Photo Catalogue of Coastal Marine Fauna on the Icelandic Scallop (*Chlamys islandica*) Survey in the Northern Gulf of St. Lawrence

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Scientific stock assessment surveys in coastal areas record a number of marine fauna and macroalgae in addition to the target commercial species. This report documents in photos examples of at least 160 marine benthic invertebrate and fish taxa sampled on the Icelandic scallop (*Chlamys islandica*) drag survey in the Mingan Archipelago, near the north shore of the Gulf of St. Lawrence, from 2007 to 2018. Some photo identifications were tentative as several taxa require microscopic examination or genetic analyses for confirmation, particularly for invertebrates such as bryozoans, hydrozoans, and sponges (Porifera). Other groups were usually well-identified, especially among fishes, crustaceans and echinoderms. Some of the species seen in photos were new data records in the region or were unusual in size. Additional work is needed to clarify special cases in taxonomy or morphotypes. The continued use of photos for record validation is recommended, with increased attention for colonial organisms encrusting substrates, potentially important for the recruitment and survival of commercial scallops.

RÉSUMÉ

Nozères, C., and Roy, V. 2021. Photo Catalogue of Coastal Marine Fauna on the Icelandic Scallop (*Chlamys islandica*) Survey in the Northern Gulf of St. Lawrence. Can. Manuscr. Rep. Fish. Aquat. Sci. 3207: iv + 165 p.

Les relevés scientifiques d’évaluation des stocks en milieu côtier permettent de consigner en partie la diversité de la faune marine et des macroalgues en plus de l’espèce commerciale visée. Ce rapport documente en photos des spécimens d’au moins 160 taxons d’invertébrés benthiques et de poissons qui ont été échantillonnés lors du relevé à la drague du pétoncle d’Islande (*Chlamys islandica*) mené dans l’archipel de Mingan, près de la rive nord du golfe du Saint-Laurent, de 2007 à 2018. Certaines identifications photographiques sont provisoires parce que l’on doit procéder à un examen microscopique ou à des analyses génétiques pour confirmer plusieurs taxons, en particulier pour des invertébrés tels que les bryozoaires, les hydrozoaires et les éponges (Porifera). D’autres groupes, en particulier les poissons, les crustacés et les échinodermes, ont été généralement bien identifiés. Certaines des espèces photographiées constituent de nouvelles mentions pour la région ou avaient une taille inhabituelle. Des travaux supplémentaires sont nécessaires pour clarifier des cas particuliers de taxonomie ou de morphotype. Il est recommandé de continuer à utiliser des photos pour la validation des enregistrements, en accordant une attention accrue aux organismes coloniaux qui encroûtent des substrats potentiellement importants pour le recrutement et la survie des pétoncles commerciaux.

INTRODUCTION

Since 1990, the Department of Fisheries and Oceans (DFO), Quebec Region, has conducted regular scientific surveys near the Mingan Archipelago, located on the north shore of the Gulf of St. Lawrence, to assist in stock evaluation of the Icelandic scallop, *Chlamys islandica* (Trottier et al. 2017). These surveys provide an opportunity for sampling a variety of benthic invertebrates, fishes, and macroalgae on the scallop beds using the dredging gear. The presence, and in some taxa, the abundance and biomass of the catch is recorded in addition to the principal capture of scallops. The presence or density of different species in the catch, and their role as predators (e.g., sea stars), competitors for space (e.g., barnacles, sponges, tunicates), or as substrates for recruitement (e.g, tube-building hydrozoans, Harvey et al. 1993) may be important information to fisheries managers. To assist with the development of an ecosystem-based approach to commercial species management (DFO 2007, Paul and Stephenson 2020), it is important to validate the identified taxa encountered on the survey, to better understand their function in the habitat and role with healthy stocks.

Correct identification of species can be time-consuming, especially when confronted with the diversity of benthos that may be found among the debris and substrates dredged up in hauls. One tool that may assist with record validation is the photo documentation of each haul, along with individual photos of novel or uncertain taxa. Photographing species in the catch has become a routine activity on several DFO scientific surveys (Nozères et al. 2014, Nozères et al. 2019, Lacasse et al. 2020) and has led to numerous revisions and corrections in catch datasets (e.g., Nozères et al. 2015).

Along with taxonomic identification, photos complement records with additional information on catch types and distributions. This includes documenting different forms or sizes, such as juvenile fishes when sampled nearshore, and shapes of tunicates (ascidians) and sponges. Catch photos may also establish baselines for regional presences of vulnerable taxa that may be displaced, or invasive species that may become established with climate change. The latter was the initial impetus for the catalogue, with participation on surveys to photograph and sample ascidians that may have included invasive species not yet reported on the north shore. A previous report covered several coastal surveys but was limited to molluscs (Bourdages et al. 2012).

The objective of this report is to provide a preliminary photo summary of megabenthic invertebrates and fishes as encountered on the Mingan scallop survey. The goal is to validate current database records of captured taxa and to prepare for sampling on future surveys. This will enable increased targeting of lesser-known taxa, while at the same time making it easier to record already-confirmed species. The catalogue will also help with the development of an environmental genetic (eDNA) reference library for nearshore species monitoring (DFO-G. Parent, Genomics Laboratory, Maurice Lamontagne Institute, Mont-Joli, QC, Canada). The result will assist in analyzing the scallop beds for the marine benthic community and potentially better understand the productivity of Icelandic scallops in the region.

MATERIALS AND METHODS

This report presents digital images documenting the benthic biodiversity, as a supplement to the stock evaluation of the Icelandic scallop in the northern Gulf. In regular stock surveys, about 118 stations (82 in zone 16E, 36 in zone 16F) are sampled every two years in late May-early June by DFO scientists from Maurice Lamontagne Institute (Mont-Joli, QC, Canada). Depths sampled are 20-71 m (average 42 m) in zone 16E and 28-85 m (average 52 m) in zone 16F. Participation by C. Nozères on the survey was partial, usually only covering the fishing area 16E, located off of Havre-St-Pierre, in the Mingan archipelago (Figure 1). Participation by V. Roy in 2018 enabled further coverage of area 16F.

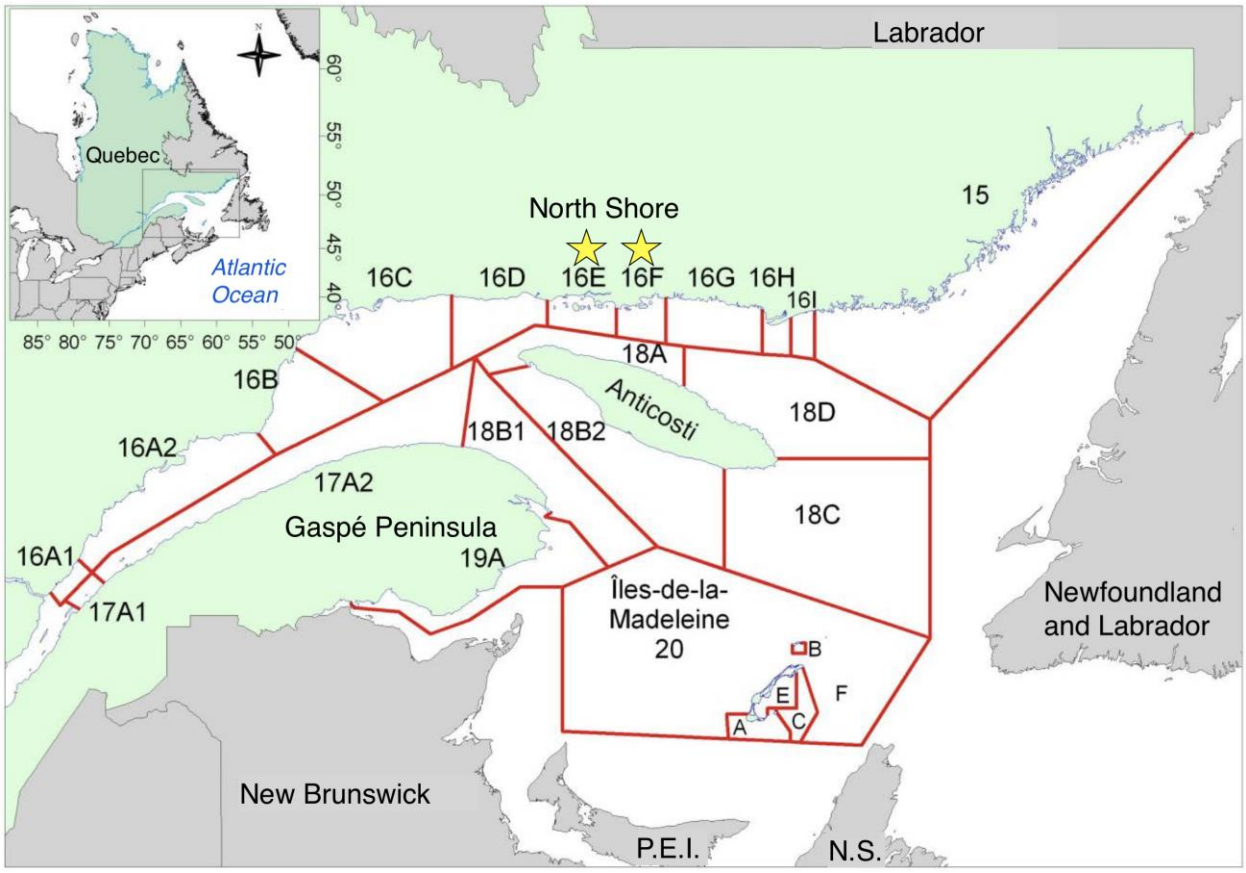

Figure 1. Map of fishing zones for Icelandic scallop (*Chlamys islandica*) in Quebec waters; photos in report came from areas 16E and 16F (starred) (figure adapted from Trottier et al. 2017).

Photos were available for 2012, 2016, and 2018. In addition, samples collected by P. Goudreau from 2007 and others from 2019 were photographed in the laboratory. For more information on the survey, please consult Trottier et al. (2017). Briefly, a Digby scallop dredge, doubled with vexar and a mesh size of 19 mm, was dragged on the bottom for about two mins and 150 m. The catch collected in the four baskets of the dredge was emptied on a table with the first (leftmost) basket sorted for all taxa that

were then entered in data records. Most photographs were taken from these specimens. If another species (usually a fish) was noticed only in the remaining three baskets, it was recorded, and could also be photographed. The photos were organized in an Adobe Photoshop Lightroom Classic database with keywords by scientific name from the World Register of Marine Species (WoRMS, http://www.marinespecies.org/, accessed 2020-02-09).

Labelling photos with names was an iterative process between certainty and presumption. Initially, taxonomic resources were consulted for species identifications, with Brunel et al. (1998) being used as the regional checklist. However, some of the taxa shown in photos were uncertain, either because they cannot be identified from a general photo (i.e., require magnification or dissection) or because the taxon itself is problematic and will require further analysis. Several specimens in photos were named by general group (phylum, order, family or genus). In some instances, a taxon is presented with the qualifier 'cf.', indicating an identification was presumed, but unconfirmed. In other cases, a taxon may be presented because of their known geographical presence (e.g., Brunel et al. 1998), even though the photo was insufficient for identification. Several specimen photos were also posted online (https://inaturalist.ca) for discussion among a pool of experts, resulting in further revisions.

RESULTS

A total of 3668 photos of taxa were available, of which 2993 were consulted for the catalogue. These were taken from the surveys in 2012 (1380 photos), 2016 (1159), and 2018 (377), while frozen specimens were examined from the 2007 and 2019 surveys, for 52 and 25 photos, respectively. Many photos were repeated observations of specimens, representing different angles and views. Of these, 293 photos were selected for presentation in Appendix, for a total of 166 taxa (Table A1). Groups of taxa are summarized below, in alphabetical order.

Ascidiacea (tunicates)

Ascidians were a diverse group with at least 16 taxa across six families, of which ten were solitary tunicates (*Boltenia echinata, Boltenia ovifera, Cnemidocarpa finmarkiensis, Dendrodoa carnea, Halocynthia pyriformis, Molgula griffithsii, Molgula pedunculata, Molgula retortiformis, Styela coriacea, Styela rustica*) and four were colonial (*Botrylloides aureus, Didemnum albidum, Synoicum pulmonaria, Trididemnum tenerum*). Species were examined by I. Bérubé (DFO-Québec) and the expert G. Lambert (University of Washington, Friday Harbor Laboratories). Not identified were the solitary *Ascidia* sp. and a colonial Didemnidae type. The botryllid was presumed to be the species *B. aureus* on the basis of geography.

Brachiopoda (lamp shells)

Two species were encountered, the common brachiopod *Hemithiris psittacea* and the less-frequent *Terebratulina septentrionalis*.

Bryozoa (moss animals)

This group of colonial animals was the most difficult to identify without microscope evaluation, which was not performed. Only one species is named here, *Celleporina surcularis*, while examples of five encrusting types are also shown.

Cnidaria (sea anemones, stalked jellies, soft corals, hydrozoans)

All cnidarians in captures were organisms fixed to a hard substrate and not pelagic medusae. At least nine taxa were sampled, with four anemones (Actiniidae cf. *Cribrinopsis similis, Metridium senile, Stomphia coccinea, Ptychodactis patula*), a stalked jellyfish (*Lucernaria quadricornis*), a soft coral (*Gersemia rubiformis*), and several hydrozoans, of which two were tentatively identified to the species level, the Bottlebrush hydroid, *Thuiaria thuja,* and the Oaten pipes hydroid, *Tubularia indivisa*.

Crustacea (barnacles, amphipods, isopods, shrimps, crabs)

Encrusting on shells, barnacles (*Balanus* sp.) were frequent, but often require dissection to confirm species, even as photos suggest most were likely of *B. balanus*, rather than *B. crenatus*. Among the mobile small crustaceans, only a few taxa were sampled infrequently in the dredge, including five amphipods (*Ampelisca* sp*., Anonyx* sp., *Eusirus cuspidatus,* Melitidae*, Paramphithoe hystrix*) and one isopod (*Synidotea marmorata*). Sculptured shrimp (*Sclerocrangon boreas*) were common in catches, while occasional specimens of seven other shrimp species were also observed: *Eualus fabricii, Eualus gaimardii, Lebbeus groenlandicus, Lebbeus polaris, Pandalus borealis, Pandalus montagui, Spirontocaris spinus*. Hermit crabs were identified to genus as *Pagurus*, although the photos were indicative of *P. pubescens* rather than the other common species, *P. arcuatus.* The largest crustaceans were the snow crab (*Chionoecetes opilio*) and lyre crabs (*Hyas araneus* and *Hyas coarctatus*).

Echinodermata (sea stars, brittle stars, sea cucumbers, sea urchins)

The echinoderms had 18 taxa consisting of six asteroid species (*Asterias rubens, Crossaster papposus, Leptasterias groenlandica, Leptasterias polaris, Pteraster militaris, Solaster endeca*) and one genus (*Henricia* sp.), five taxa of ophiuroids or brittle stars (*Gorgonocephalus* sp*., Ophiacantha bidentata, Ophiopholis aculeata, Ophiura robusta, Stegophiura nodosa*), four of sea cucumbers (*Chiridota laevis, Cucumaria frondosa, Ekmania barthii, Psolus phantapus*), and two kinds of sea urchins: regular urchins (*Strongylocentrotus* sp.) and sand dollars (*Echinarachnius parma*).

Mollusca (bivalves, gastropods, chitons, cephalopods)

The molluscs comprised the most diverse group in captures, with 24 taxa of gastropods and 16 of bivalves. Also seen were chitons (the species *Stenosemus albus* and two likely species of family Tonicellidae, *Boreochiton ruber* and *Tonicella marmorea*) and cephalopods: a sepiolid (*Rossia* sp.) and an octopus (*Bathypolypus bairdii*). Some

species await confirmation from genetic analysis, in particular for buccinid whelks (e.g., *Buccinum terraenovae*).

Nemertea (ribbon worms)

Ribbon worms are fragile and difficult to identify, except for the chevron ribbon worm, *Amphiporus angulatus*. A green type was also observed, possibly of *Lineus* sp.

Polychaeta (errant worms)

Specimens from seven families were observed: Nereididae, Nephtyidae, Phyllodocidae, Polynoidae, Sabellidae, Spionidae, and Terebellidae. Occasionally, specimens in photos were labelled to the genus or species level, e.g., *Nereis* cf. *pelagica*, but these identifications are preliminary pending genetic or morphological confirmation of future specimens. The spionid *Polydora* sp. was documented from burrows inside scallop shells.

Porifera (sponges)

Four types of sponge were identified: *Cladocroce spatula*, *Haliclona oculata*, *Mycale lingua,* and *Sycon* sp. (Dinn 2020). Uncertain species shown included a funnel or fan-shaped sponge (Porifera A) similar to the new species *Plicatellopsis bowerbanki* (Dinn et al. 2020), a tufted sponge possibly of family Tetillidae (Porifera B), a morel mushroom shaped type (Porifera C), an encrusting yellow or orange type (Porifera D), a large papillated sponge (Porifera E), and a large yellow type possibly of *Halichondria* sp. (Porifera F). Identifications will require that future specimens be examined in the laboratory for analysis of spicules or DNA.

Sipuncula (peanut worms)

The peanut worms are robust, but difficult to identify, often requiring dissection. *Golfingia* sp. are abundant regionally and presumed to be of the type shown here.

Teleostei (bony fishes)

Fishes were occasional in captures, with 26 taxa observed. The sand lances, *Ammodytes* sp., consist of two species distinguished by genetics (*A. americanus/dubius* and *A. hexapterus*). Other specimens were difficult to identify at the juvenile (< 20 cm) stage, such as *Gadus* sp. and *Myoxocephalus* sp. (Nozères et al. 2010). Some captures were of species that occur in deepwater as adults, but sampled nearshore as juveniles, such as Atlantic halibut (*Hippoglossus hippoglossus*) and lumpfish (*Cyclopterus lumpus*). Other species, including Ocean pout (*Zoarces americanus*) and Twoline snakeblenny (*Ulvaria subbifurcata*) are rare records in catch databases as they are associated with rocky bottoms of coastal areas, not normally sampled by groundfish surveys in the region (e.g., Bourdages et al. 2020).

Unknown

An unknown, erect and encrusting brown organism was often seen covering scallop shells. It was not possible to determine its taxonomic grouping. Sponge spicules have not been found in samples, and the organism may be a type of bryozoan, or possibly a hydrozoan from the genus *Grammaria*. Live specimens should be examined for positive identification.

DISCUSSION

The present catalogue is not a complete or validated checklist of taxa on the survey, nor do they represent the current records in the catch database. Such caveats are important to make explicit as biodiversity data is circulated among statisticians who may be unaware of the context (see discussion in Kenchington and Kenchington 2013). Some of the issues encountered in report preparation are outlined below.

Utility of photo catalogue for biodiversity and environmental monitoring

Sampling with a nearshore dredge (Digby type) revealed over 160 taxa in photos. Additional sampling, in periods and area, along with laboratory examination, would increase that number. Future work will be to review the catch records, validated where possible with photos, to enable biodiversity analyses of occurrence (rarity), productivity (biomass and abundance), diversity (richness). The catalogue will help in the preparation of analyses, by indicating the types of organisms encountered, especially for taxa that were not measured or entered into records, such as fishes, crustaceans, and sponges.

The choice of taxa for analyses will also need to be investigated. Large molluscs, echinoderms, and crustaceans were frequently represented and may be useful for biomass and abundance analyses. Small mobile taxa such as amphipods, polychaetes, and fishes were more sporadic in captures, reflecting the selectivity of the dredge gear and not their distribution range and density in the area. Pelagic and incidental (rare) species seen on the survey were unlikely to be good candidates to analyze benthic ecosystems. However, they may be important as anecdotal records to inform on the state of the environment. Thus, the appearance of northern shrimp (*Pandalus borealis*) might indicate upwelling events, while the arrival of juvenile redfish (*Sebastes* sp.) reflects their general expansion in the northern Gulf of St. Lawrence (Bourdages et al. 2020).

Both northern shrimp and redfish are very common in the region, and yet only recently have they appeared on the scallop surveys, which underscores an issue of rarity in sampling bias. This situation becomes important when seeking species as indicators of environmental conditions, such as warming water temperatures. An example may be seen with the common sea star, *Asterias rubens*, that is well known on the nearshore survey, but only recently recorded on the offshore survey (Bourdages et al. 2020), suggesting range expansion of the species. In this example, a species rare on one type of a survey is common using another approach. In another instance, a colonial ascidian

seen on the survey was presumed to be *Botrylloides aureus,* as it is the coldwater species in the region (Brunel et al. 1998). The endemic species is similar to a warmwater invasive species, *Botrylloides violaceus*, present in the southern Gulf, that is important to monitor for changes in the community (Bock et al. 2011). In this case, the catalogue will serve as an historical baseline for future surveys following the spread of *B. violaceus*.

Coastal taxa as seen on the scallop survey were important to document because the annual trawl survey in the northern Gulf of St. Lawrence region principally samples from deeper areas (100-400 m), rather than rocky bottoms in coastal areas (Bourdages et al. 2020). New monitoring techniques are in development, in particular, the analysis of water samples for molecular traces of the species present (eDNA). Confirming the presence of species, from both coastal and offshore areas, will be valuable for validating the detections in water samples, reducing questions of bias and contamination that are a potential problem with eDNA monitoring.

Utility of photo catalogue for identifications

As mentioned above, several megafaunal species were readily identifiable from general photos while smaller ones, especially the encrusting colonial or ephiphytic species will require close examination and microscope images for confirmation. Photographing during the scallop survey was successful to rapidly document the diversity of some groups. Having now completed a general overview with this catalogue, problematic species may be efficiently targeted for future laboratory examination. Nonetheless, encrusting and epiphytic species such as bryozoans and hydrozoans were not practical to systematically photograph or note in catch records because of the effort required to find them among the dredge debris. These are likely to remain underrepresented unless a specific need presents itself, for example, to show presence and extent of invasive species with potential impacts on commercial species, as was done for ascidians.

Review of problematic taxa

Aside from the challenges of survey sampling and species identification from photos, a number of taxa encountered were problematic and in need of review. While some have had longstanding issues (i.e., buccinid whelks), others were discovered during the preparation of the catalogue, by bringing attention to historical references. Several issues are summarized by group below.

