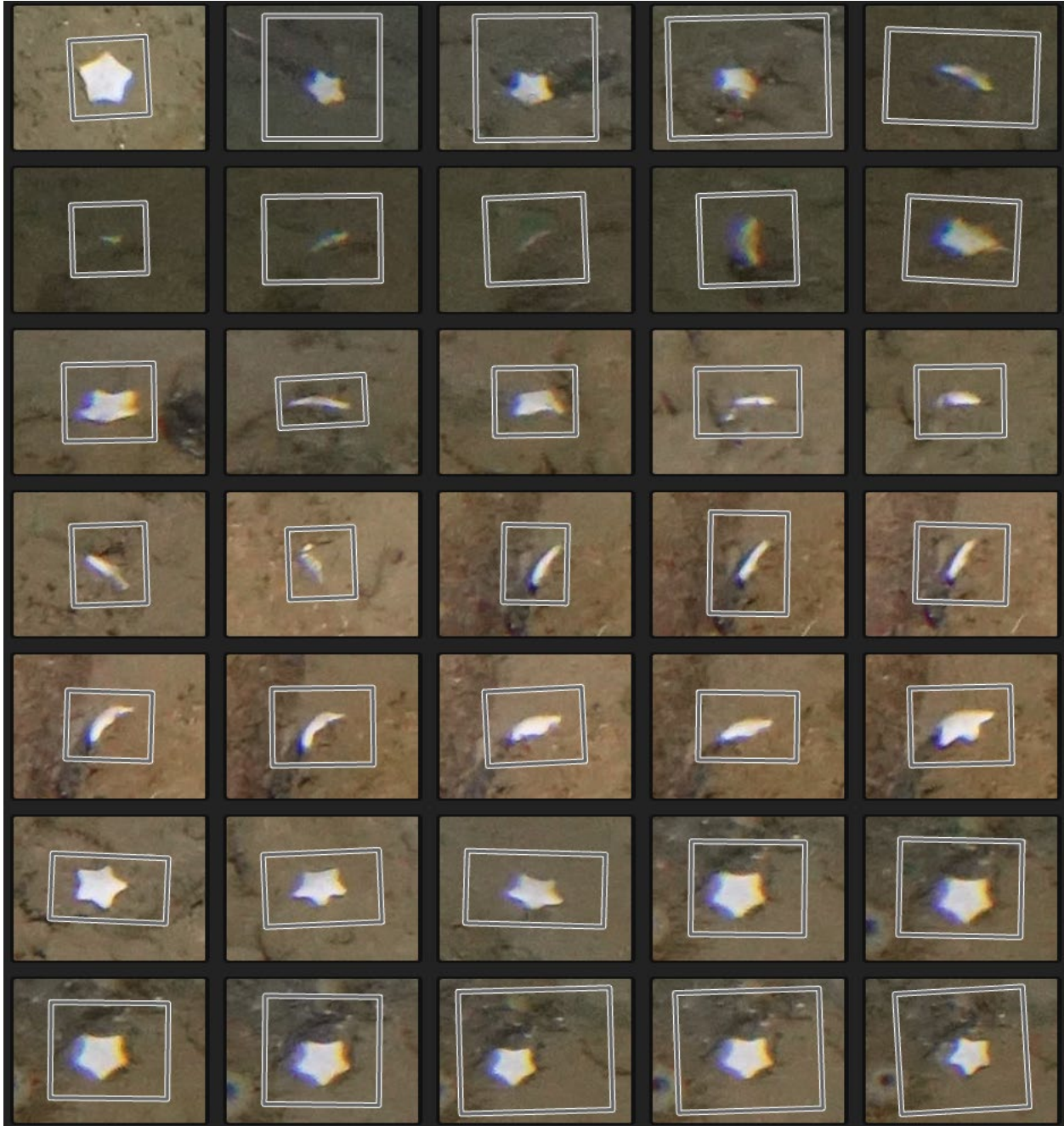
Echinodermata – Asteroidea **– *Pteraster militaris***

https://www.inaturalist.org/taxa/255713-Pteraster-militaris
Identification: a small star with short arms, maybe confused with *Poraniomorpha hispida*.

Echinodermata – Asteroidea – ***Sclerasterias tanneri***
https://www.inaturalist.org/taxa/791519-Sclerasterias-tanneri

Identification: a large sea star with mottled arms. May be confused with *Henricia* in poor-quality images or in the image background.

L2_2022_02_21 14_31_04_TL208213

L1_2021_11_06 22_00_31_TL104725

Echinodermata – Asteroidea **– *Stephanasterias albula***
https://www.inaturalist.org/taxa/596488-Stephanasterias-albula
Identification: a small star with multiple arms of varying lengths. Species is presumed, though
may need confirmation because of unclear images. May be confused with *Henricia* or other stars.
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Mollusca – Cephalopoda – Octopoda – **Bathypolypus bairdii**
https://www.inaturalist.org/taxa/699436-Bathypolypus-bairdii
Identification: the common, regional octopod. Historically misnamed as *Bathypolypus arcticus*.
May be confused with the purplish, warty *Graneledone verrucosa*.