Ascidians

Several groups of ascidians were difficult to identify. The solitary *Ascidia* sp. are a speciose group needing microscope examination. Simillarly, the colonial didemnid ascidians varied in appearance, needing laboratory work to confirm identification to the species, as was done for two of the specimens shown here. Two other colonial species were common on the survey but are very poorly known in the literature and may merit further study. In the case of *Botrylloides aureus*, this one is similar to the invasive species, *B. violaceus*, which may have resulted in mislabelled specimens registered in genetics banks, making it difficult to select reference sequences for monitoring work,

such as with eDNA. In the second case, *Synoicum pulmonaria* formed massive (>20 cm), globular colonies, larger than what has been reported elsewhere (Van Name 1945). This may suggest examining of the conditions for its form and growth, or further review of the species.

Bryozoans

The encrusting bryozoans are of interest for monitoring nuisance and non-indigenous species but require extensive laboratory work. Photos may help to suggest potential species and their geographic distribution, that may then be explored for future sampling.

Cnidaria

Most cnidarians are softbodied organisms requiring considerable expertise to identify, with several taxa also in question or needing further review. Of the sea anemones (Anthozoa: Actiniaria), identification of species in family Actiniidae are now in doubt due to recent work in Newfoundland suggesting the commonly known species of *Urticina felina* is European and not present in the NW Atlantic (Sanamyan et al. 2020). In its place may be two other species, *Cribrinopsis similis* (column with verrucae, as seen in presented photos) and *U. crassicornis* (smooth column; not seen on survey), although these also may need review with the Pacific species of *U. crassicornis*. Another anemone, *Ptychodactis patula*, was first noticed in 2019, having been overlooked and likely mistaken for debris in catches because of its floppy shape and beige colour, in contrast to the firm columns and bright colours of other species. The species is a new record for the Gulf of St. Lawrence (Brunel et al. 1998), and does not seem rare or isolated, as photos from other surveys including the Estuary and the Saguenay have revealed additional observations. The species is also known in the NW Atlantic, as documented by divers in St. Pierre-and-Miquelon, south of Newfoundland (http://actiniaria.com/ptychodactis_patula.php).

Of the soft corals (Anthozoa: Alyconacea), the *Gersemia*-type was regularly seen attached to scallop shells. From other surveys in the region (e.g., Bourdages et al. 2020), at least two types should be present nearshore, *G. rubiformis* and *Drifa glomerata* (non-retracting polyps), although only the *G. rubiformis* appears to have been documented in photos on this survey. Similar species in the family Nephtheidae such as *Pseudodrifa racemosa* occur in the NW Atlantic (de Moura Neves et al. 2020) and may also be expected in the region. In general, species of family Nephtheidae appear to be in need of extensive revision, at the genus and family level (Williams 2013). At present, specimens of *G. rubiformis* reported in the NE Pacific are considered a new and as-yet unnamed species of *Alcyonium* (Boutillier et al. 2019). In addition, as with the anemones, reports of alcyonacean species in local reports and guides have been confused visually with taxa seen in USA and Europe, such as *Alcyonium digitatum*, or else in database records by name, such as the bryozoan species of *Alcyonidium*.

Several types of hydrozoans attached to shells and debris were too frequent to be photo-documented, with likely several more species present than shown here. However, hydrozoans require close examination and tentative identifications based on photos may be unreliable. The identification of species may be useful, especially if their

abundance is a nuisance to scallops, similar to barnacles, or of potential benefit as substrates for recruitement, as was mentioned earlier for tubularids.

Crustacea

Several small crustaceans required effort to identify to the species level and thus were recorded to genus or family only in order to be efficient and consistent with records while at sea. Conserving a selection or photographing all specimens would be ways to ensure species identifications if desired. This could be feasible with crabs (few species), shrimps and amphipods (few specimens). For barnacles (Balanidae), their abundance and diverse growth forms will make it more difficult to be certain if one or more species were present (e.g., *Balanus balanus* and *B. crenatus*), which are of concern as a nuisance when growing in large masses on scallop shells.

Echinoderms

Of the sea stars (asteriids), there is some uncertainty regarding the small five-armed *Leptasterias groenlanica* relative to other *Leptasterias* sp., which will require validation (Brunel et al. 1998). Similarly, while *Asterias rubens* was a common species, it is unclear if the second species, or hybrids, of *Asterias forbesi* may occur in the area. For example, the upper right specimen in the photo presented five *Asterias rubens* sea stars is similar to *A. forbesi* (purple rather than red and orange, less-pronounced line of dorsal spines), however, it has pale and not an orange madreporite (a diagnostic character). Other species examples are, the sun stars, *C. pappossus* and *S. endeca,* that are similar to other species in the Atlantic and Arctic, such as *C. squamatus and S. syrtensis.* All specimens should be examined rather than assuming the presence of the commonly known species. Note that for *Solaster* spp., specimens might not be distinguishable from general photos, requiring the close visual examination of spines for identification (Zakharov et al. 2018).

Of the brittle stars (ophiurids), the basket star *Gorgonocephalus arcticus* is the species in checklists and in genetic analyses of the North Atlantic (e.g., de Moura Neves et al. 2020), however, morphology suggest another species such as *G. eucnemis*, or several species may be present and further review is necessary (Brunel et al. 1998).

Among the sea cucumbers (holothurids), small specimens were seen of brown *Psolus phantapus* (Nozères et al. 2014). Usually, the species buries in soft sediment, however all examined specimens were small and fixed to surfaces, which is behaviour of the scarlet *Psolus fabricii*, a rocky nearshore species that was absent from the survey, however, this may require confirmation by laboratory examination of small *Psolus*. Another holothurid, *Ekmania barthii*, was infrequent and poorly known, and may require further review.

There are two species of regular sea urchins (echinoids) in the region, the green *Strongylocentrotus droebachiensis* and the pale *S. pallidus*. The latter is usually common offshore, but the two species may be found together nearshore when in colder waters (Gagnon and Gilkinson 1994) as occurs in the Mingan area, and thus these were recorded to the genus level.

Molluscs

Among bivalves, the small *Astarte* shells were abundant. While two types were noticed in photos (cf. *A. borealis, A. elliptica*), their identification is uncertain. The taxonomy of Astartidae may be difficult to resolve without extensive work, however it may be of interest to examine selected specimens for chronological analyses of their thick shells (e.g., Moss et al. 2018).

Gastropods are in need of confirmation for two groups: Buccinidae whelks and nudibranchs. The whelks are variable in shell form and also controversial in taxonomy (Brunel et al. 1998). Presently, two species are known (*Buccinum undatum, B. scalariforme*), but even these are uncertain as to their shape, genetics, and distribution (Magnúsdóttir et al. 2019). Off of Newfoundland, there is reported to be a deepsea (>500 m) version of *B. scalariforme* (Montgomery et al. 2017), although this has not been observed elsewhere. A third type has long been recorded as *B. totteni*, then updated to *B. polare*, but a recent review suggests the latter is a Pacific species and the local species may be the long-forgotten species *B. terraenovae* (Fraussen and Terryn 2019). Another group of whelks, of the genus *Neptunea,* are usually considered as two types: *N. despecta* and *N. decemcostata*. The latter species may be more southern in distribution and have been mistaken for the juveniles of *N. despecta* in the region. Nudibranchs also have several cryptic taxa that often have revisions, for example with the re-discovery of the little-known *Dendronotus elegans* following a review of the recent species *D. niveus* (Valdés et al. 2017, Korshunova et al. 2020). The red-fingered nudibranchs have a complex taxonomic history (Korshunova et al. 2017). The observed species was *Borealea nobilis,* previously of the genus *Flabellina* or *Coryphella* (http://www.marinespecies.org/aphia.php?p=image&tid=1048814&pic=65178). Along with the local deepwater species (e.g., *Buccinum cyaneum, Doridoxa ingolfiana*), these whelks and nudibranchs are in need of genetic analyses to be effective with eDNA for monitoring of diversity and distributions.

The velutinid *Onchidiopsis corys* is a naked gastropod with only a vestigial internal shell, it may be mistaken for a nudibranch. Similar species include *O. glacialis* in the Arctic and *Calyptoconcha pellucida* in the Atlantic. The species *O. corys* is reported from the north shore (Brunel et al. 1998) and confirmed from photos by P. Sargent (DFO-NL) (https://inaturalist.ca/observations/41635104). Specimens were remarkable for their relatively large size (5-15 cm), possibly greater than the size of others recorded elsewhere, and for all species in the family.

Chitons (Polyplacophora) of family Tonicellidae have two well-known species that are present in the region, but that are very difficult to identify, usually requiring close examination of the mantle girdle surface. The species *Tonicella marmorea* has minute granules, not easily seen in photos, which are absent in *Boreochiton ruber*. In some specimens, the patterns and colouring of girdle bands may also be used to discriminate between the two species (Smith and Lightfoot 2020, Smith et al. 2020). In the pair of photos presented in the Appendix, the top specimen is likely to be *T. marmorea* (see discussion: https://inaturalist.ca/observations/41637889), while the bottom one may be an example of *B. ruber*.

Cephalopods were infrequent on the survey, but also merit examination. Boreal octopus (*Bathypolypus bairdii*) may attain unusually large sizes in the Canadian Arctic (Gardiner and Dick 2010) as well as in coldwater areas such as the Saguenay Fjord (J. Gauthier, DFO-MLI, pers. comm., https://inaturalist.ca/observations/54751039) and Minganie. A sepiolid was also seen in captures, presumably of *R. palpebrosa*, as the other resident species, *R. megaptera,* was found at depths of 180 m or more (Mercer 1968), however, the two species may be difficult to distinguish in photos (Frandsen and Zumholz 2004). While both were present in this shallow water survey, the captures of cephalopods are usually in deep channels of the Estuary and Gulf of St. Lawrence (Chabot et al. 2007), and thus aspects of their growth, distribution, and environmental preferences may be worth investigating.

Polychaetes

Most worms are fragile and endobenthic (burrowing), and only a few specimens were collected from dredging scallop beds, including scale worms (Polynoidae) on hard surfaces, tube worms (Sabellidae, Terebellidae) in crevices, and large specimens of endobenthic errant worms (Nephtyidae, Nereididae). Several cryptic species are suspected among the families found on the survey. Rigourous analyses of both morphology and genetics on conserved specimens will be necessary to validate checklists and records, both for historical names and new species.

Sponges

Sponges have increasingly been a focus on the northern and southern Gulf surveys since the 2000s (Kenchington et al. 2016, Nozères et al. 2020), with records based largely on morphotypes or common species, however, laboratory work is sometimes needed for confirmation. A funnel sponge seen in photos may be the new species *Plicatellopsis bowerbanki* (Dinn et al. 2020), but this will require spicule examination. In some instances, photos may be reasonable sufficient to suggest species once a reference type has been established. A recent analysis of fan-shaped sponges revealed *Isodictya palmata* as having been historically misidentified for the lesser-known species *Cladocroce spatula* (Dinn et al. 2020), which can now be recorded for similar-looking specimens. Another erect sponge was presumed to be of *Haliclona oculata*, although some specimens were also similar to the traditional *Isodictya*-type. As with *C. spatula*, this sponge and the unknown types (Porifera A to F) may be of taxa not yet reported or misidentified in the Estuary and Gulf of St. Lawrence (Brunel et al. 1998) and should be sampled for future analyses of their morphology and DNA.

Teleost fishes

Small specimen of some fish species cannot be readily identified from photos. As juveniles (< 20 cm), Atlantic Cod (*Gadus morhua*) cannot be distinguished from Ogac (*Gadus macrocephalus*), although Atlantic Cod are more common and thus more likely. Redfishes can be distinguished by examining the anal fin rays; the presented specimen appeared to have 8 soft rays, suggesting it was the common Deepwater Redfish (*Sebastes mentella*) rather than the Acadian Redfish (*Sebastes fasciatus*). In another example, small (< 20 cm) specimens of *Myoxocephalus* sculpins could be either *M.*

aenaeus or *M. scorpius*, while large ones were of all of *M. scorpius*. Snailfishes were also difficult to identify when small, being of possibly one or more confused species, i.e*., Liparis atlanticus, L. coheni, L. inquilinus,* or *L. tunicatus* (Able and Irion 1985), while all large ones (> 20 cm) were of *L. bathyarcticus*. The latter is a new species, distinguished by its genetics and distribution in the NW Atlantic (Mecklenburg et al. 2018), apart from the older name of *L. gibbus* that now refers to a species in Alaska.

CONCLUSIONS

The photo catalogue was an efficient means to provide insights on the species encountered on a scallop survey. The catalogue raised awareness of taxa in records, some of which may be useful indicators for environmental analyses. Limits of this tool were also encountered, in the level of validation possible with photos, especially for encrusting organisms, and the need for taxonomic review of cryptic taxa, in particular for the sponges, anemones, and gastropods.

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APPENDIX

Photo catalogue of invertebrate and fish taxa seen on the Icelandic scallop (*Chlamys islandica*) survey in the Mingan Archipelago, from 2007 to 2018.

Table A1. List of taxa as presented in the photo catalogue of the scallop survey in the Mingan Archipelago from 2007-2018, with classification by phyla, class, and family. Visually similar groups are adjacent to each other, then ordered alphabetically within groups, by family and taxon.

Phyla	Class	Familly	Taxon
Sponges			
Porifera	Demospongiae	Chalinidae	*Cladocrace spatula*
Porifera	Demospongiae	Chalinidae	*Haliclona oculata*
Porifera	Demospongiae	Mycalidae	*Mycale lingua*
Porifera	Calcarea	Sycettidae	*Sycon* sp.
Porifera			Porifera A (cf. *Plicatellopsis bowerbanki*)
Porifera			Porifera B (hirsute, cf. Tetilidae)
Porifera			Porifera C (morel mushroom-like)
Porifera			Porifera D (encrusting)
Porifera			Porifera E (papillate)
Porifera			Porifera F (cf. *Halichondria* sp.)
Anthozoans (sea anemones and soft corals)			
Cnidaria	Anthozoa	Actiniidae	Actiniidae (cf. *Cribrinopsis similis*)
Cnidaria	Anthozoa	Actinostolidae	*Stomphia coccinea*
Cnidaria	Anthozoa	Metridiidae	*Metridium senile*
Cnidaria	Anthozoa	Ptychodactinidae	*Ptychodactis patula*
Cnidaria	Anthozoa	Nephtheidae	*Gersemia rubiformis*
Hydrozoans (hydroid polyps)			
Cnidaria	Hydrozoa	Sertulariidae	*Thuiaria thuja*
Cnidaria	Hydrozoa	Sertulariidae	Sertulariidae A
Cnidaria	Hydrozoa	Sertulariidae	Sertulariidae B
Cnidaria	Hydrozoa	Tubulariidae	*Tubularia indivisa*
Stalked jellies			
Cnidaria	Staurozoa	Lucernariidae	*Lucernaria quadricornis*
Bryozoans			
Bryozoa	Gymnolaemata	Celleporidae	*Celleporina surcularis*
Bryozoa	Gymnolaemata		Cheilostomatida (cf. *Posterula sarsi*)
Bryozoa	Gymnolaemata		Cheilostomatida (cf. *Smittina* sp.)
Bryozoa	Gymnolaemata		Cheilostomatida A
Bryozoa	Gymnolaemata		Cyclostomatida (cf. *Exidmonea atlantica*)
Bryozoa	Gymnolaemata		Cyclostomatida (cf. *Lichenopora* sp.)
Brachiopods (lamp shells)			
Brachiopoda	Rhynchonellata	Hemithiriididae	*Hemithiris psittacea*
Brachiopoda	Rhynchonellata	Cancellothyrididae	*Terebratulina septentrionalis*
Bivalves			

Phyla	Class	Familly	Taxon
Mollusca	Bivalvia	Anomiidae	*Heteranomia squamula*
Mollusca	Bivalvia	Astartidae	*Astarte borealis*
Mollusca	Bivalvia	Astartidae	*Astarte elliptica*
Mollusca	Bivalvia	Cardiidae	*Ciliatocardium ciliatum*
Mollusca	Bivalvia	Cardiidae	*Serripes groenlandicus*
Mollusca	Bivalvia	Carditidae	*Cyclocardia borealis*
Mollusca	Bivalvia	Hiatellidae	*Hiatella arctica*
Mollusca	Bivalvia	Limidae	*Limatula subauriculata*
Mollusca	Bivalvia	Lyonsiidae	*Lyonsia arenosa*
Mollusca	Bivalvia	Mytilidae	*Musculus discors*
Mollusca	Bivalvia	Mytilidae	*Musculus niger*
Mollusca	Bivalvia	Mytilidae	*Solamen glandula*
Mollusca	Bivalvia	Pectinidae	*Chlamys islandica*
Mollusca	Bivalvia	Pectinidae	*Placopecten magellanicus*
Mollusca	Bivalvia	Tellinidae	*Macoma calcarea*
Mollusca	Bivalvia	Yoldiidae	*Yoldia myalis*
Gastropods			
Mollusca	Gastropoda	Aporrhaidae	*Arrhoges occidentalis*
Mollusca	Gastropoda	Buccinidae	*Aulacofusus brevicauda*
Mollusca	Gastropoda	Buccinidae	*Buccinum scalariforme*
Mollusca	Gastropoda	Buccinidae	*Buccinum terraenovae*
Mollusca	Gastropoda	Buccinidae	*Buccinum undatum*
Mollusca	Gastropoda	Buccinidae	*Neptunea despecta*
Mollusca	Gastropoda	Buccinidae	*Plicifusus kroyeri*
Mollusca	Gastropoda	Buccinidae	*Volutopsius norwegicus*
Mollusca	Gastropoda	Capulidae	*Ariadnaria borealis*
Mollusca	Gastropoda	Mangeliidae	*Propebela scalaris*
Mollusca	Gastropoda	Muricidae	*Boreotrophon* (cf. *clathratus*)
Mollusca	Gastropoda	Muricidae	*Scabrotrophon fabricii*
Mollusca	Gastropoda	Margaritidae	*Margarites costalis*
Mollusca	Gastropoda	Margaritidae	*Margarites groenlandicus*
Mollusca	Gastropoda	Naticidae	*Cryptonatica affinis*
Mollusca	Gastropoda	Naticidae	*Euspira pallida*
Mollusca	Gastropoda	Velutinidae	*Onchidiopsis corys*
Mollusca	Gastropoda	Velutinidae	*Velutina velutina*
Mollusca	Gastropoda	Onchidorididae	*Adalaria proxima*
Mollusca	Gastropoda	Dorididae	*Aldisa zetlandica*
Mollusca	Gastropoda	Coryphellidae	*Borealea nobilis*
Mollusca	Gastropoda	Dendronotidae	*Dendronotus frondosus*
Mollusca	Gastropoda	Dendronotidae	*Dendronotus elegans*
Mollusca	Gastropoda	Lepetidae	*Lepeta caeca*
Chitons			
Mollusca	Polyplacophora	Ischnochitonidae	*Stenosemus albus*
Mollusca	Polyplacophora	Tonicellidae	Tonicellidae (cf. *Boreochiton ruber*)
Mollusca	Polyplacophora	Tonicellidae	Tonicellidae (cf. *Tonicella marmorea*)

Phyla	Class	Familly	Taxon
Cephalopods			
Mollusca	Cephalopoda	Bathypolypodidae	*Bathypolypus bairdii*
Mollusca	Cephalopoda	Sepiolidae	*Rossia* (cf. *palpebrosa*)
Polychaete worms			
Annelida	Polychaeta	Nereididae	*Nereis* sp.
Annelida	Polychaeta	Nephtyidae	*Nephtys* sp.
Annelida	Polychaeta	Phyllodocidae	*Phyllodoce* sp.
Annelida	Polychaeta	Polynoidae	Polynoidae
Annelida	Polychaeta	Sabellidae	Sabellidae (cf. *Chone*)
Annelida	Polychaeta	Sabellidae	*Myxicola infundibulum*
Annelida	Polychaeta	Spionidae	*Polydora* sp.
Annelida	Polychaeta	Terebellidae	Terebellidae
Nemertean worms			
Nemertea	Hoplonemertea	Amphiporidae	*Amphiporus angulatus*
Nemertea			Nemertea (cf. *Lineus*)
Peanut worms			
Sipuncula	Sipunculidea	Golfingiidae	*Golfingia* sp.
Barnacles			
Arthropoda	Hexanauplia	Balanidae	*Balanus* (cf. *balanus*)
Amphipods			
Arthropoda	Malacostraca	Ampeliscidae	*Ampelisca* sp.
Arthropoda	Malacostraca	Eusiridae	*Eusirus cuspidatus*
Arthropoda	Malacostraca	Melitidae	Melitidae
Arthropoda	Malacostraca	Paramphithoidae	*Paramphithoe hystrix*
Arthropoda	Malacostraca	Uristidae	*Anonyx* sp.
Isopods			
Arthropoda	Malacostraca	Idoteidae	*Synidotea marmorata*
Crabs			
Arthropoda	Malacostraca	Cancridae	*Cancer irroratus*
Arthropoda	Malacostraca	Oregoniidae	*Chionoecetes opilio*
Arthropoda	Malacostraca	Oregoniidae	*Hyas araneus*
Arthropoda	Malacostraca	Oregoniidae	*Hyas coarctatus*
Arthropoda	Malacostraca	Paguridae	*Pagurus* (cf. *pubescens*)
Shrimps			
Arthropoda	Malacostraca	Crangonidae	*Sclerocrangon boreas*
Arthropoda	Malacostraca	Pandalidae	*Pandalus borealis*
Arthropoda	Malacostraca	Pandalidae	*Pandalus montagui*
Arthropoda	Malacostraca	Thoridae	*Eualus fabricii*
Arthropoda	Malacostraca	Thoridae	*Eualus gaimardii*
Arthropoda	Malacostraca	Thoridae	*Lebbeus groenlandicus*
Arthropoda	Malacostraca	Thoridae	*Lebbeus polaris*
Arthropoda	Malacostraca	Thoridae	*Spirontocaris spinus*
Sea cucumbers			
Echinodermata	Holothuroidea	Chiridotidae	*Chiridota laevis*
Echinodermata	Holothuroidea	Cucumariidae	*Cucumaria frondosa*

Phyla	Class	Familly	Taxon
Echinodermata	Holothuroidea	Cucumariidae	*Ekmania barthii*
Echinodermata	Holothuroidea	Psolidae	*Psolus phantapus*
Sea stars			
Echinodermata	Asteroidea	Asteriidae	*Asterias rubens*
Echinodermata	Asteroidea	Asteriidae	*Leptasterias polaris*
Echinodermata	Asteroidea	Asteriidae	*Leptasterias groenlandica*
Echinodermata	Asteroidea	Echinasteridae	*Henricia* sp.
Echinodermata	Asteroidea	Solasteridae	*Crossaster papposus*
Echinodermata	Asteroidea	Solasteridae	*Solaster endeca*
Echinodermata	Asteroidea	Pterasteridae	*Pteraster militaris*
Brittle stars			
Echinodermata	Ophiuroidea	Gorgonocephalidae	*Gorgonocephalus* sp.
Echinodermata	Ophiuroidea	Ophiacanthidae	*Ophiacantha bidentata*
Echinodermata	Ophiuroidea	Ophiopholidae	*Ophiopholis aculeata*
Echinodermata	Ophiuroidea	Ophiuridae	*Ophiura robusta*
Echinodermata	Ophiuroidea	Ophiopyrgidae	*Stegophiura nodosa*
Sea urchins			
Echinodermata	Echinoidea	Strongylocentrotidae	*Strongylocentrotus* sp.
Echinodermata	Echinoidea	Echinarachniidae	*Echinarachnius parma*
Tunicates (Ascidians)			
Chordata	Ascidiacea	Ascidiidae	*Ascidia* sp.
Chordata	Ascidiacea	Molgulidae	*Molgula griffithsii*
Chordata	Ascidiacea	Molgulidae	*Molgula pedunculata*
Chordata	Ascidiacea	Molgulidae	*Molgula retortiformis*
Chordata	Ascidiacea	Pyuridae	*Boltenia echinata*
Chordata	Ascidiacea	Pyuridae	*Boltenia ovifera*
Chordata	Ascidiacea	Pyuridae	*Halocynthia pyriformis*
Chordata	Ascidiacea	Styelidae	*Botrylloides aureus*
Chordata	Ascidiacea	Styelidae	*Cnemidocarpa finmarkiensis*
Chordata	Ascidiacea	Styelidae	*Dendrodoa carnea*
Chordata	Ascidiacea	Styelidae	*Styela coriacea*
Chordata	Ascidiacea	Styelidae	*Styela rustica*
Chordata	Ascidiacea	Didemnidae	*Didemnum albidum*
Chordata	Ascidiacea	Didemnidae	*Tridemnum tenerum*
Chordata	Ascidiacea	Didemnidae	Didemnidae
Chordata	Ascidiacea	Polyclinidae	*Synoicum pulmonaria*
Teleostei (Bony fishes)			
Chordata	Actinopterygii	Gadidae	*Gadus* (cf. *morhua*)
Chordata	Actinopterygii	Pleuronectidae	*Hippoglossoides platessoides*
Chordata	Actinopterygii	Pleuronectidae	*Hippoglossus hippoglossus*
Chordata	Actinopterygii	Pleuronectidae	*Limanda ferruginea*
Chordata	Actinopterygii	Ammodytidae	*Ammodytes* sp.
Chordata	Actinopterygii	Anarhichadidae	*Anarhichas lupus*
Chordata	Actinopterygii	Stichaeidae	*Eumesogrammus praecisus*
Chordata	Actinopterygii	Stichaeidae	*Leptoclinus maculatus*

Phyla	Class	Familly	Taxon
Chordata	Actinopterygii	Stichaeidae	*Stichaeus punctatus*
Chordata	Actinopterygii	Stichaeidae	*Ulvaria subbifurcata*
Chordata	Actinopterygii	Zoarcidae	*Gymnelus viridis*
Chordata	Actinopterygii	Zoarcidae	*Lycodes lavalaei*
Chordata	Actinopterygii	Zoarcidae	*Zoarces americanus*
Chordata	Actinopterygii	Agonidae	*Aspidophoroides monopterygius*
Chordata	Actinopterygii	Agonidae	*Leptagonus decagonus*
Chordata	Actinopterygii	Cottidae	*Gymnocanthus tricuspis*
Chordata	Actinopterygii	Cottidae	*Icelus spatula*
Chordata	Actinopterygii	Cottidae	*Myoxocephalus* sp.
Chordata	Actinopterygii	Cottidae	*Myoxocephalus scorpius*
Chordata	Actinopterygii	Cottidae	*Triglops murrayi*
Chordata	Actinopterygii	Cyclopteridae	*Cyclopterus lumpus*
Chordata	Actinopterygii	Cyclopteridae	*Eumicrotremus terraenovae*
Chordata	Actinopterygii	Hemitripteridae	*Hemitripterus americanus*
Chordata	Actinopterygii	Liparidae	*Liparis* (cf. *atlanticus*)
Chordata	Actinopterygii	Liparidae	*Liparis bathyarcticus*
Chordata	Actinopterygii	Sebastidae	*Sebastes* (cf. *mentella*)
Animalia			
Unknown: erect, encrusting brown organism, often seen covering scallop shells			

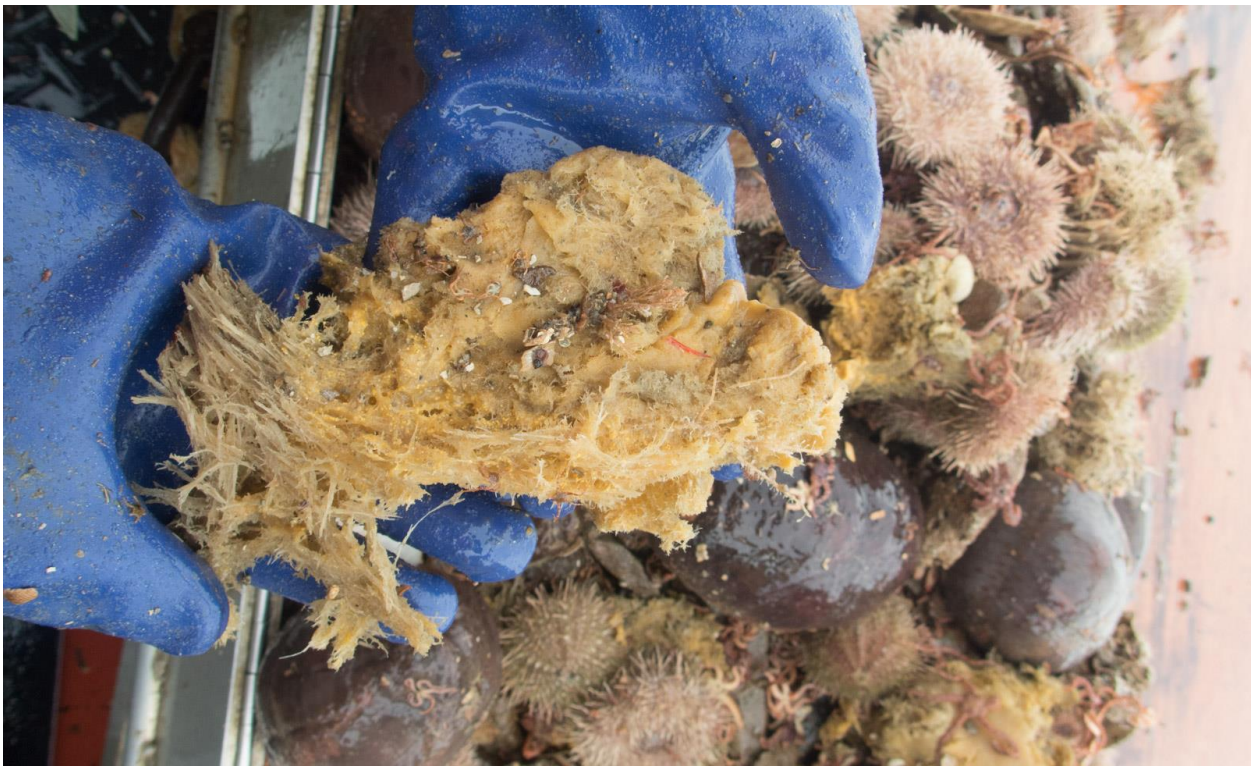
Porifera

Demospongiae: *Cladocrace spatula*

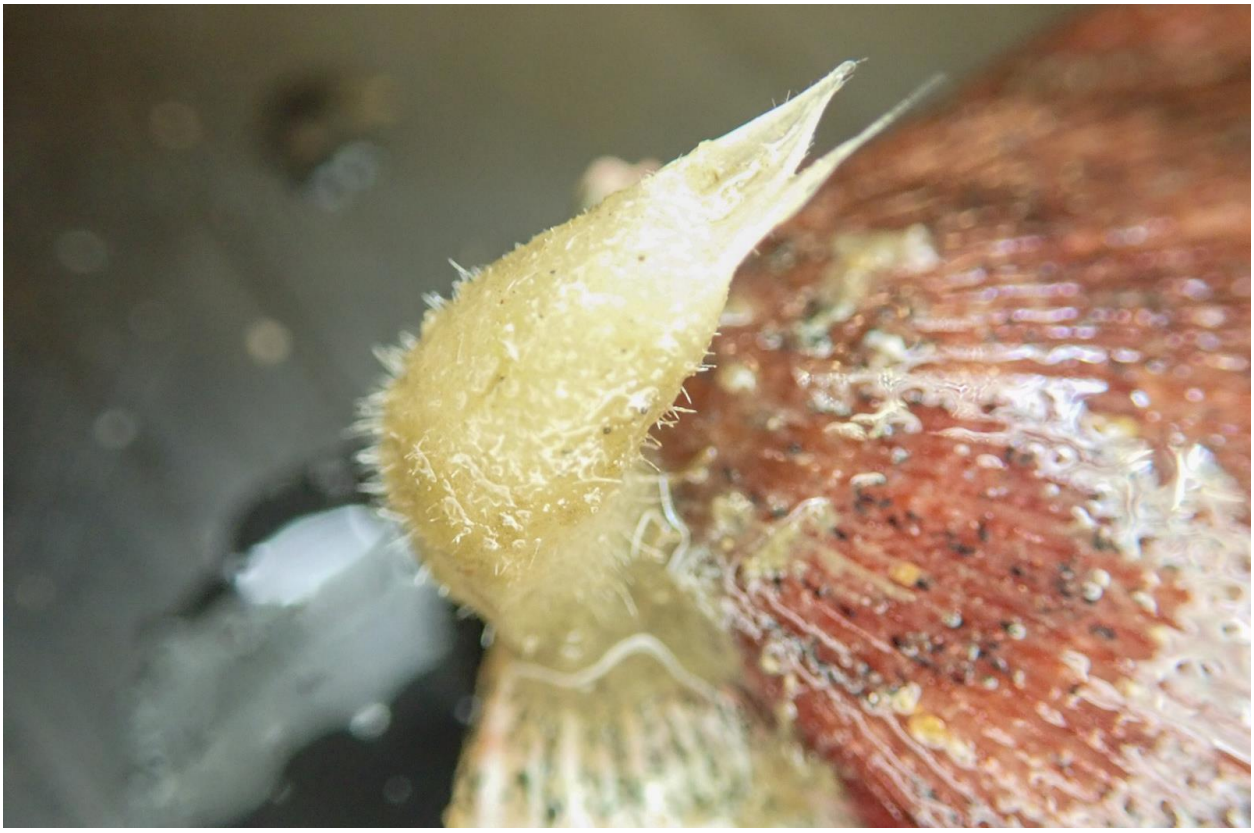
Porifera

Demospongiae: *Haliclona oculata*

Porifera



Demospongiae: *Mycale lingua*

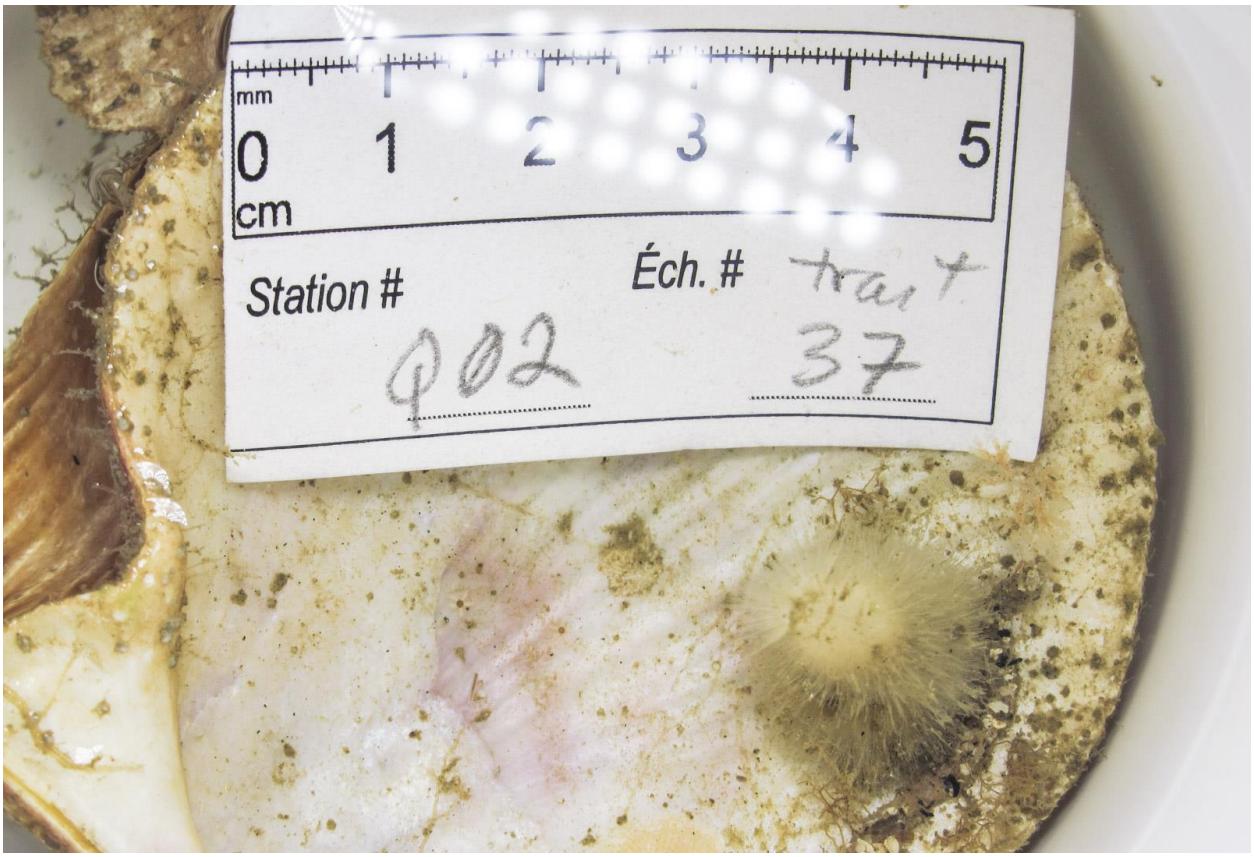


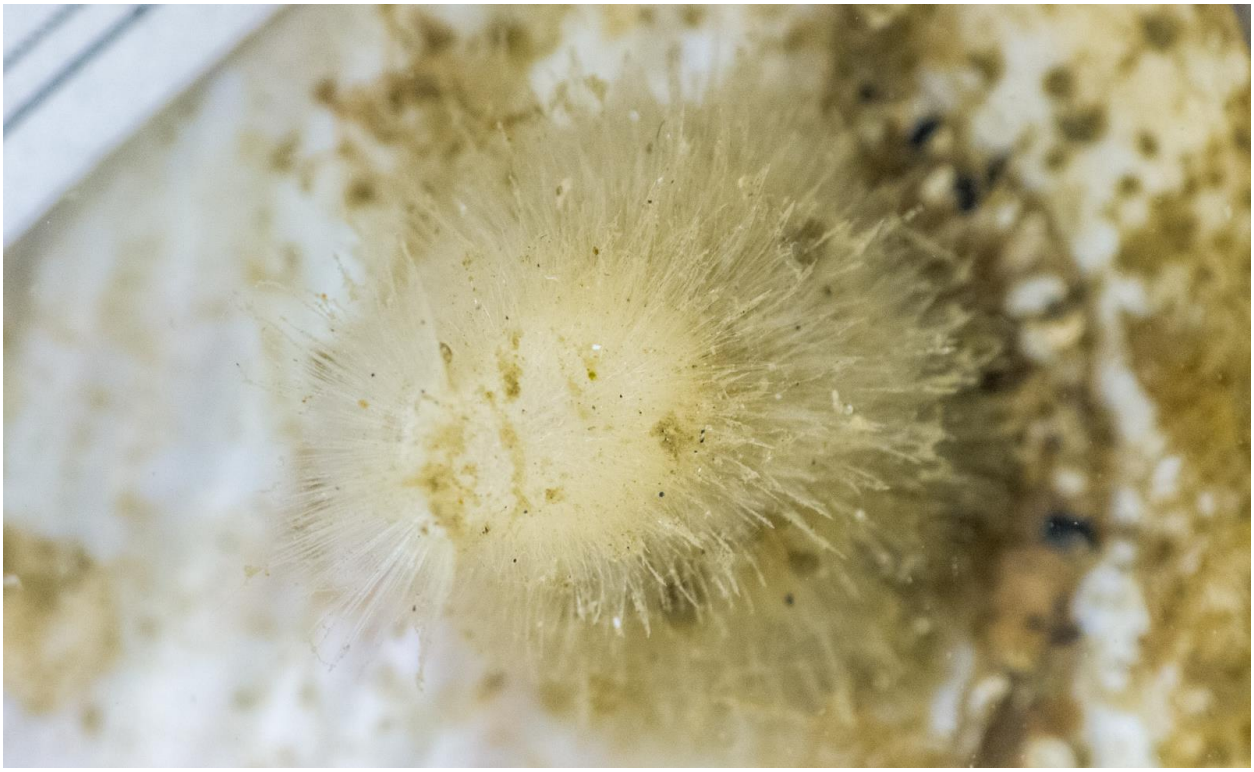
Calcarea: *Sycon* sp.

Porifera

Porifera A (cf. *Plicatellopsis bowerbanki*)

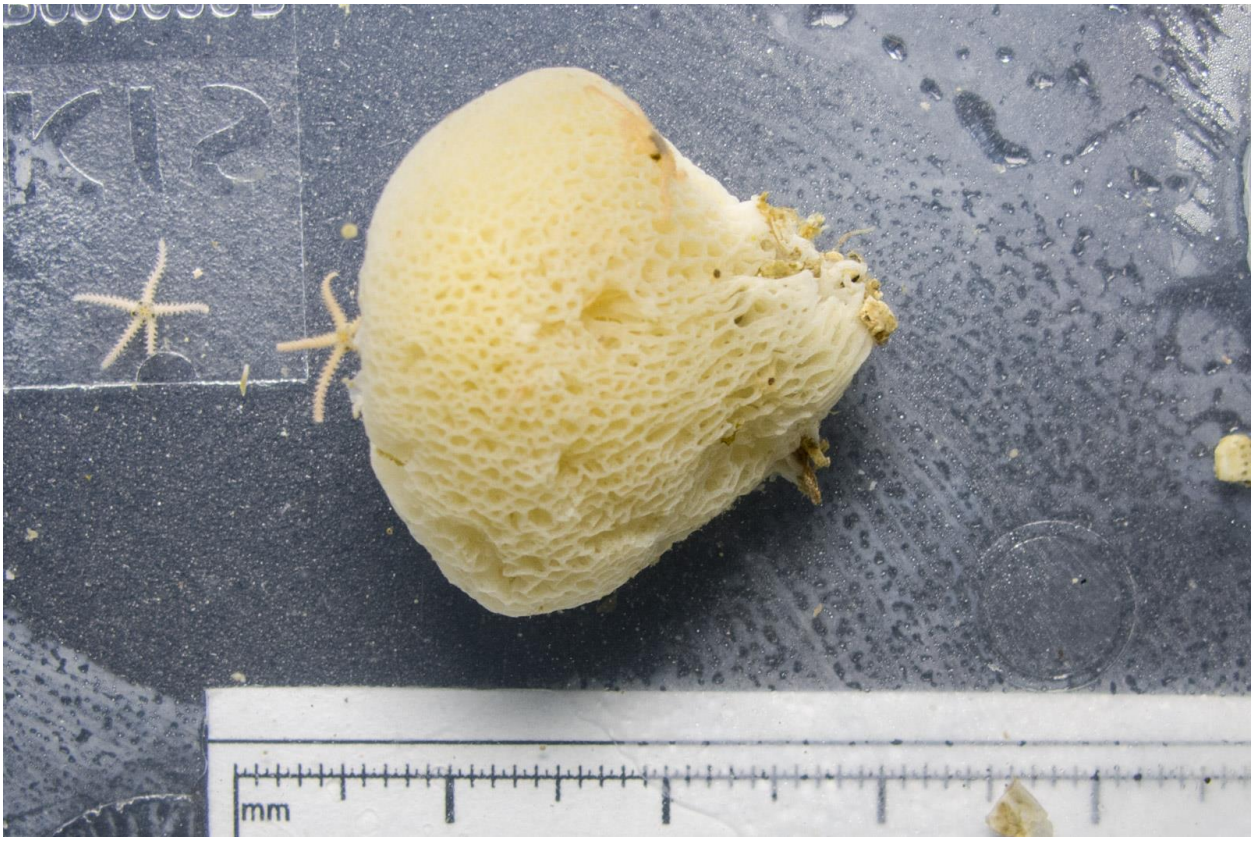
Porifera





Porifera B (non-determined tufted type, cf. Tetillidae)