L1_2022_10_18 08_59_55_TL107096

L3_2023_02_13 00_29_38_TL303090

Mollusca – Cephalopoda – Sepiida – **Rossia sp.**

Identification: a small cephalopod with stubby fins, sometimes seen swimming, though often observed semi-buried. Likely to be *Rossia palebrosa*, but *Rossia megaptera* may also be present. Historically mistaken for the southern species, *Semirossia tenera*, and thus the label is tentative until captured specimens can be confirmed.

L3_2023_01_03 17_29_34_TL301156

L2_2023_02_21 17_31_22_TL203888

Mollusca – Gastropoda – Lepetellida – ***Diodora cayenensis***
https://www.inaturalist.org/taxa/340014-Diodora-cayenensis
Identification: the species is presumed from its relatively large size, much greater than the local limpets such as *Lepeta caeca*.

L1_2023_02_17 21_29_55_TL103974

L1_2023_02_17 13_29_55_TL103958

Mollusca – Gastropoda – Nudibranchia – ***Aldisa zetlandica***
https://www.inaturalist.org/taxa/542066-Aldisa-zetlandica
Identification: a relatively large and white nudibranch, the presumed species of infraorder Doridoidei and reportedly present regional captures though it requires future confirmation.
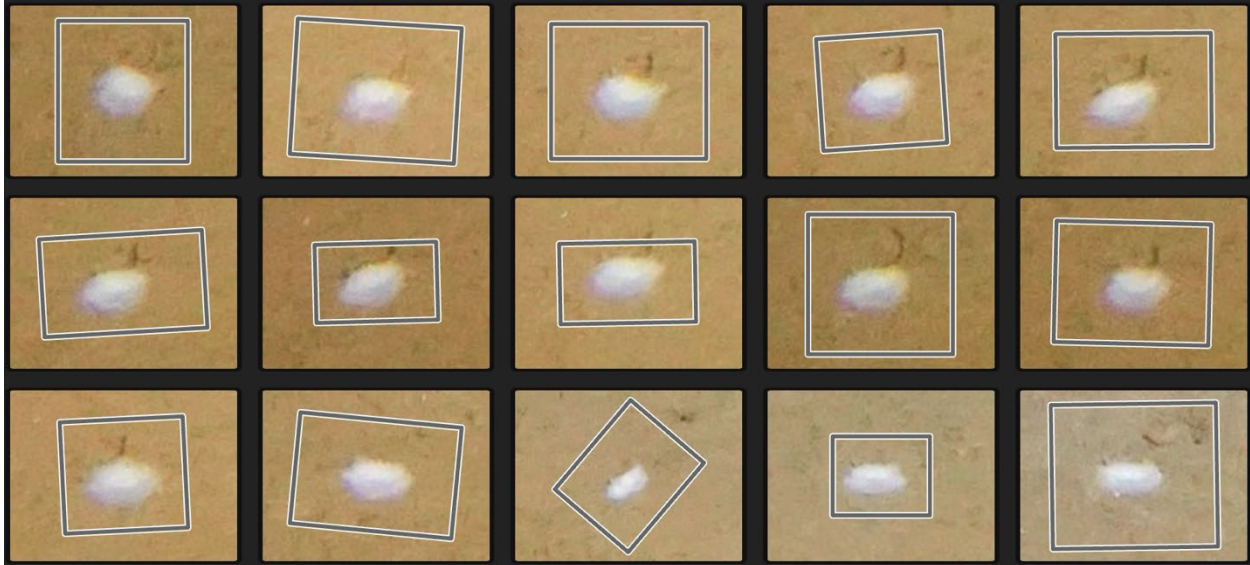
Sambro Bank (2022)

Mollusca – Gastropoda – Pleurobranchida – ***Pleurobranchaea tarda***
https://inaturalist.ca/taxa/684419-Pleurobranchaea-tarda
Identification: a small beige-brown gastropod often misidentified as a nudibranch like *Aldisa*. To be confirmed from captures.

Sambro Bank (2023)