Porifera

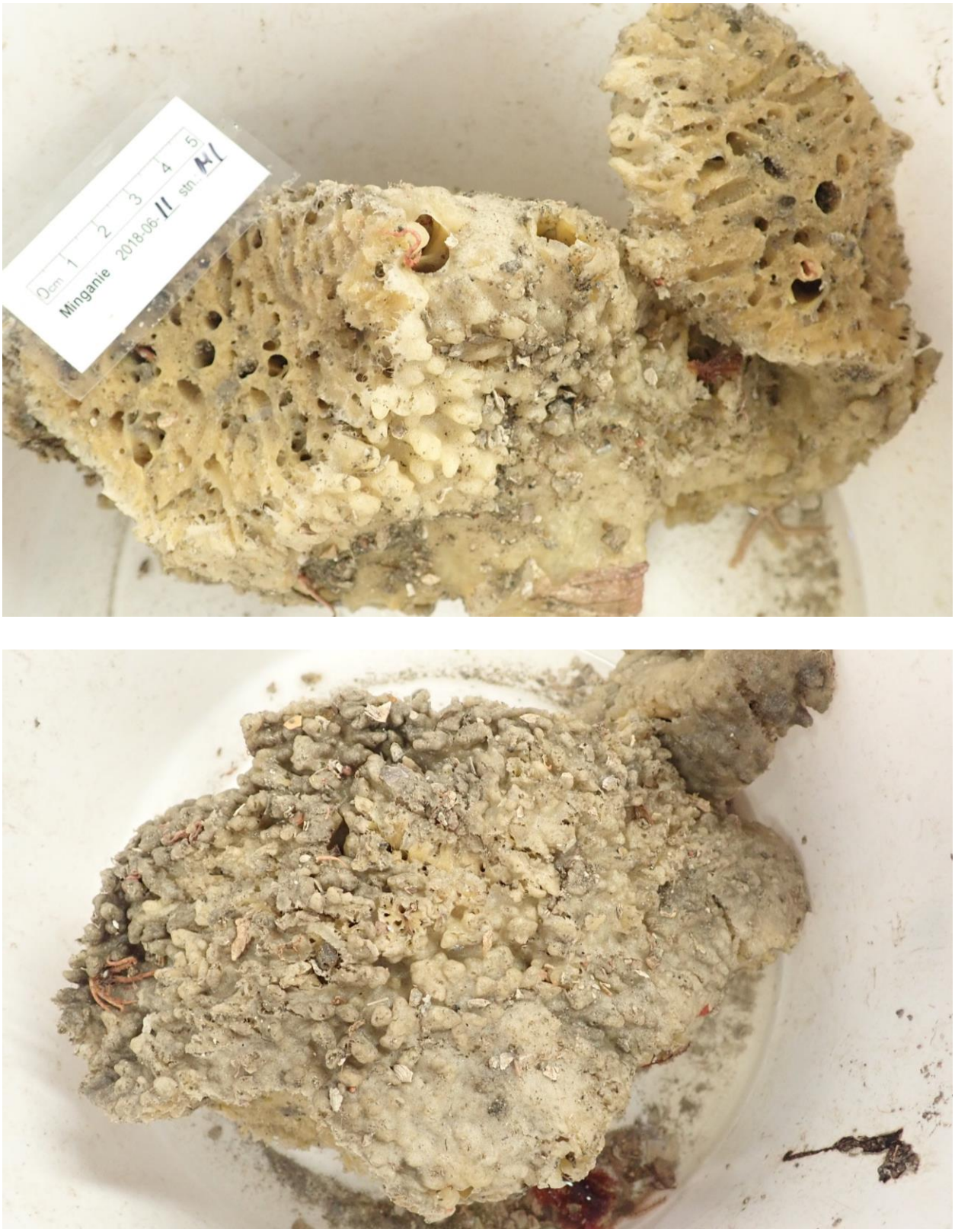


Porifera C (non-determined morel mushroom shaped type)

Porifera

Porifera D (non-determined encrusting yellow or orange type)

Porifera



Porifera E (non-determined papillate type)

Porifera

Porifera F (non-determined sponge, cf. *Halichondria* sp.)

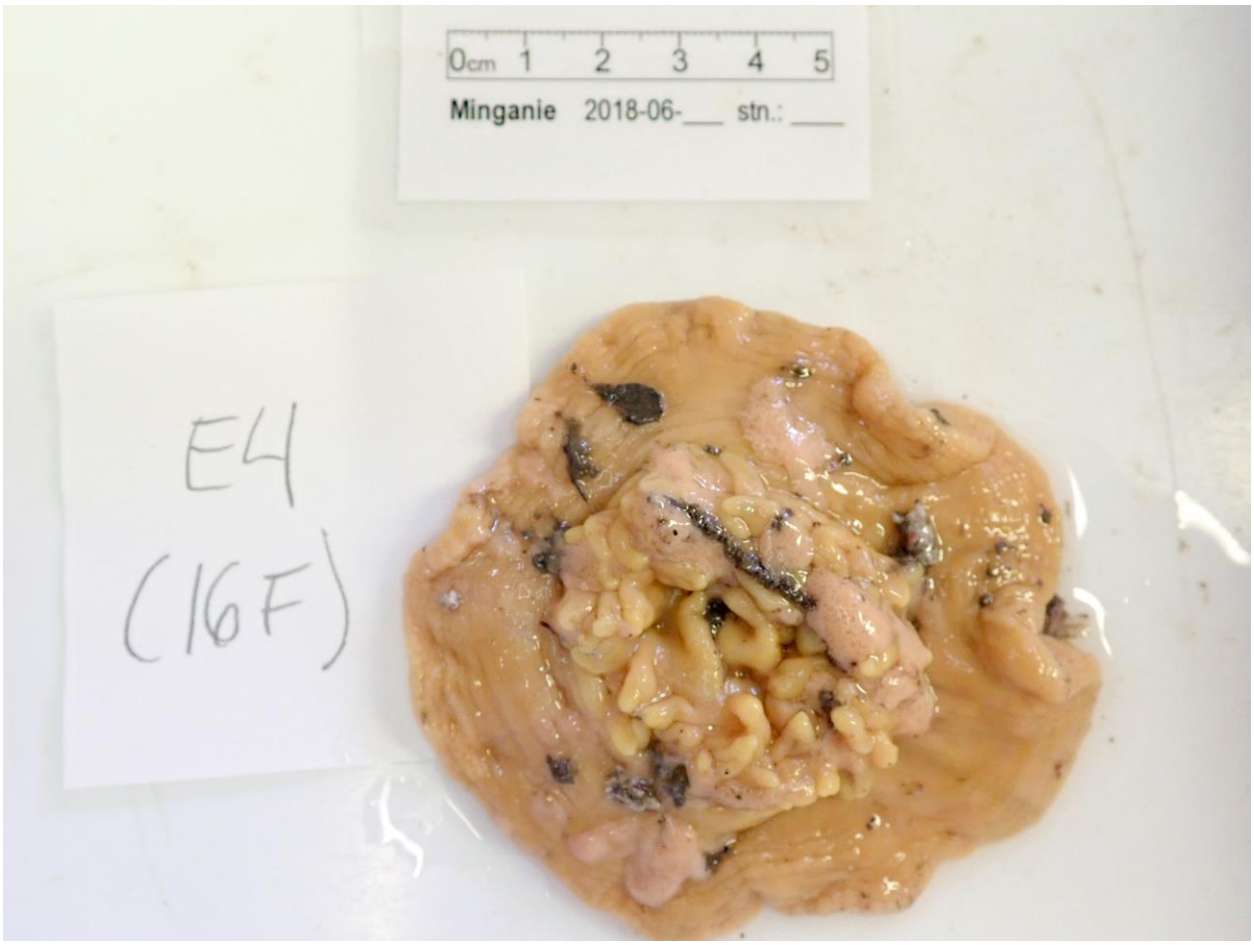
Cnidaria

Anthozoa: Actiniaria: Actiniidae (cf. *Cribrinopsis similis*, with verrucae)

Anthozoa: Actiniaria: *Stomphia coccinea*

Anthozoa: Actiniaria: *Metridium senile*

Cnidaria



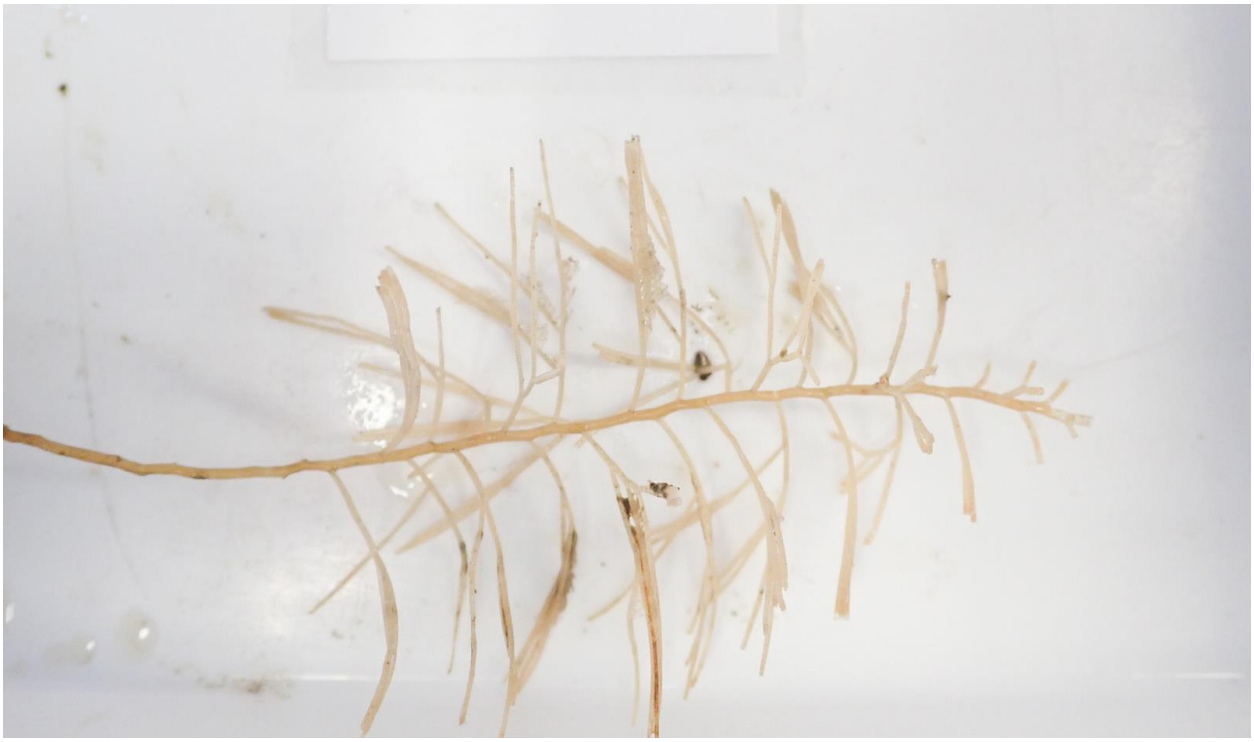
Anthozoa: Actiniaria: *Ptychodactis patula*

Anthozoa: Alcyonacea: *Gersemia rubiformis*

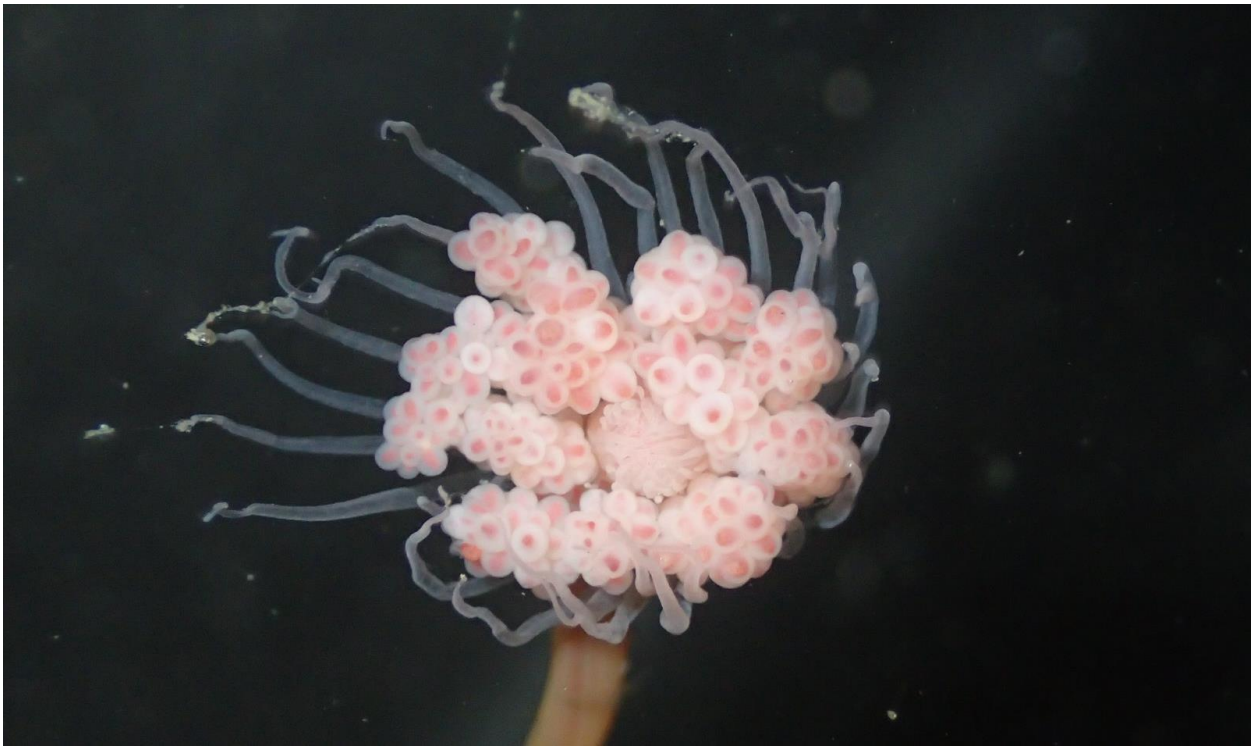
Cnidaria

Hydrozoa: Sertulariidae: *Thuiaria thuja*

Hydrozoa: Sertulariidae A

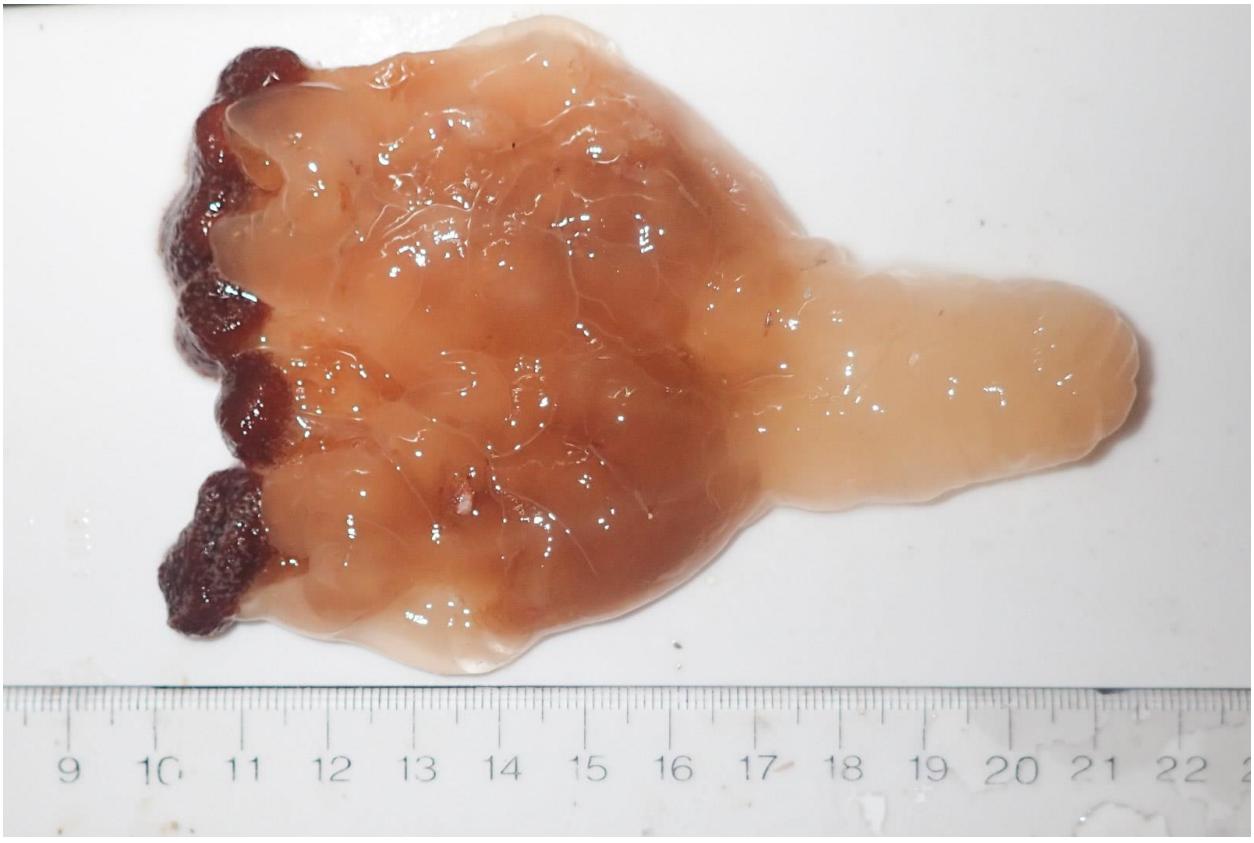


Hydrozoa: Sertulariidae B



Hydrozoa: *Tubularia indivisa*

Cnidaria



Staurozoa: *Lucernaria quadricornis*

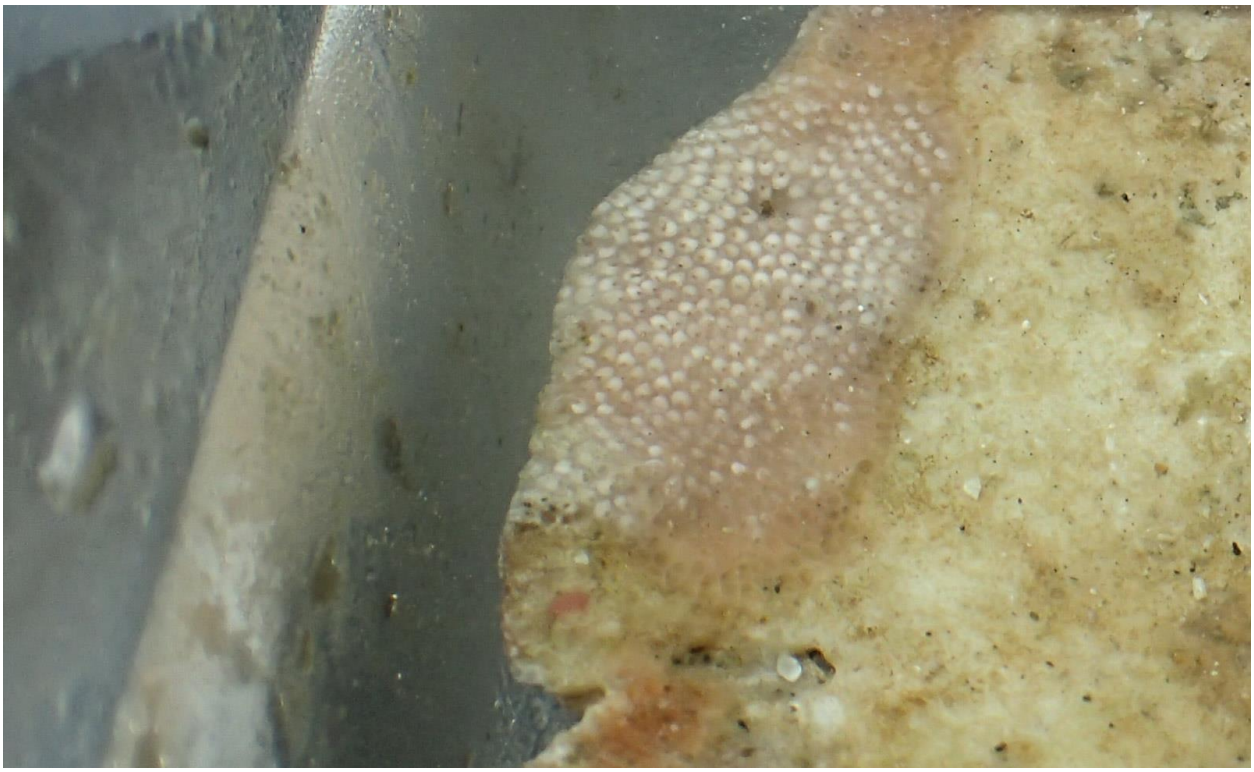
Bryozoa

Cheilostomatida: *Celleporina surcularis*

Bryozoa

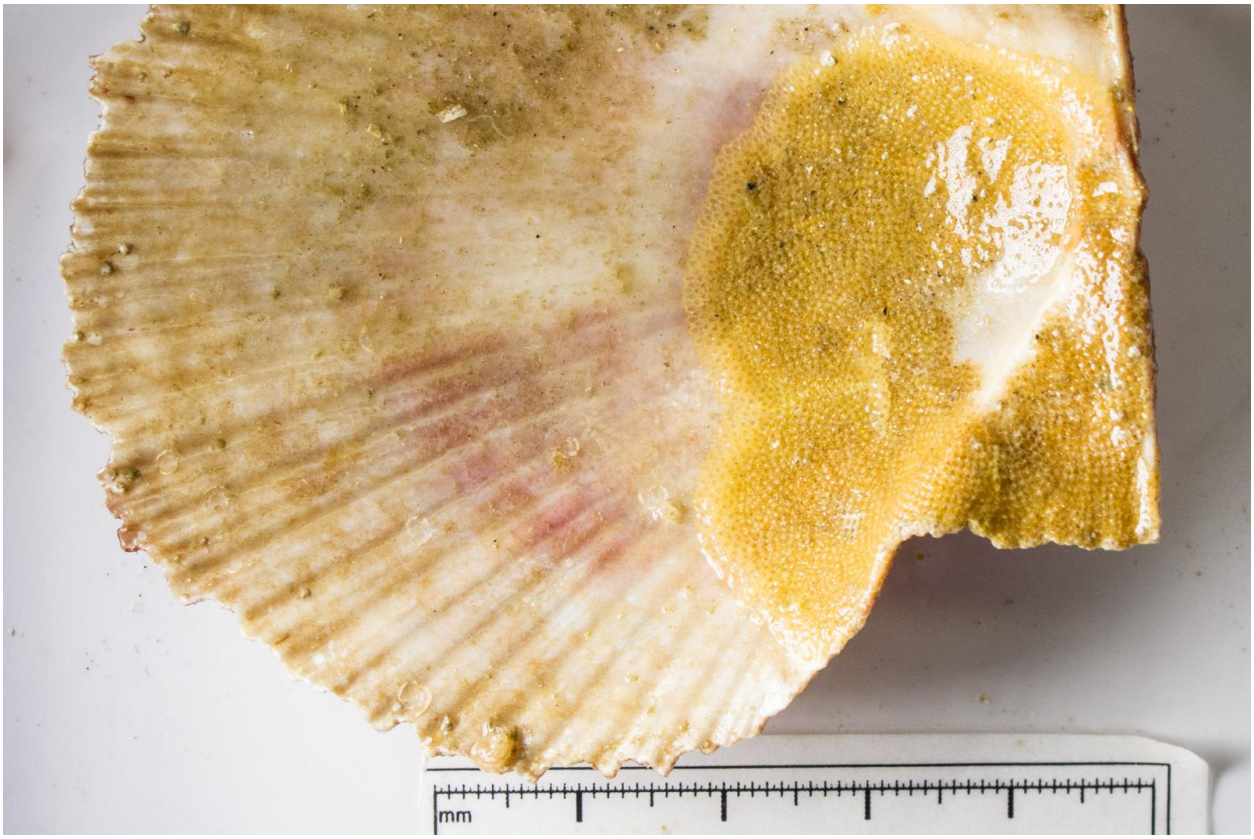
Cheilostomatida (cf. *Posterula sarsii*)

Bryozoa



Cheilostomatida (cf. *Smittina* sp)

Bryozoa



Cheilostomatida A (non-determined)

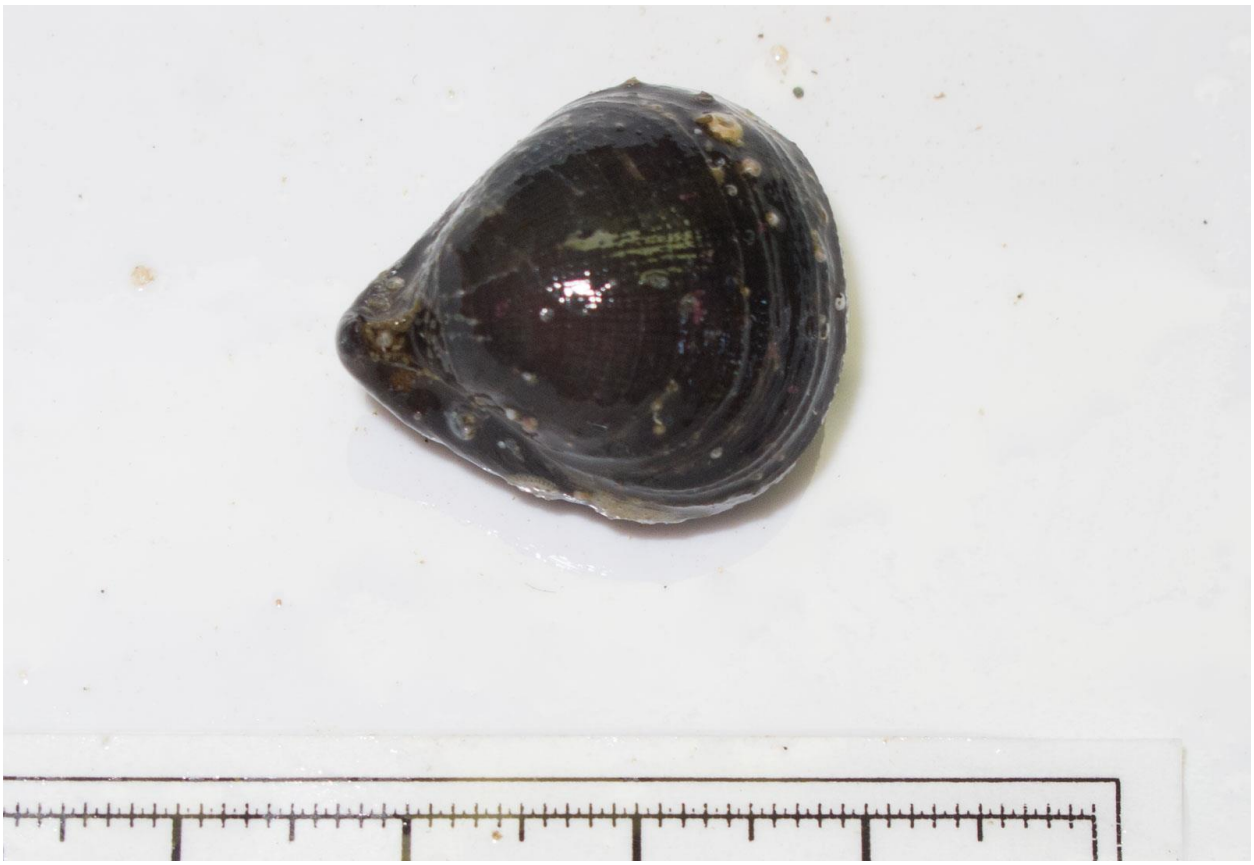
Bryozoa

Cyclostomatida (cf. *Eximonea atlantica*)

Bryozoa

Cyclostomatida (cf. *Lichenopora* sp.)

Brachiopoda



Hemithiridídae: *Hemithiris psittacea*

Cancellothyrididae: *Terebratulina septentrionalis*

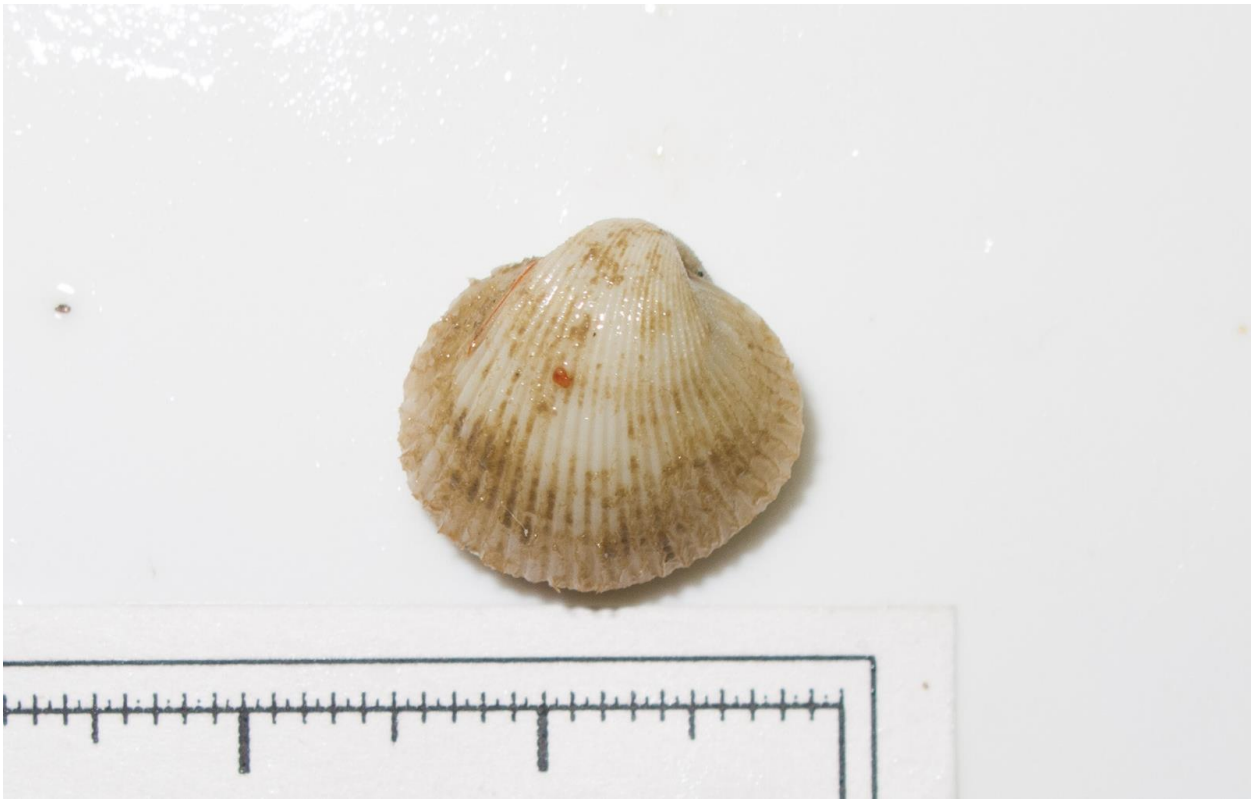
Mollusca

Bivalvia: Anomiidae (cf. *Heteranomia squamula*)

Bivalvia: Astartidae: *Astarte borealis*

Mollusca

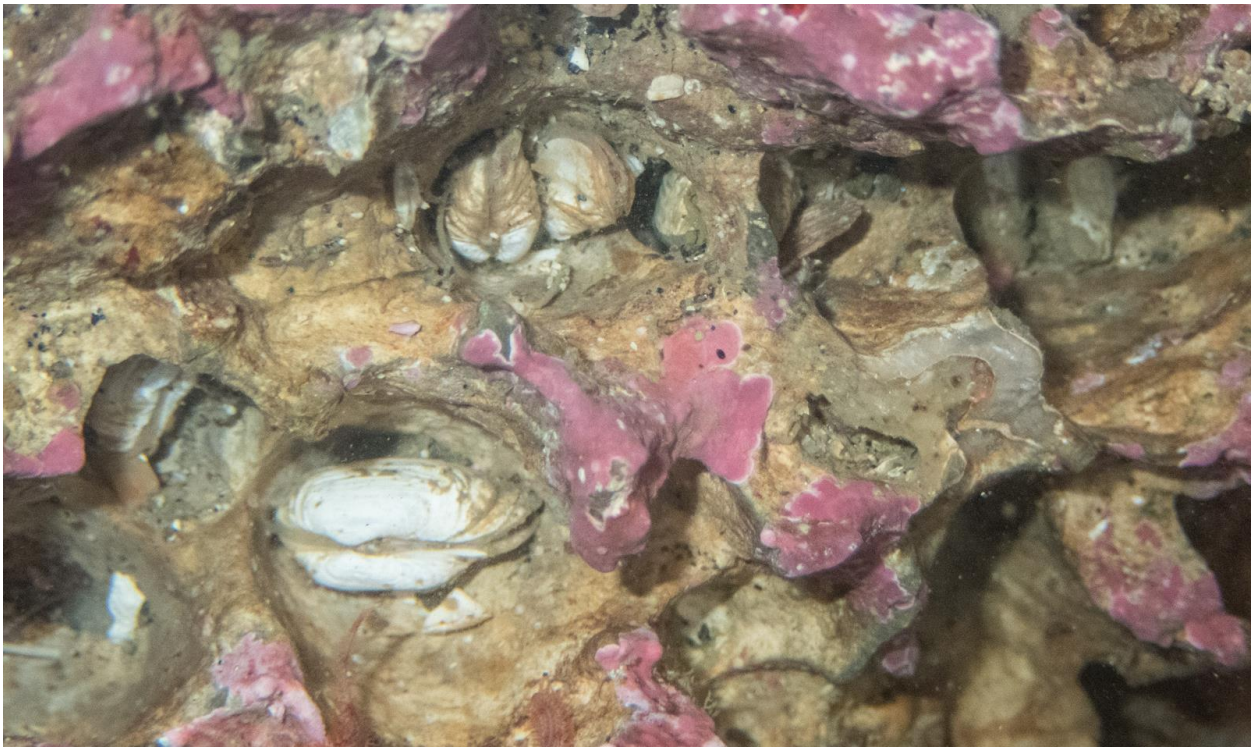
Bivalvia: Astartidae: *Astarte elliptica*



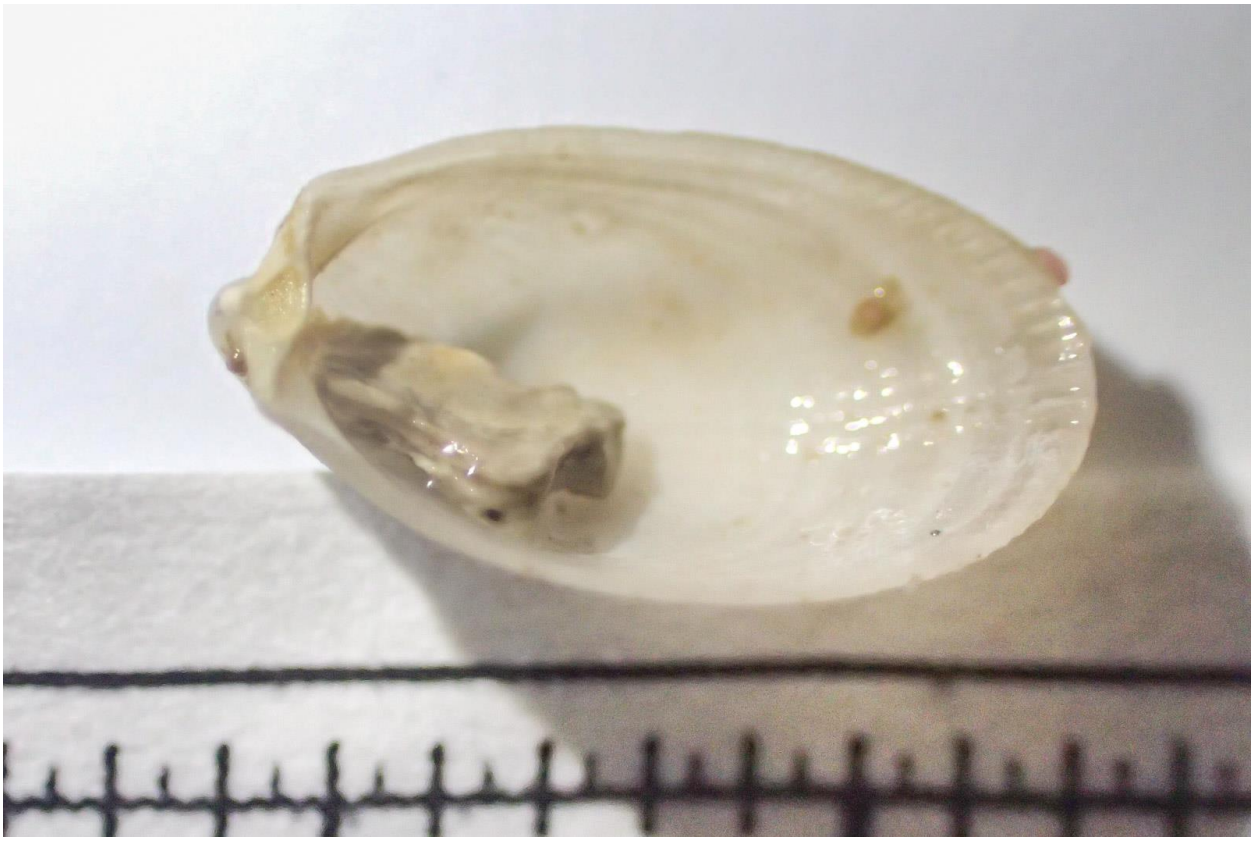
Bivalvia: Cardiidae: *Ciliatocardium ciliatum*

Bivalvia: Cardiidae: *Serripes groenlandicus*

Bivalvia: Carditidae *Cyclocardia borealis*



Bivalvia: Hiatellidae: *Hiatella arctica*



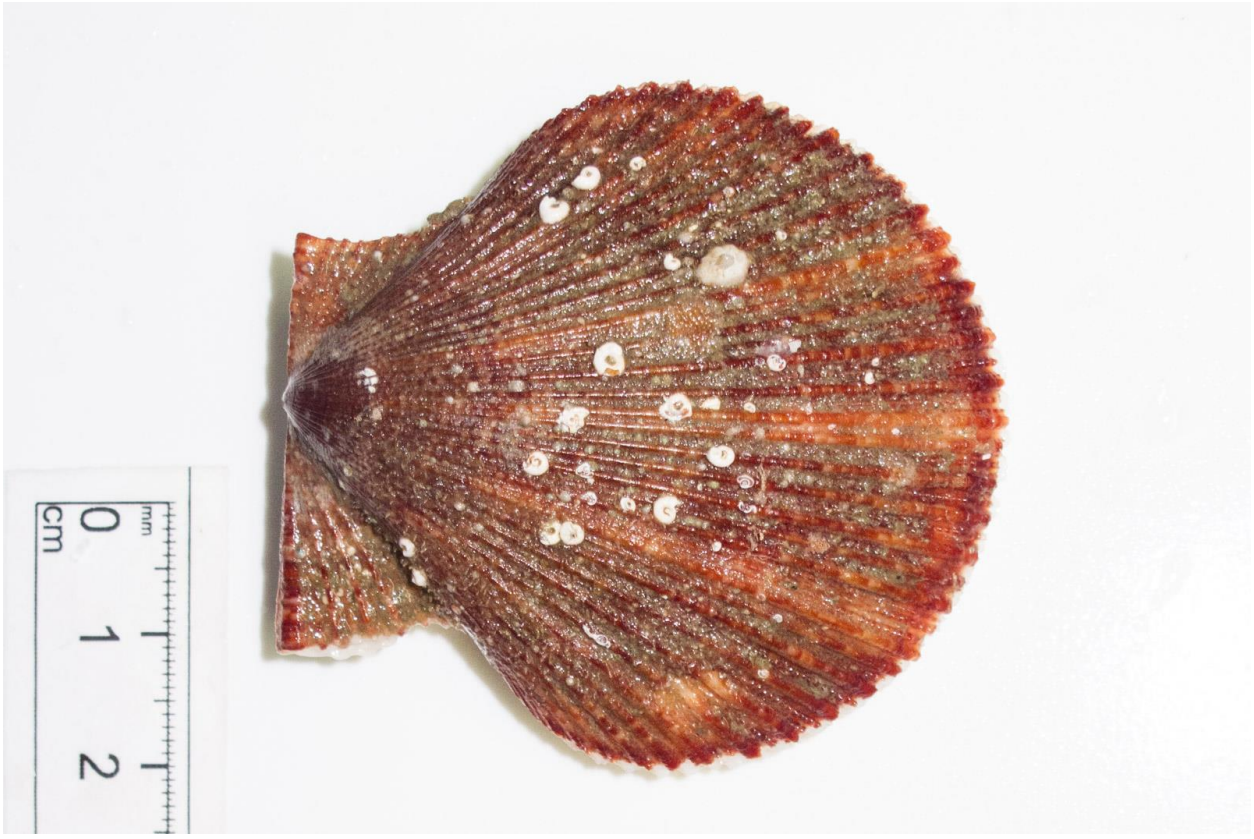
Bivalvia: Limidae: *Limatula subauriculata*