Mollusca – Gastropoda – Nudibranchia – ***Zimenella salmonacea***
https://www.inaturalist.org/taxa/1025896-Ziminella-salmonacea
Identification: a nudibranch with pink-red dorsal cerata, is the presumed species of superfamily
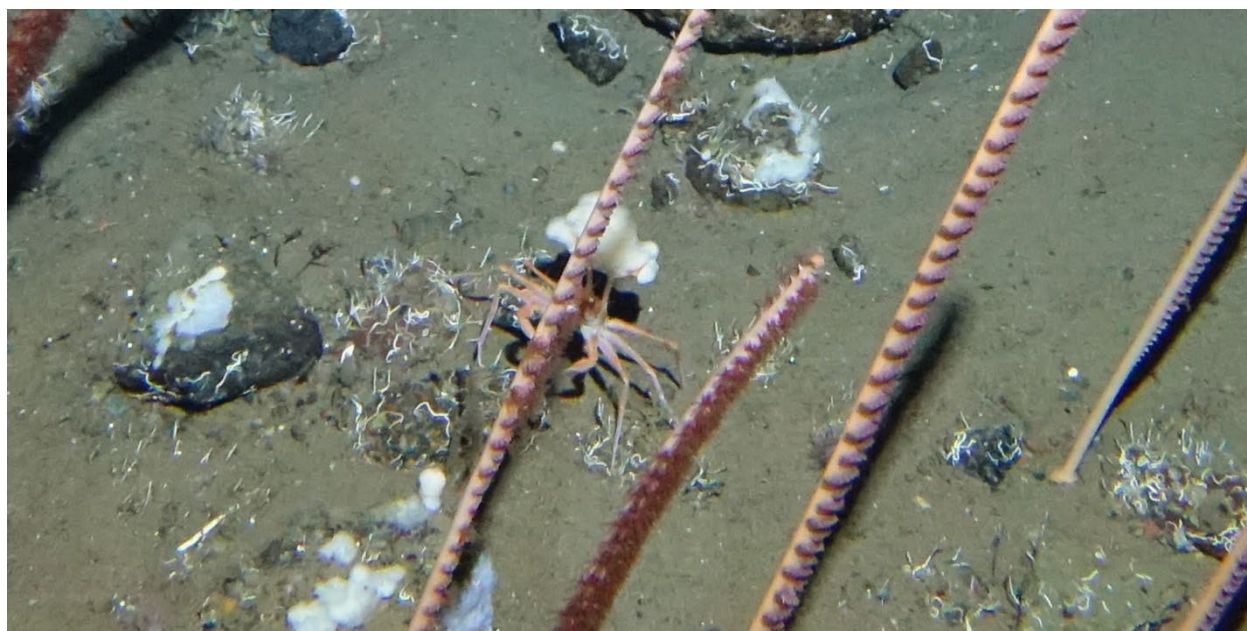Fionoidea as it occurs in deepwater but requires confirmation if ever found in captures.
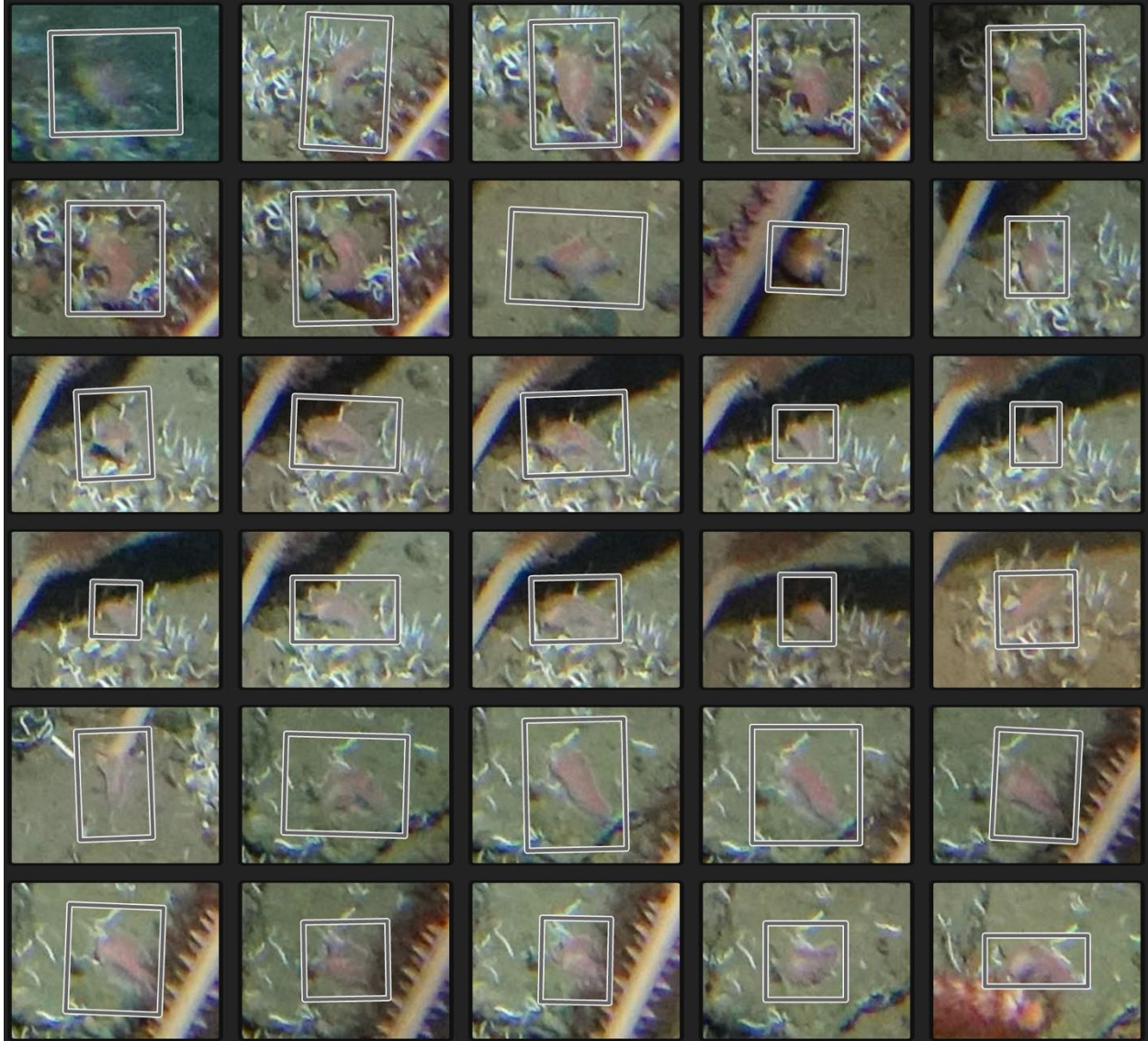
Porifera