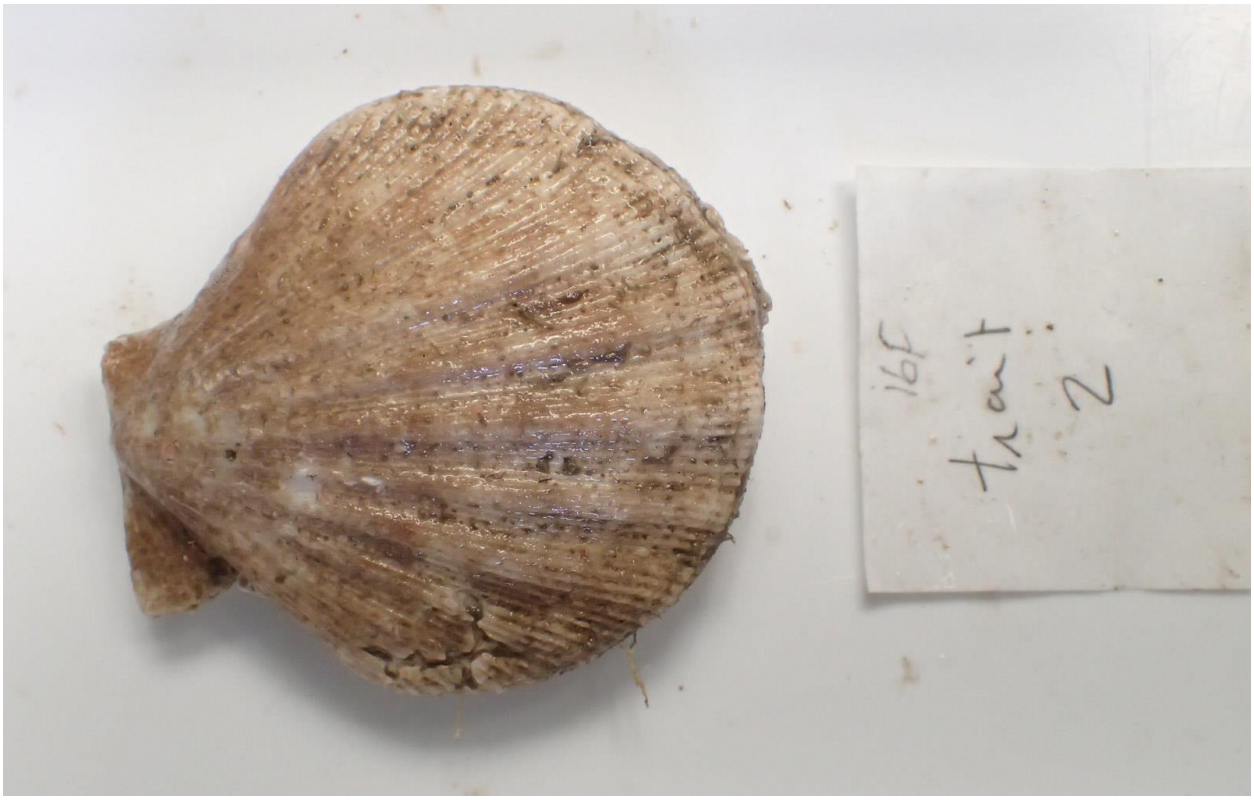
Bivalvia: Lyonsiidae: *Lyonsia arenosa*

Bivalvia: Mytilidae: *Musculus discors*

Bivalvia: Mytilidae: *Musculus niger*

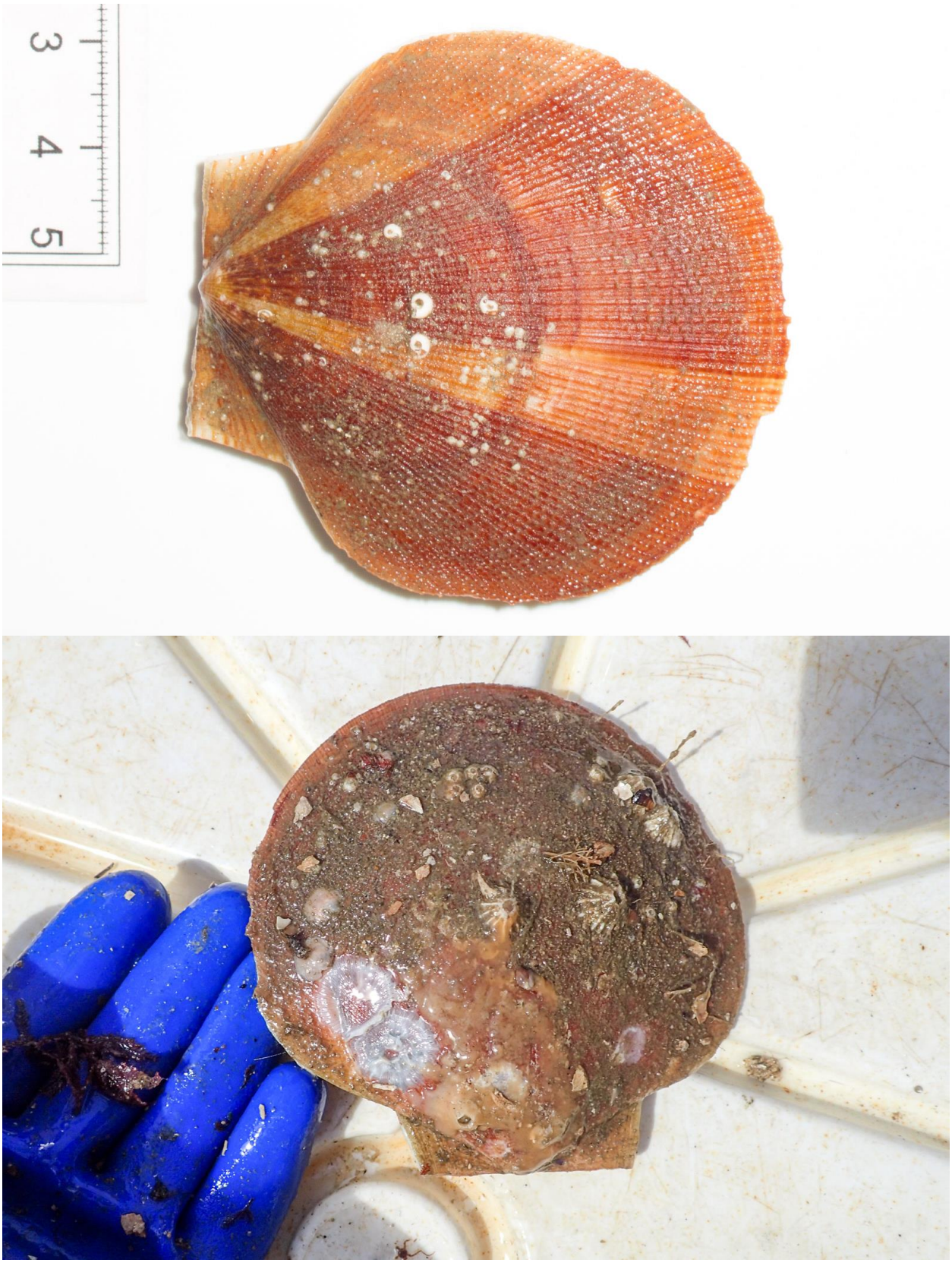
Bivalvia: Mytilidae: *Solamen glandula*





Bivalvia: Pectinidae: *Chlamys islandica*

Mollusca



Bivalvia: Pectinidae: *Placopecten magellanicus*

Bivalvia: Tellinidae: *Macoma calcarea*

Bivalvia: *Yoldia myalis*

Mollusca

Gastropoda: Aporrhaidae: *Arrhoges occidentalis*

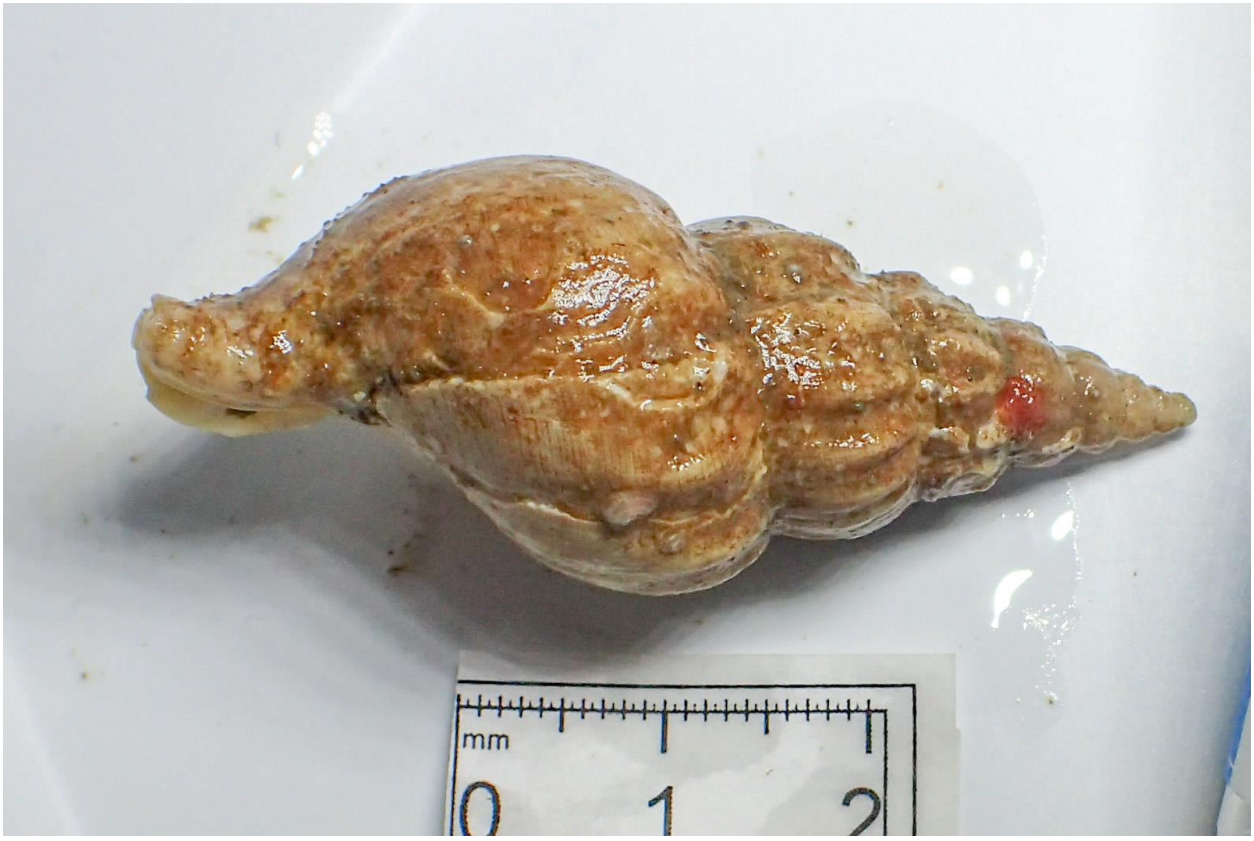
Gastropoda: Buccinidae: *Aulacofusus brevicauda*

Gastropoda: Buccinidae: *Buccinum scalariforme*

Gastropoda: Buccinidae: *Buccinum* (cf. *terraenovae*)

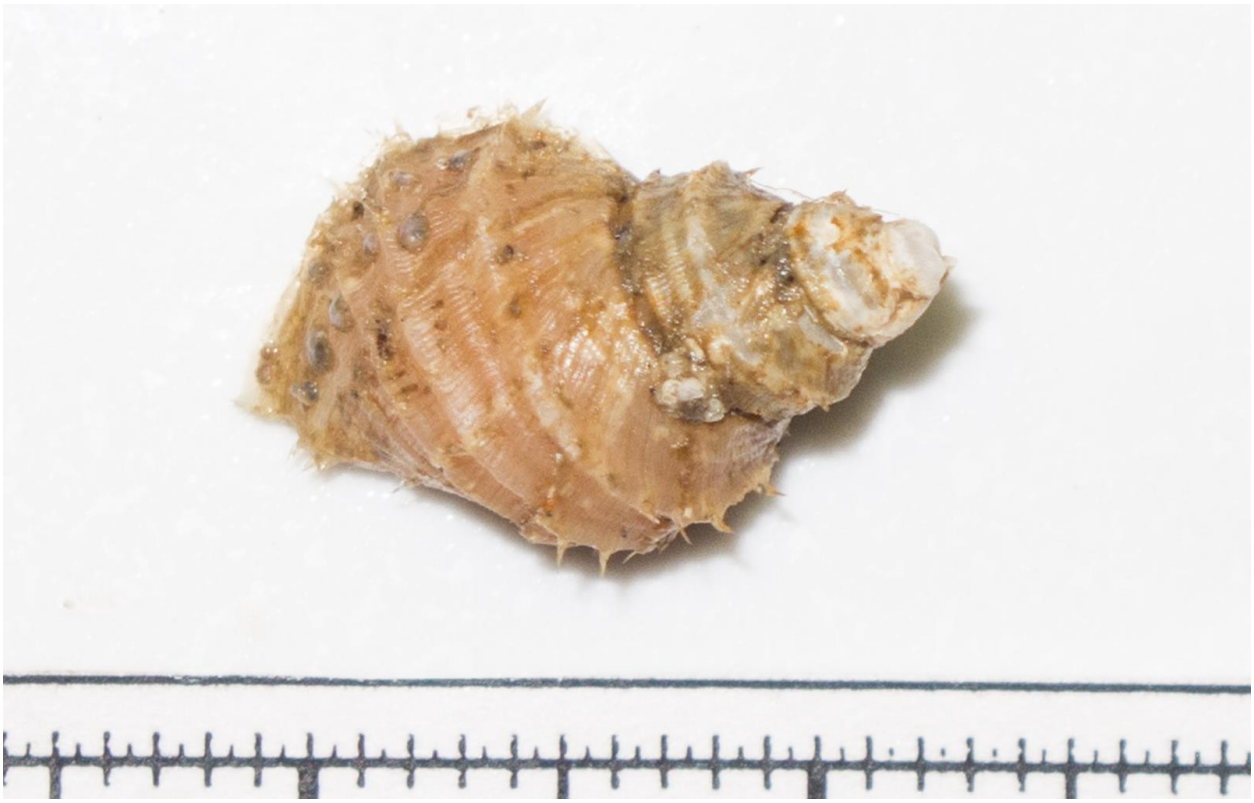
Gastropoda: Buccinidae: *Buccinum undatum*

Gastropoda: Buccinidae: *Neptunea despecta*



Gastropoda: Buccinidae: *Plicifusus kroyeri*

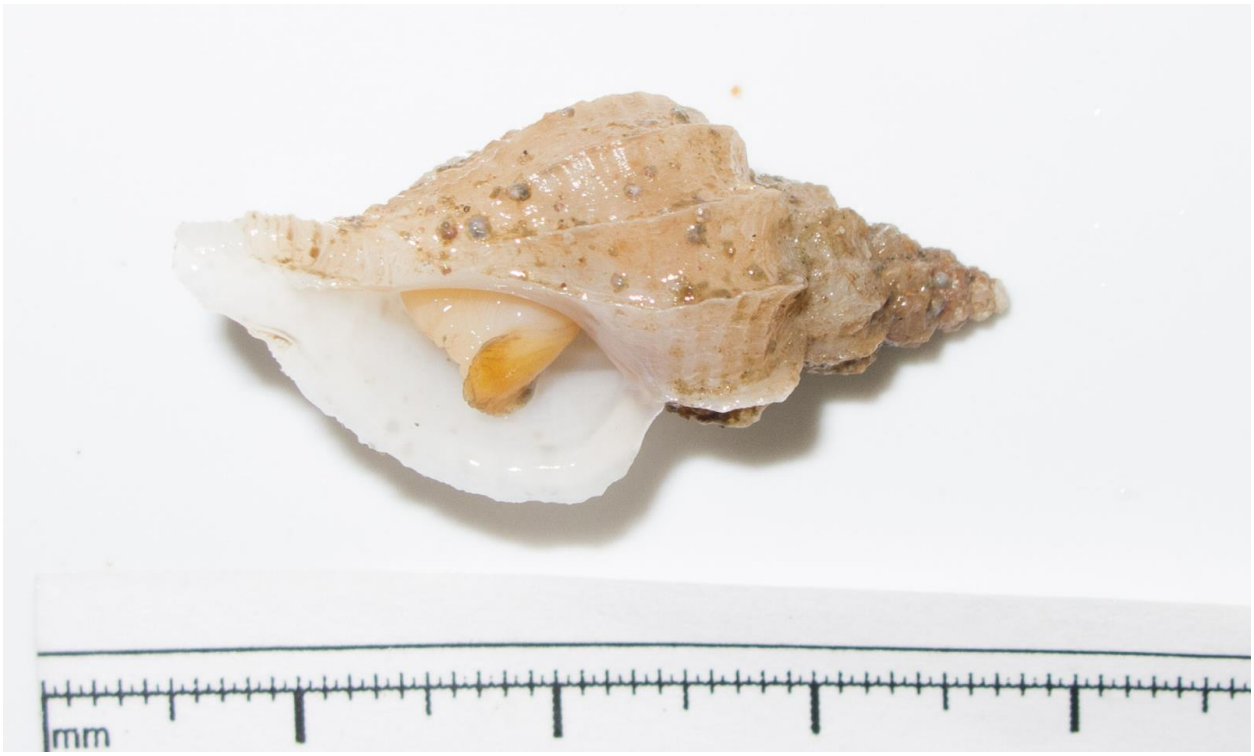
Gastropoda: Buccinidae: *Volutopsius norwegicus*



Gastropoda: *Ariadnaria borealis*

Gastropoda: *Propebela scalaris*

Gastropoda: Muricidae: *Boreotrophon* (cf. *clathratus*)



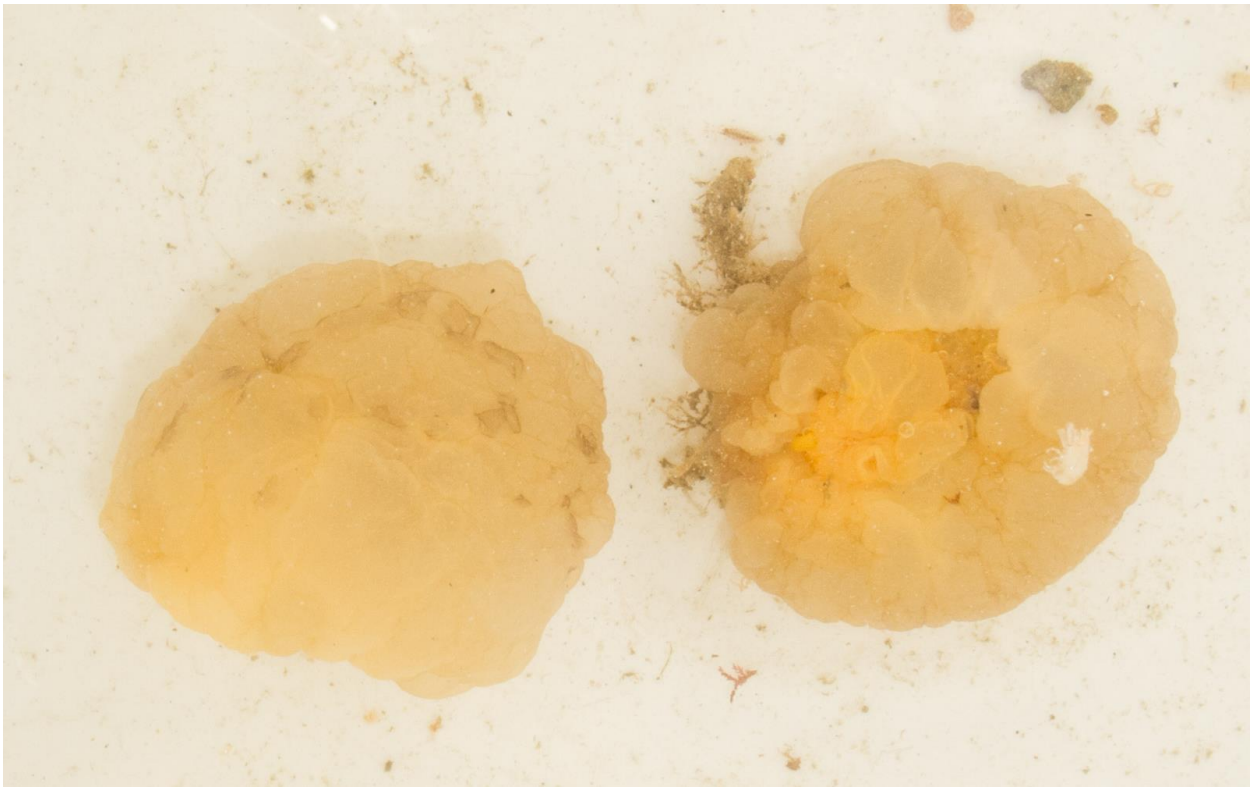
Gastropoda: Muricidae: *Scabrotrophon fabricii*

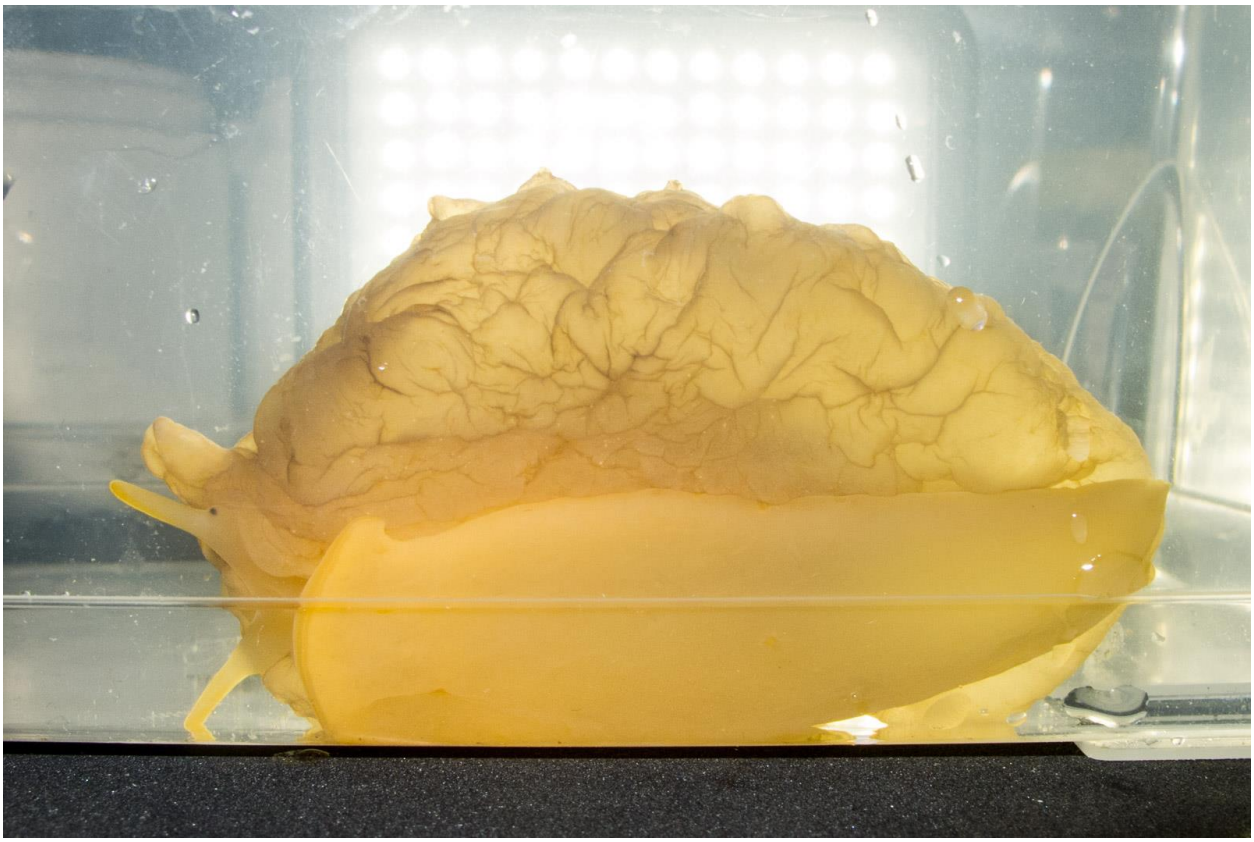
Gastropoda: *Margarites costalis*

Gastropoda: *Margarites groenlandicus*

Gastropoda: Naticidae: *Cryptonatica affinis*

Gastropoda: Naticidae: *Euspira pallida*

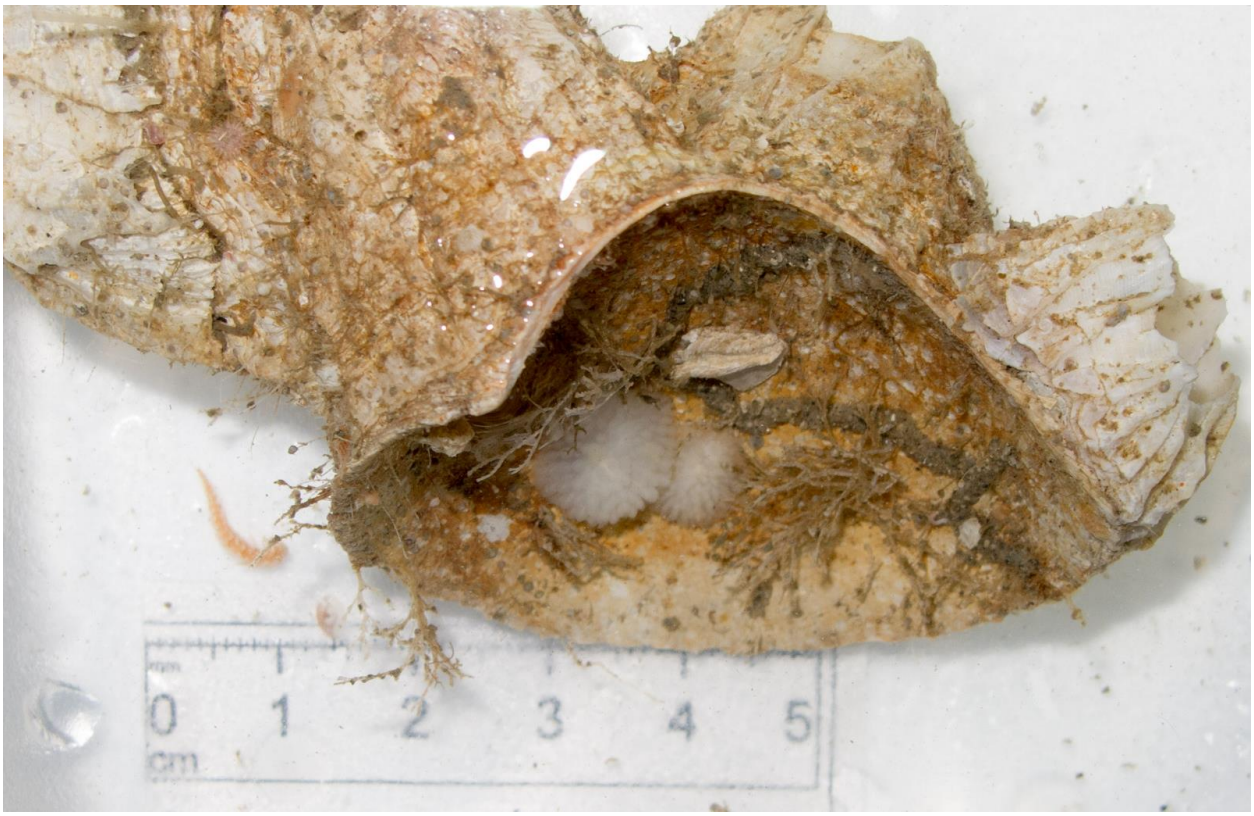




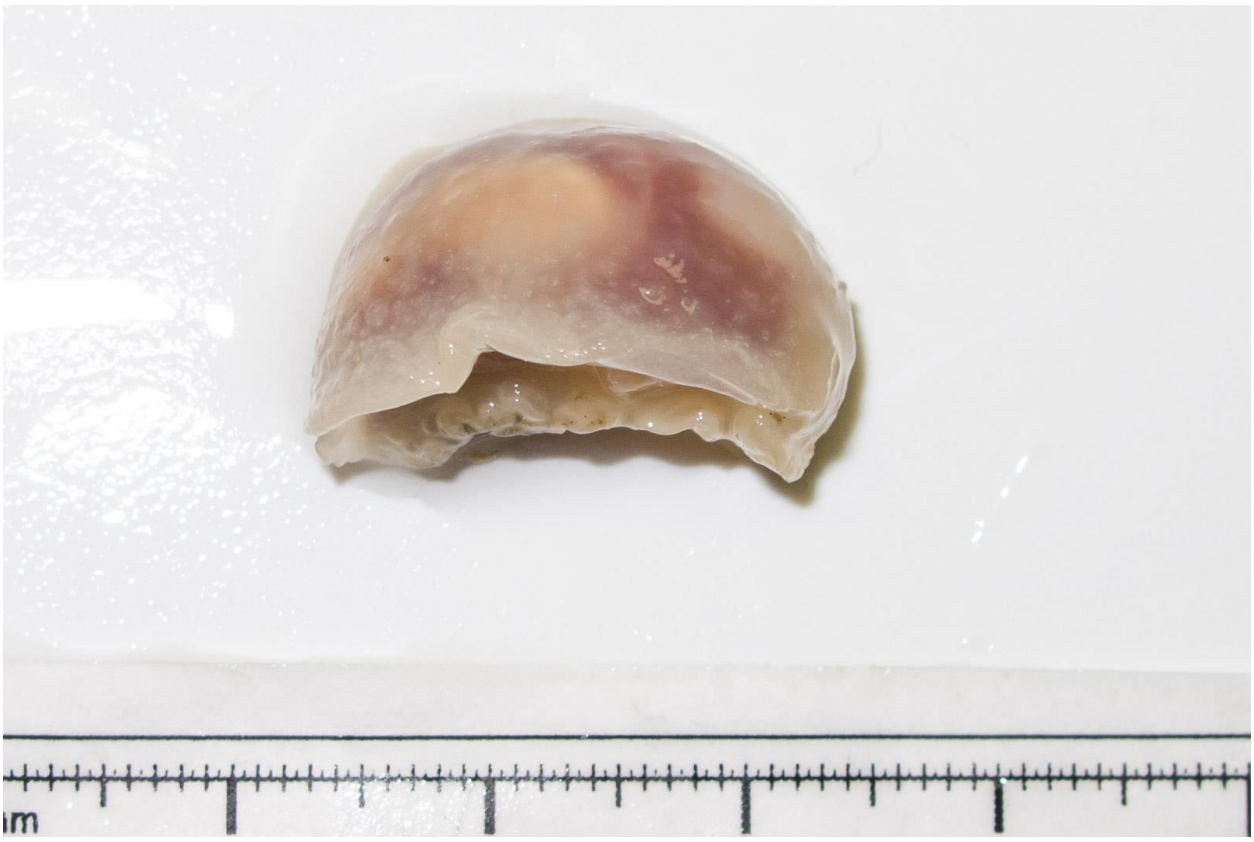
Gastropoda: Velutinidae: *Onchidiopsis corys*

Gastropoda: Velutinidae: *Velutina velutina*

Mollusca



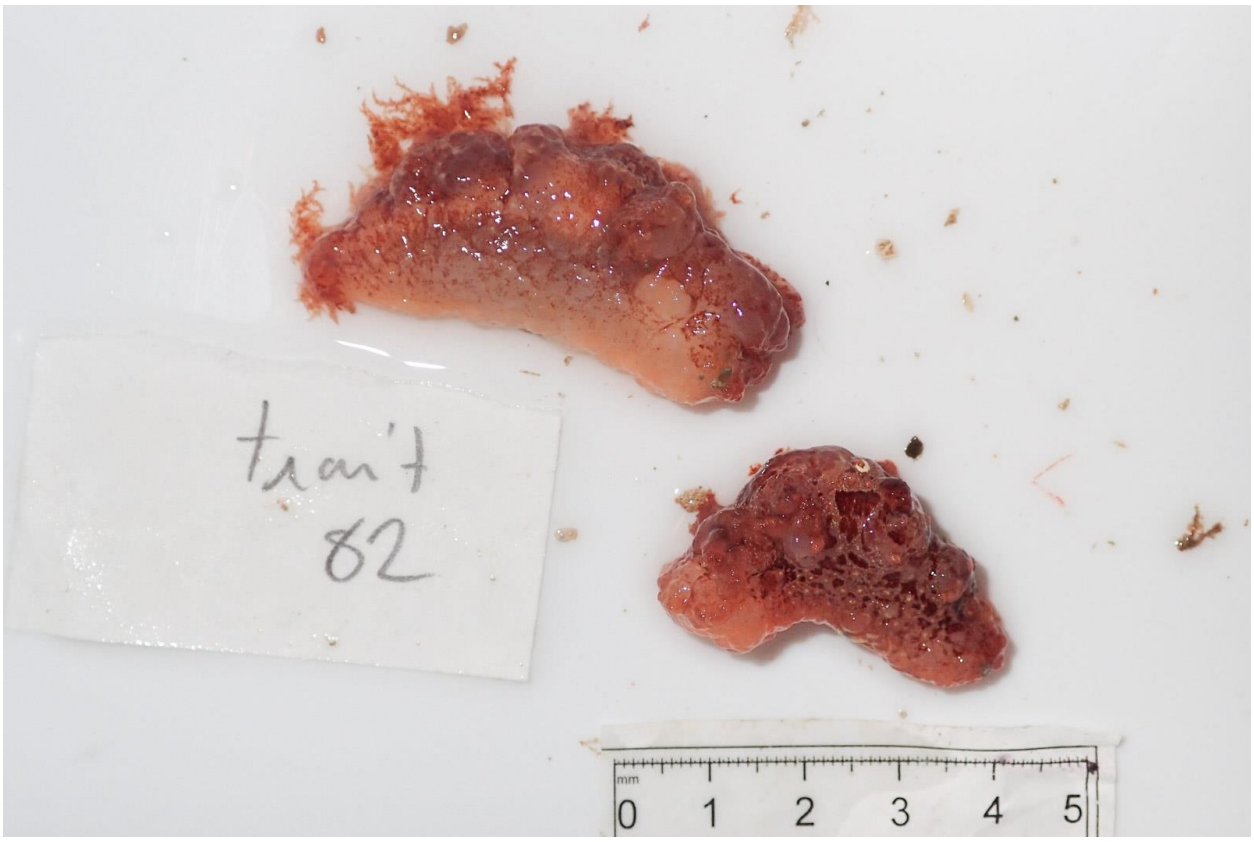
Gastropoda: *Adalaria proxima*



Gastropoda: *Aldisa zetlandica*

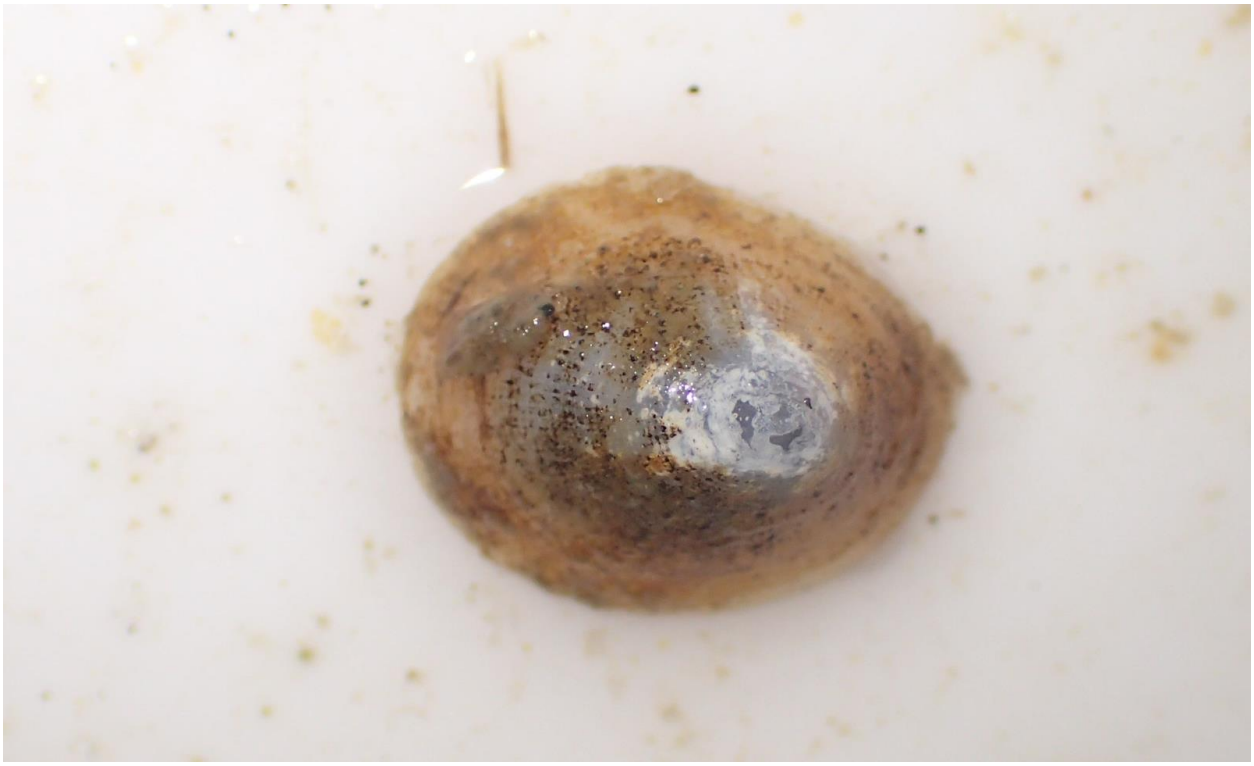
Mollusca

Gastropoda: *Borealea nobilis*



Gastropoda: *Dendronotus frondosus*

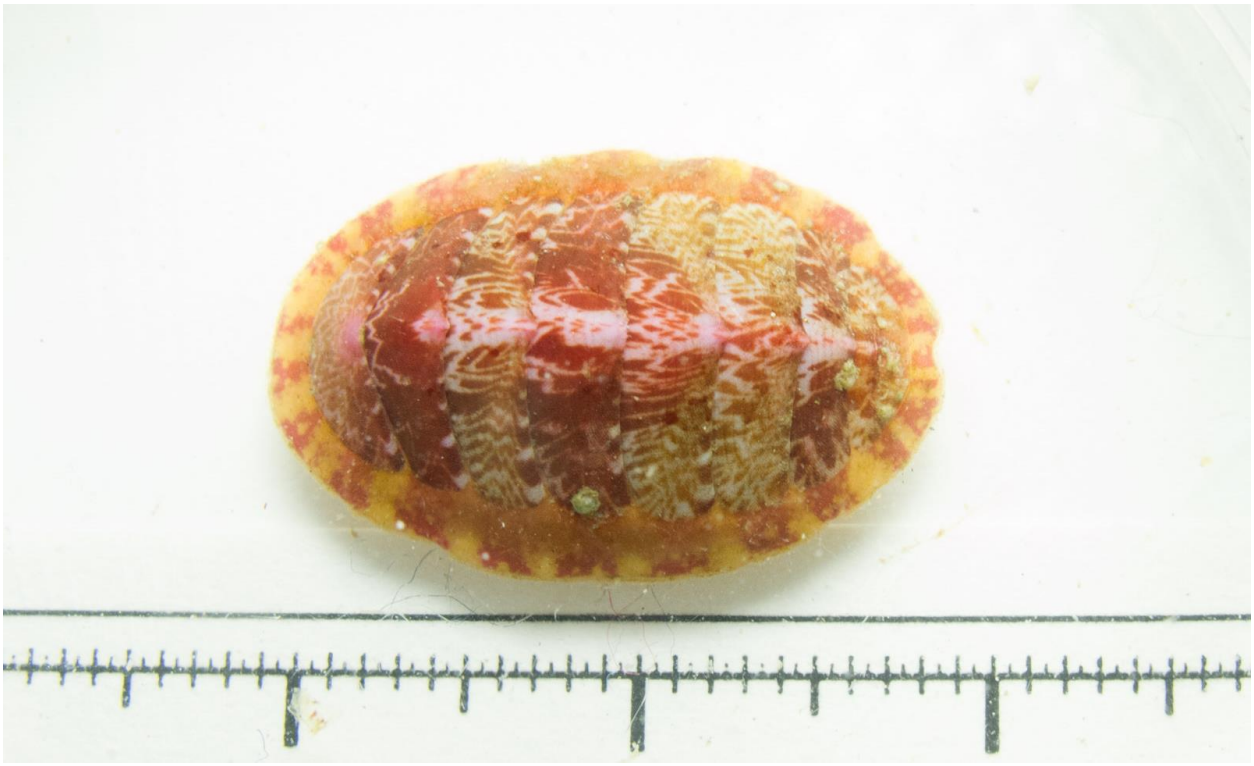
Gastropoda: *Dendronotus elegans*



Gastropoda: *Lepeta caeca*

Mollusca

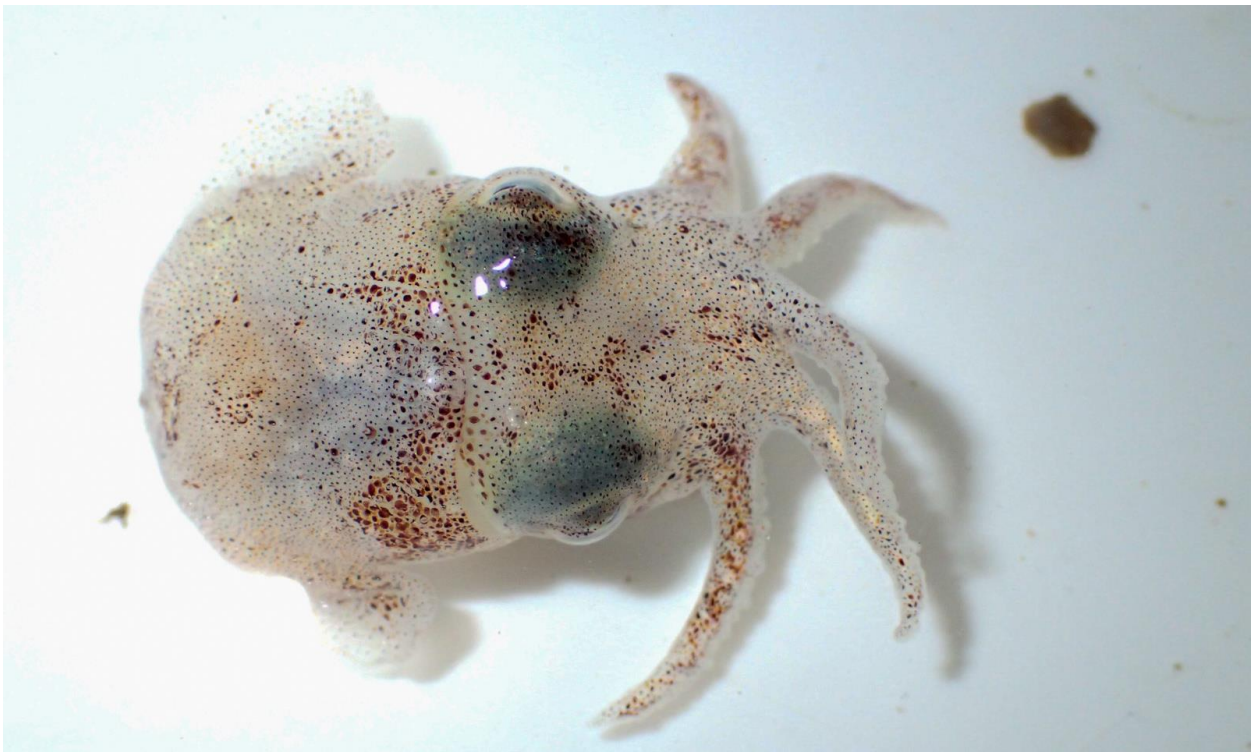
Polyplacophora: Ischnochitonidae: *Stenosemus albus*



Polyplacophora: Tonicellidae (cf. *Tonicella marmorea*)

Polyplacophora: Tonicellidae (cf. *Boreochiton ruber*)

Cephalopoda: Bathypolypodidae: *Bathypolypus bairdii*

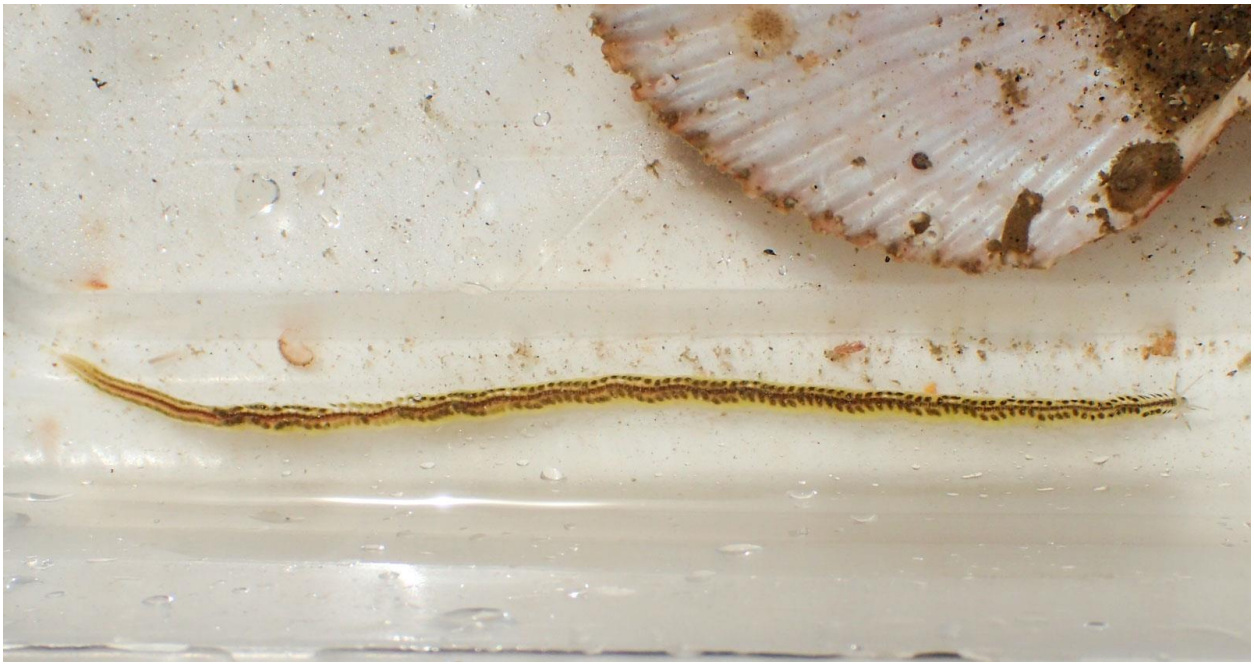


Cephalopoda: Sepiolidae: *Rossia* (cf. *palpebrosa*)

Polychaeta: Nereididae: *Nereis* (cf. *pelagica*)

Annelida

Polychaeta: Nephytidae: *Nephtys* sp.



Polychaeta: Phyllodocidae: *Phyllodoce* sp.