Identification: a whitish mass, presumed to be a sponge, only seen carried by the carrier crab *Homola minima,* and at all three lander sites. To be reviewed and confirmed in future analyses.
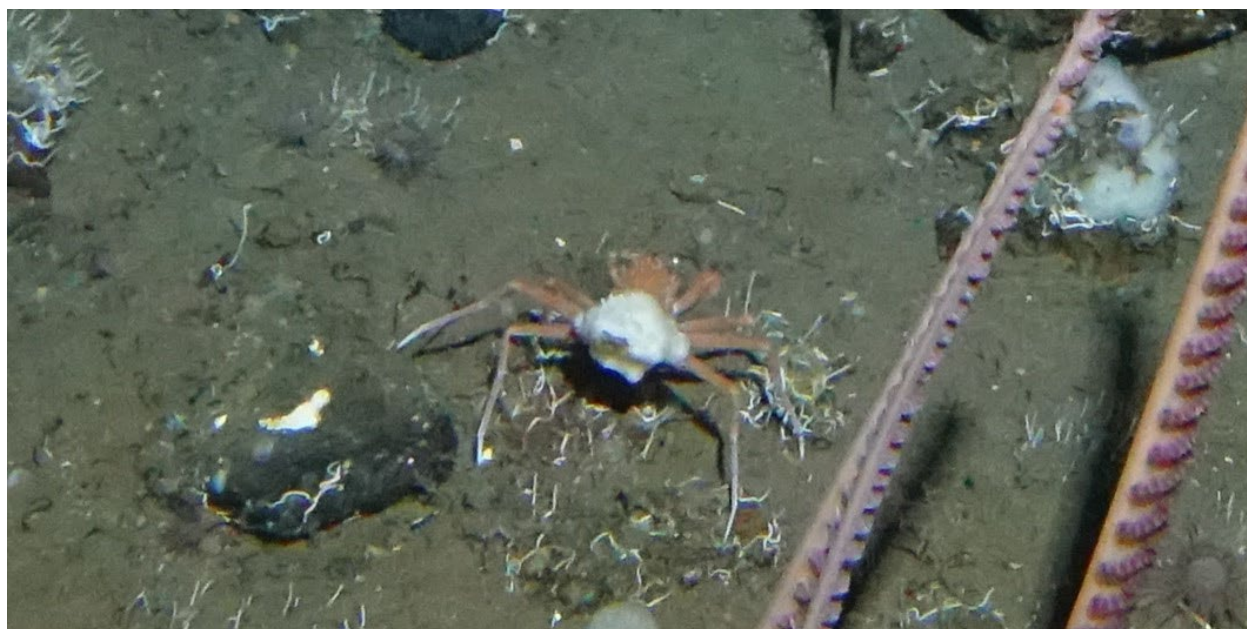
L3_2023_03_02 09_59_39_TL303925.JPG

L3_2022_11_17 05_59_33_TL307879.JPG

Tunicata – Appendicularia – *Oikopleura*
https://www.inaturalist.org/taxa/345356-Limacina-helicina
Identification: a semi-translucent floating shape with paired circles, as the mucus net constructed by a pelagic ascidian, e.g. https://inaturalist.ca/observations/212504894. May be confused with jellies such as cnidarians, ctenophores, siphonophores or winged pteropod molluscs such as *Limacina helicina*, e.g., https://inaturalist.ca/observations/213493501

L2_2021_11_17 08_00_32_TL203597

L2_2021_11_13 07_00_31_TL203404

Appendix 3 – Unknown kinds and special labels

Certain observations were given placeholder labels as they have special status beyond taxonomy. Several groups were formed, each containing multiple kinds, that may have their identification eventually resolved, but are presently uncertain because they were poorly visible, either very small or in the dark image background. Other labels were to tag activity, e.g., detached sponges or sea pens, or to indicate shadows in image frame, usually of fishes, when they were visible without the corresponding organism in view.

Unknown (biota)
Identification: a broad grouping of usually small and poorly visible forms, perhaps of organic debris. The label is a placeholder as the observations are reviewed and regrouped.

Unknown anemone (Actiniaria)

Identification: undescribed sea anemones, usually small and orange. Sedentary fauna was not annotated in the projects, but some labels were applied as placeholder. The label is to be reviewed for future analyses of activity, such as the opening and closing of oral disk and tentacles.
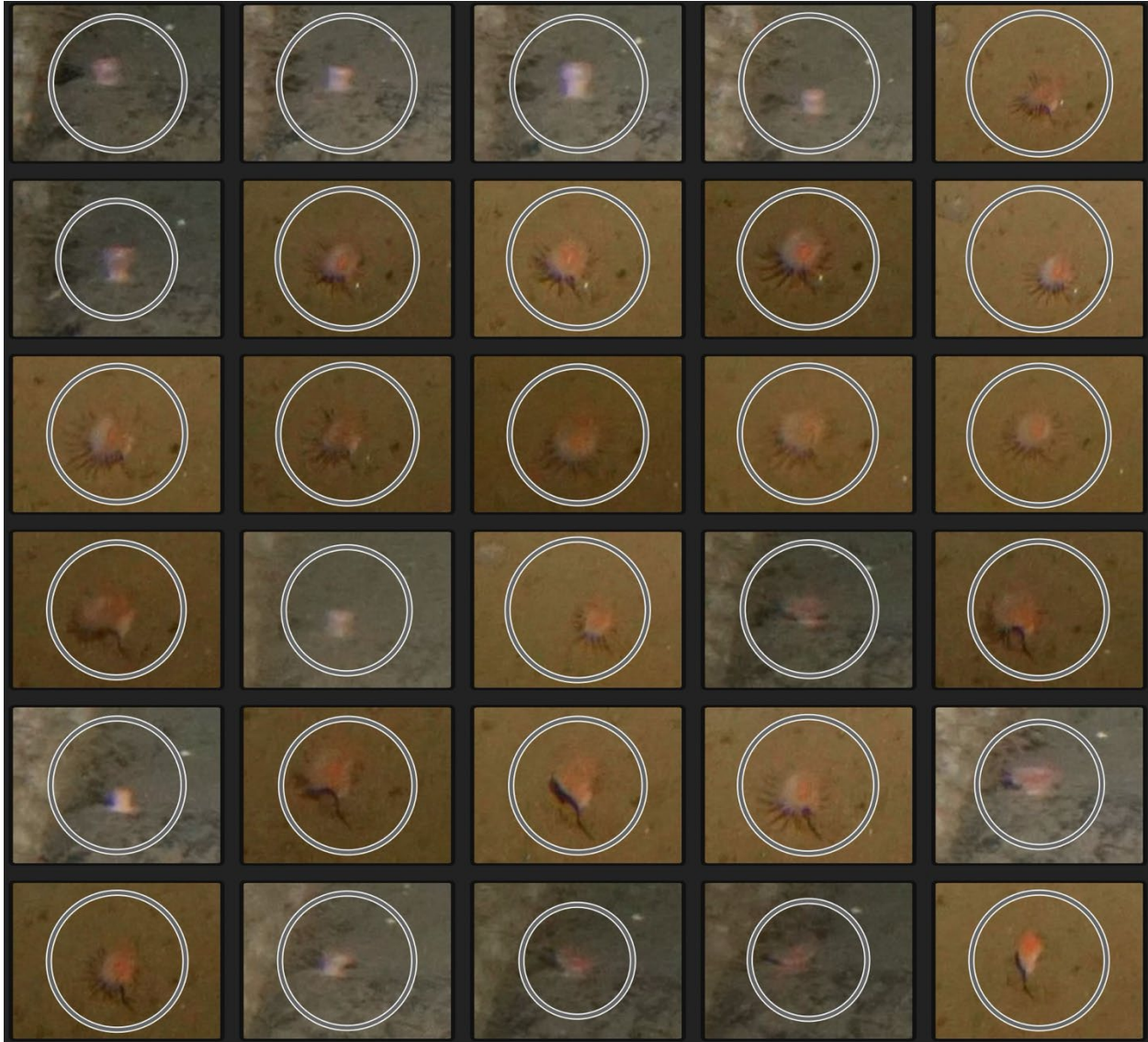
Unknown crustacean (small)
Identification: poorly visible, unknown kinds that appear to be crustacean-like (legs)

Unknown fish - juvenile

Identification: poorly visible, very small fish that do not appear to be of any of the identified kinds.
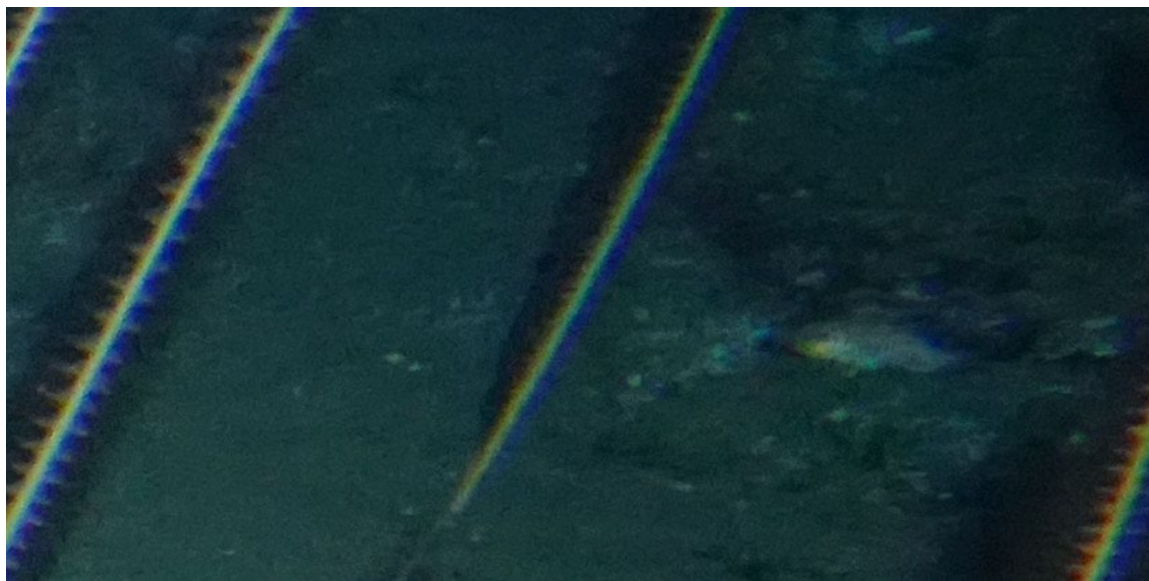

L2_2022_10_29 11_30_13_TL207363

L3_2023_04_08 06_29_43_TL305694

Unknown fish (*Helicolenus* or *Sebastes*)
Identification: two kinds of fishes that may be rosefish or redfish, either not clearly visible or appearing different than usual (e.g., eyes, mouth, colouring).

L3_2023_02_18 17_59_38_TL303365

Previously identified as Silk Snapper (*Lutjanus vivanus*).

L1_2021_10_21 14_00_25_TL103942

Unknown fish (*Merluccius* or *Urophycis*)

Identification: either poorly visible or an uncertain kind of fish that is elongated in form. Some may eventually be classified to taxon, perhaps based on form, orientation (e.g., horizontal = *Merluccius*, angled = *Urophycis*), or nearby images with clearer examples.

Unknown gastropod (small)
Identification: a small, white, shelled mollusc, perhaps of *Boreotrophon*, *Colus*, or another kind.

Unknown jelly (Cnidaria, Ctenophora, Larvacea)
Identification: small and poorly visible, translucent, and usually oval forms. May be of medusae, siphonophores, other jellies or their mucus nets (Larvacea).
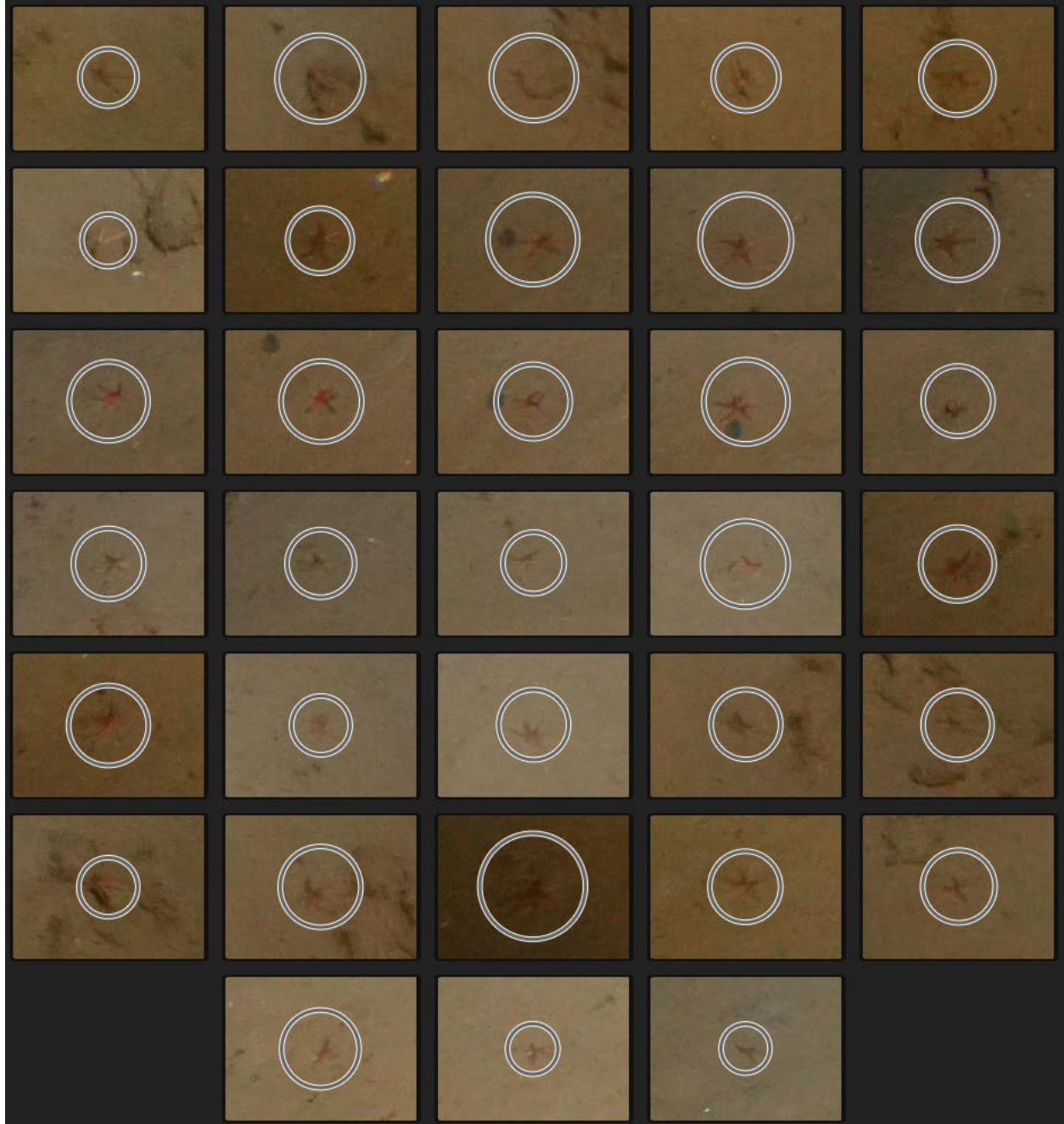
Unknown star (Asteroidea)
Identification: poorly visible and very small sea star, perhaps of *Henricia*, *Pteraster*, or *Stephanasterias*. JM: The second group of photos looks *Leptychaster arcticus.*
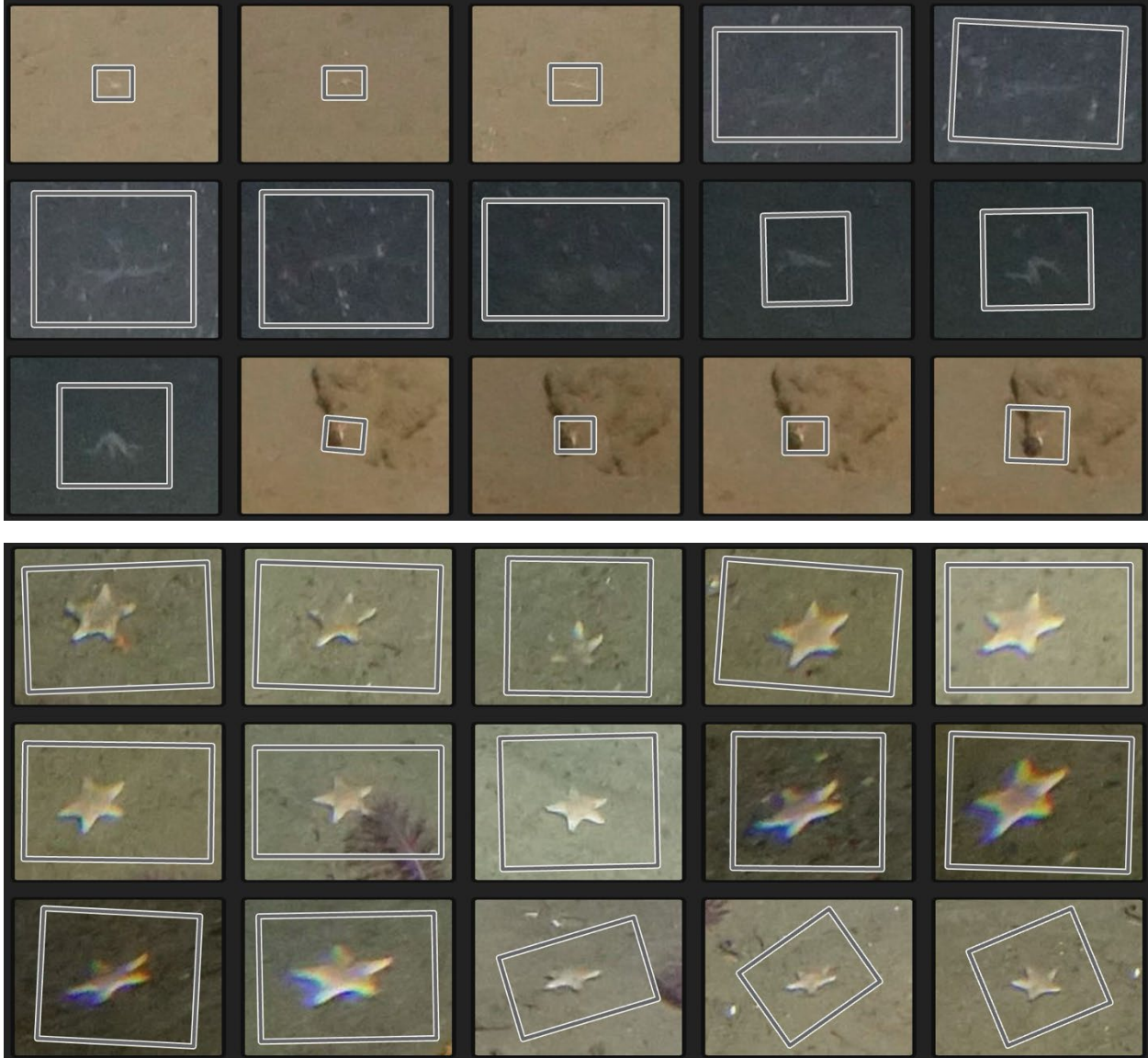
Unknown star (Ophiuroidea)
Identification: poorly visible and very small brittle star, perhaps of *Ophiocten*, *Ophiura,* or *Ophiopholis.*

Unknown worm (Annelida or Nemertea)
Identification: an elongated, worm-like form.

L2_2023_01_26 05_31_04_TL202616 NEMERTEA

L1_2022_11_19 07_59_54_TL108628 POLYCHAETA

Motility (Situational) – **detached sponge (*Vazella*)**
Identification: a large, pale vase-like sponge (*Vazella pourtalesii*), that appears temporarily across a sequence of images. The label serves to document this activity and is not a species observation.
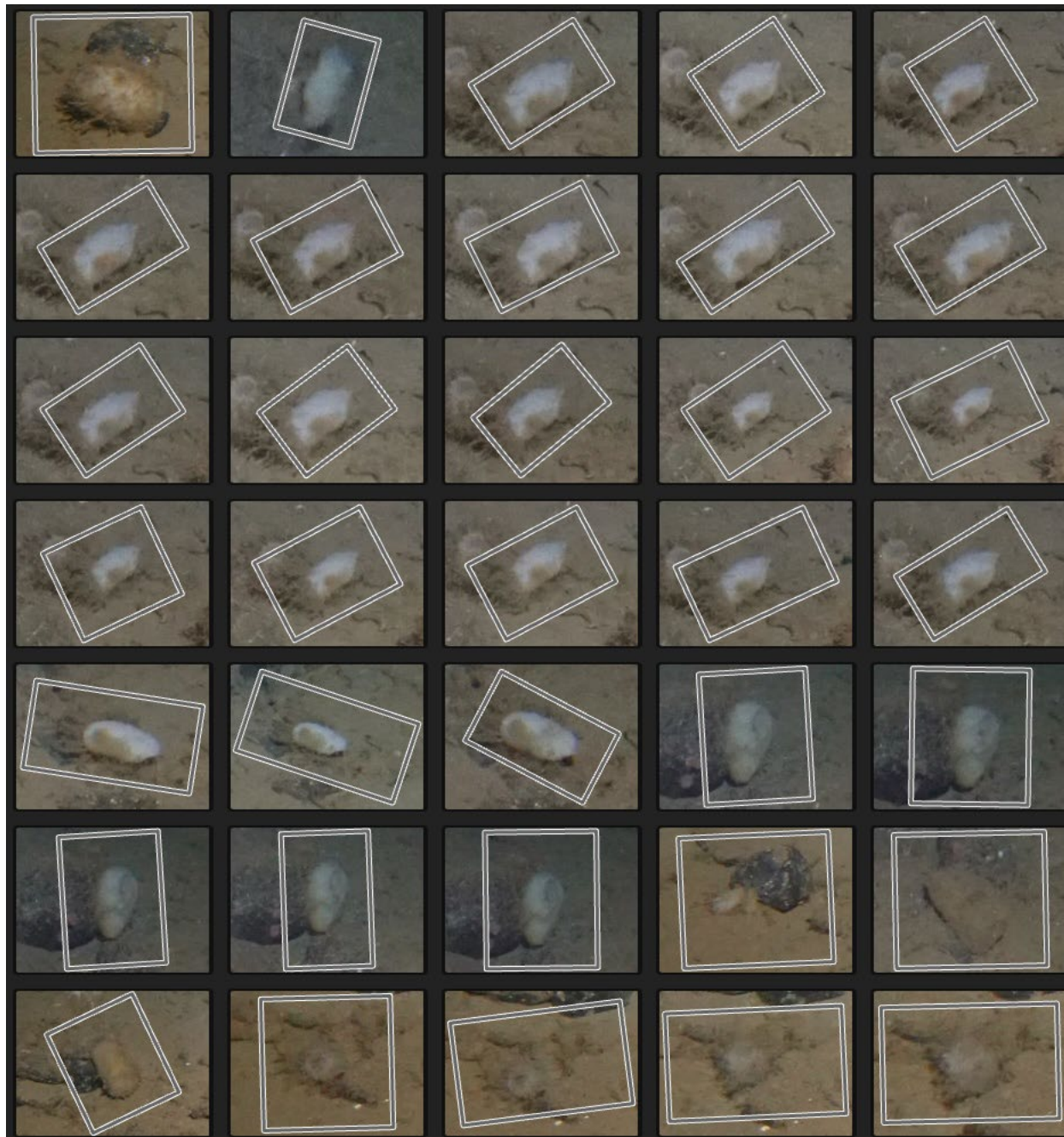
Motility (Situational) – **re-positioning (sea pen)**
Identification: a sea pen lying on the substrate that repositions and raises itself over a sequence of images. The label serves to document this activity and is not a species observation.

Shadow

Identification: shadows of organism from the camera light flashes. Shadows were labelled, but not named to species. The silhouettes with spiky fins and short bodies were mostly of Redfish, with elongated shadows likely of hake. Because of flash and camera angles, sometimes the shadow was in full view while the source (fish) was only in partial view in the image frame. For these images, only the fish was labelled, as the shadow would be a repeated observation of the same individual. Small swimmers, usually of very small redfish or shrimp, were sometimes detected only because of their dark shadows. These were recorded with their taxon name, and not as a shadow.

Redfish-like silhouette

L2_2022_10_07 14_30_01_TL206313

White Hake-like silhouette

L2_2023_02_04 19_01_10_TL203075