Annelida

Polychaeta: Polynoidae

Polychaeta: Sabellidae (similar to members of former genus *Chone*)

Polychaeta: Sabellidae: *Myxicola infundibulum*

Polychaeta: Spionidae: *Polydora* sp.

Annelida

Polychaeta: Terebellidae (cf. *Amphitrite cirrata*)

Nemertea

Nemertea: *Amphiporus angulatus*


Nemertea (cf. *Lineus* sp.)

Golfingiidae: *Golfingia* sp.

Crustacea: Cirripedia: Balanidae: *Balanus* cf. *balanus*

Crustacea: Amphipoda: Ampeliscidae: *Ampelisca* sp.

Crustacea: Amphipoda: Eusiridae: *Eusirus cuspidatus*

Crustacea: Amphipoda: Melitidae

Crustacea: Amphipoda: Paramphithoidae: *Paramphithoe hystrix*

Crustacea: Amphipoda: Uristidae: *Anonyx* sp.

Crustacea: Isopoda: Idoteidae: *Synidotea marmorata*

Crustacea: Decapoda: Cancridae: *Cancer irroratus*

Crustacea: Decapoda: Oregoniidae: *Chionoecetes opilio*

Crustacea: Decapoda: Oregoniidae: *Hyas Araneus*

Crustacea: Decapoda: Oregoniidae: *Hyas coarctatus*

Crustacea: Decapoda: Paguridae: *Pagurus* (cf. *pubescens*)

Crustacea: Decapoda: Crangonidae: *Sclerocrangon boreas*

Crustacea: Decapoda: Pandalidae: *Pandalus borealis*

Crustacea: Decapoda: Pandalidae: *Pandalus montagui*

Crustacea: Decapoda: Thoridae: *Eualus fabricii*

Crustacea: Decapoda: Thoridae: *Eualus gaimardii*

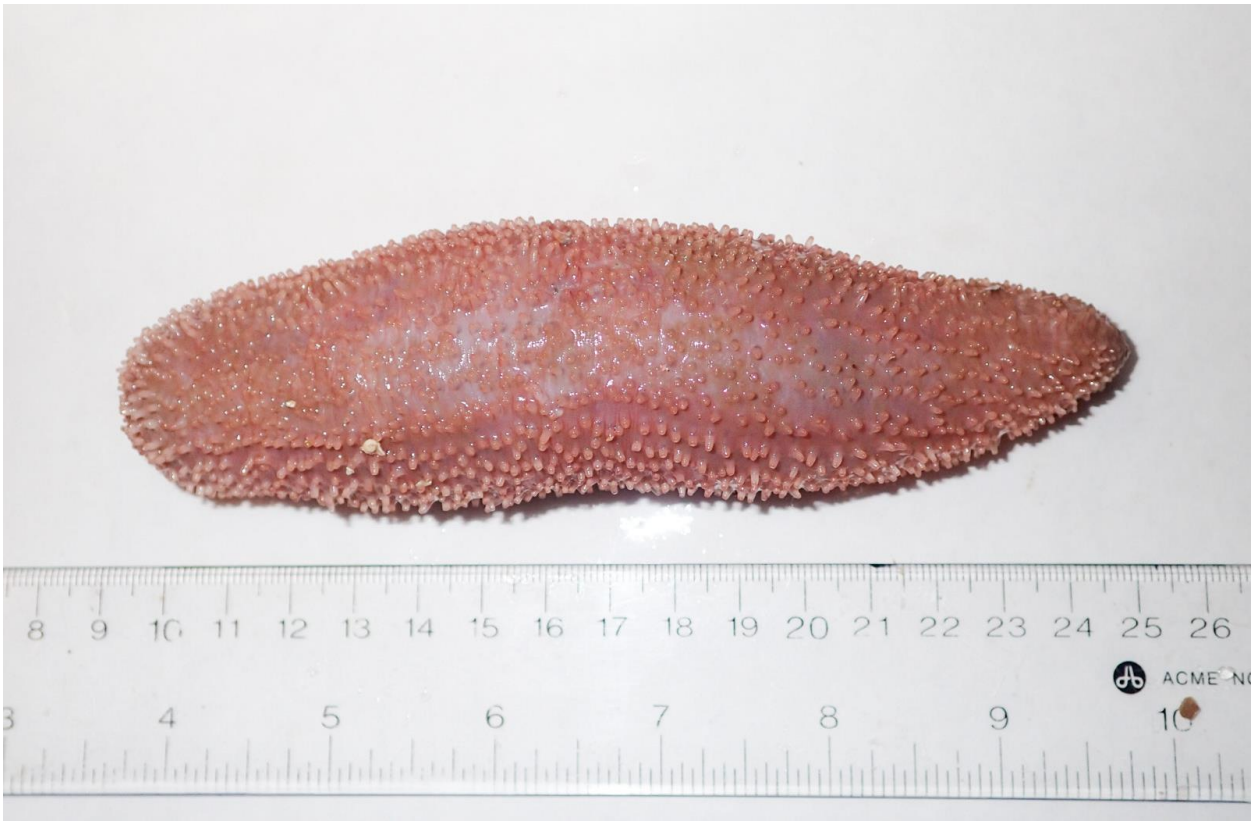
Crustacea: Decapoda: Thoridae: *Lebbeus groenlandicus*

Crustacea: Decapoda: Thoridae: *Lebbeus polaris*

Crustacea: Decapoda: Thoridae: *Spirontocaris spinus*

Holothuroidea: *Chiridota laevis*

Holothuroidea: *Cucumaria frondosa*



Holothuroidea: *Ekmania barthii*

Holothuroidea: *Psolus phantapus*

Echinodermata

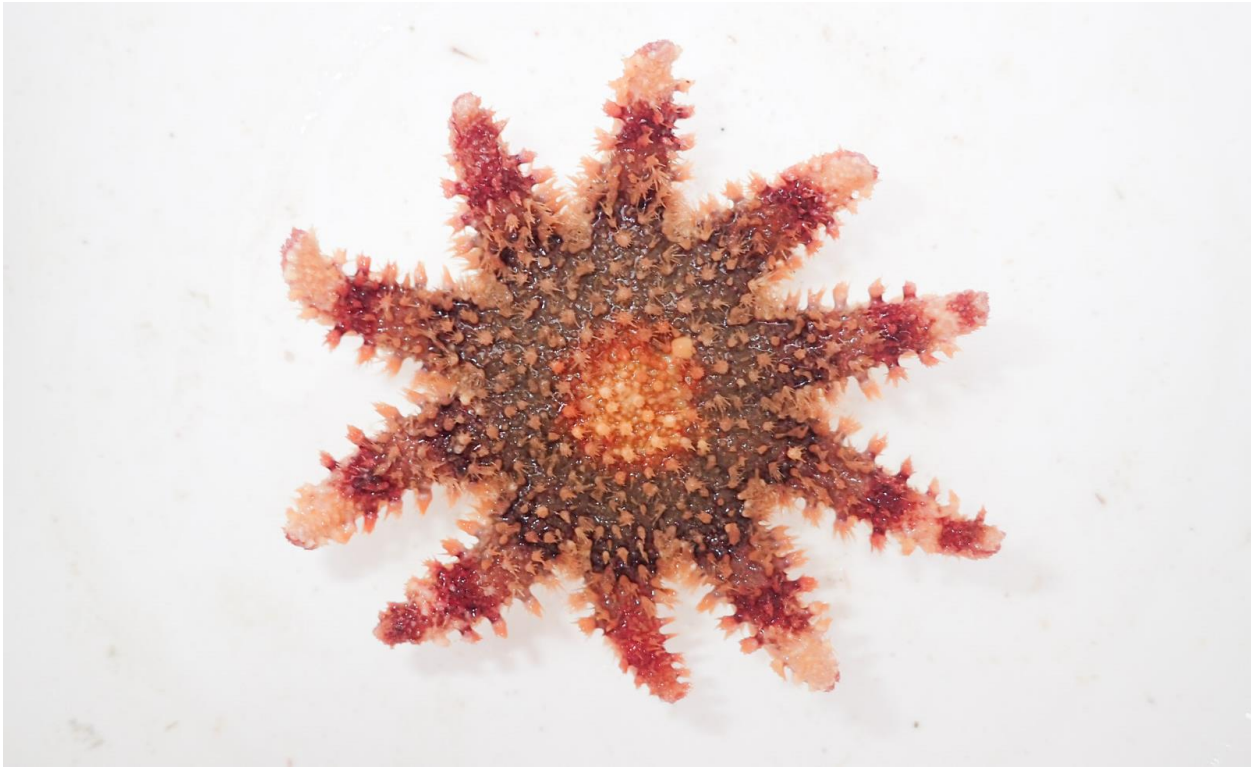
Asteroidea: *Asterias rubens*

Asteroidea: *Leptasterias groenlandica*

Asteroidea: *Leptasterias polaris*

Echinodermata

Asteroidea: *Henricia* sp.



Asteroidea: *Crossaster papposus*

Asteroidea: *Solaster endeca*

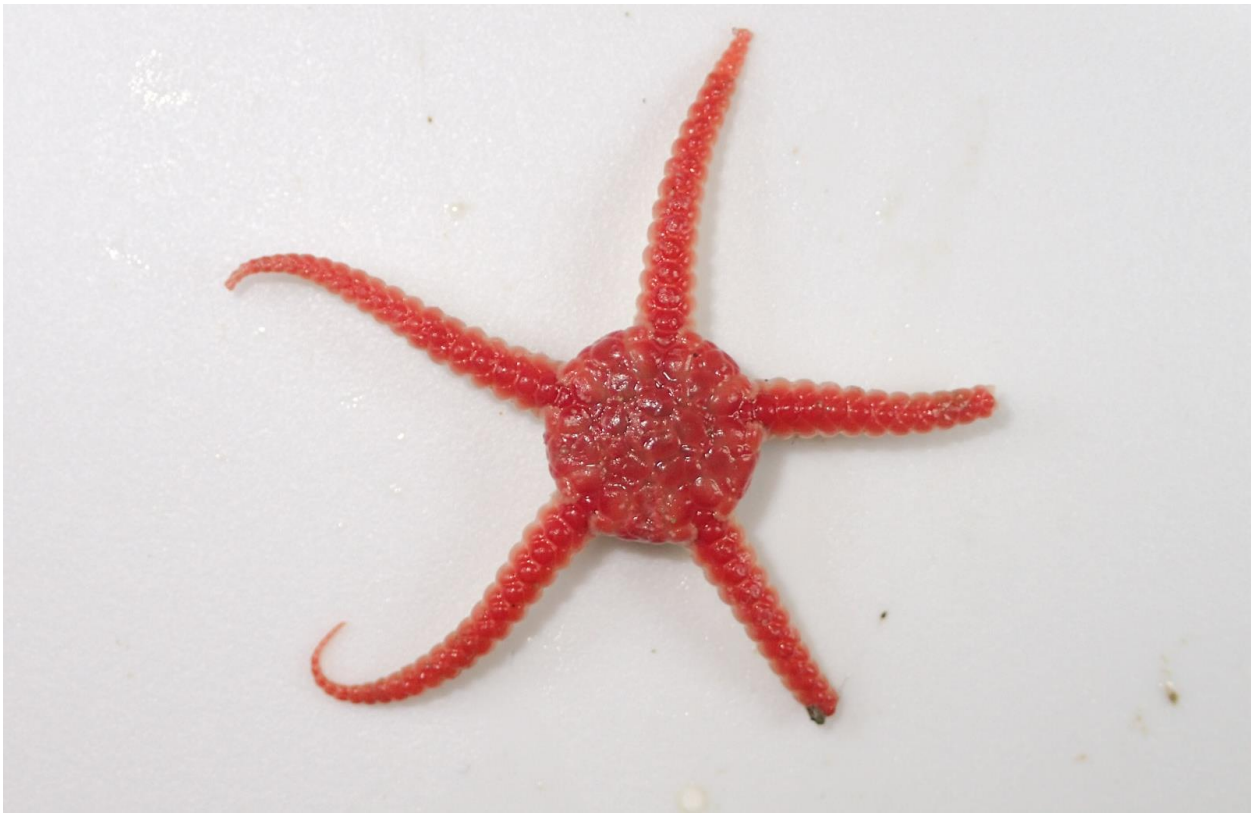
Asteroidea: *Pteraster militaris*

Ophiuroidea: *Gorgonocephalus* sp.

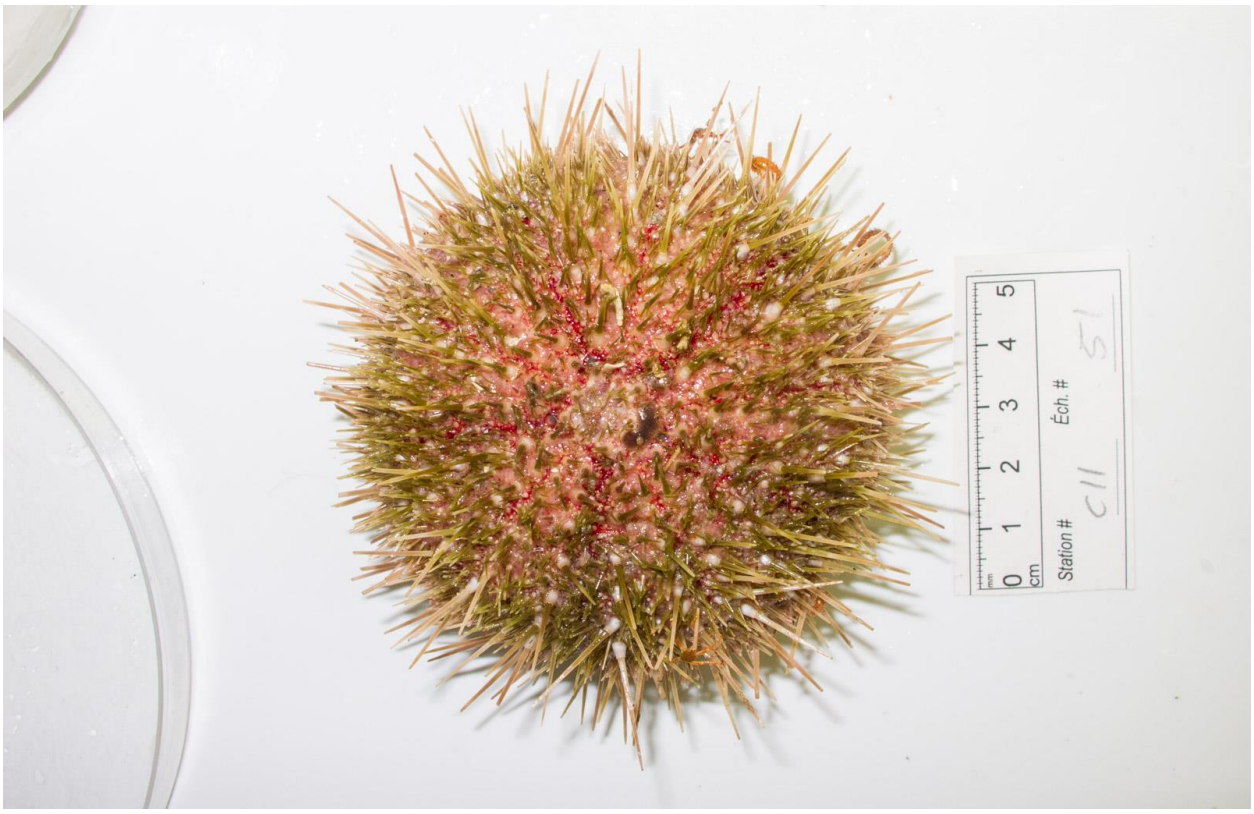
Ophiuroidea: *Ophiacantha bidentata*

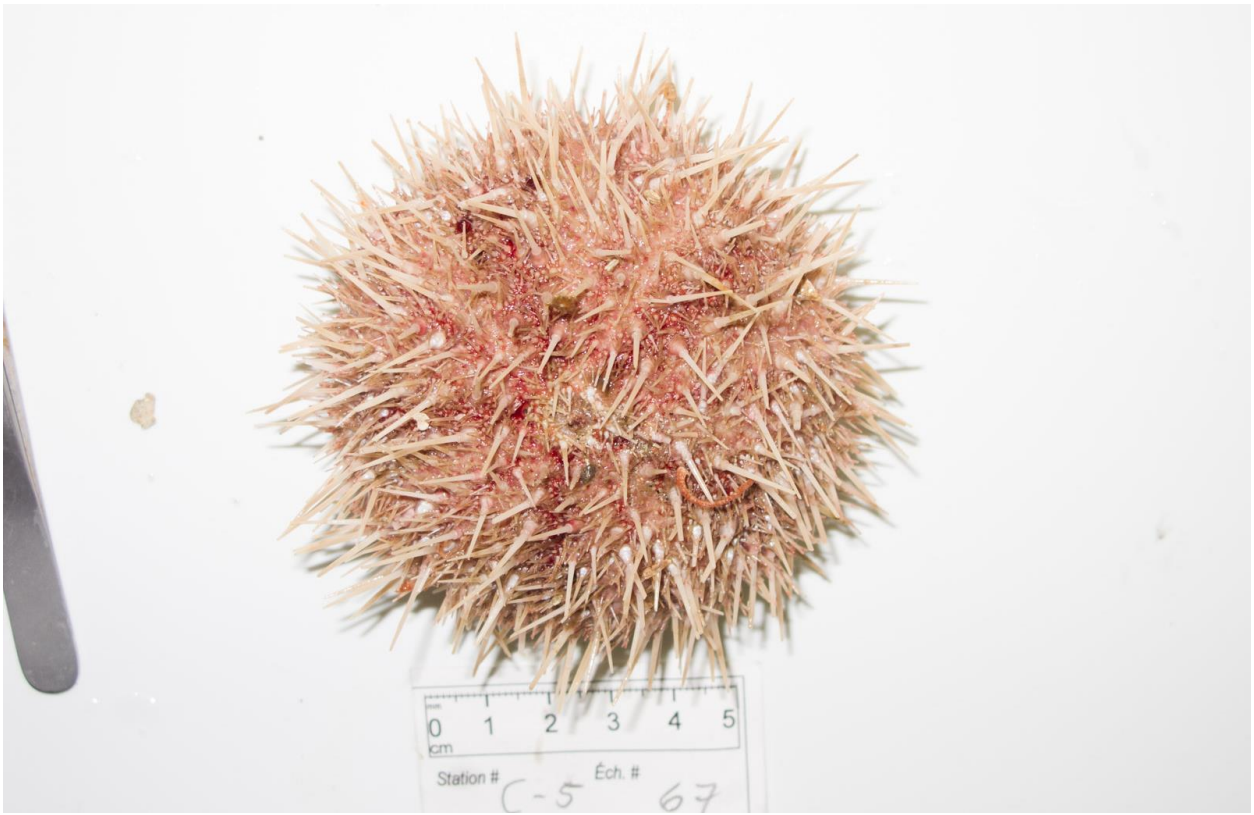
Ophiuroidea: *Ophiopholis aculeata*

Ophiuroidea: *Ophiura robusta*



Ophiuroidea: *Stegophiura nodosa*



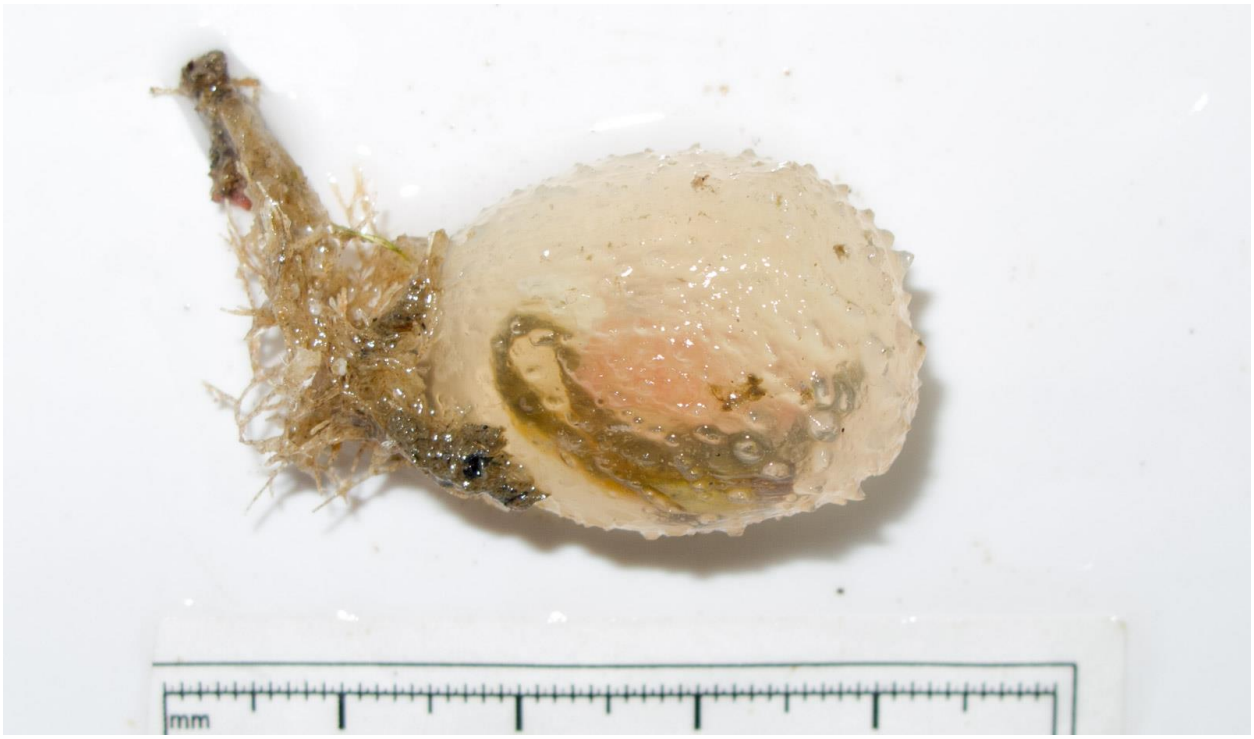


Echinoidea: *Strongylocentrotus* (*droebachiensis* or *pallidus*)

Echinoidea: *Echinarachnius parma*

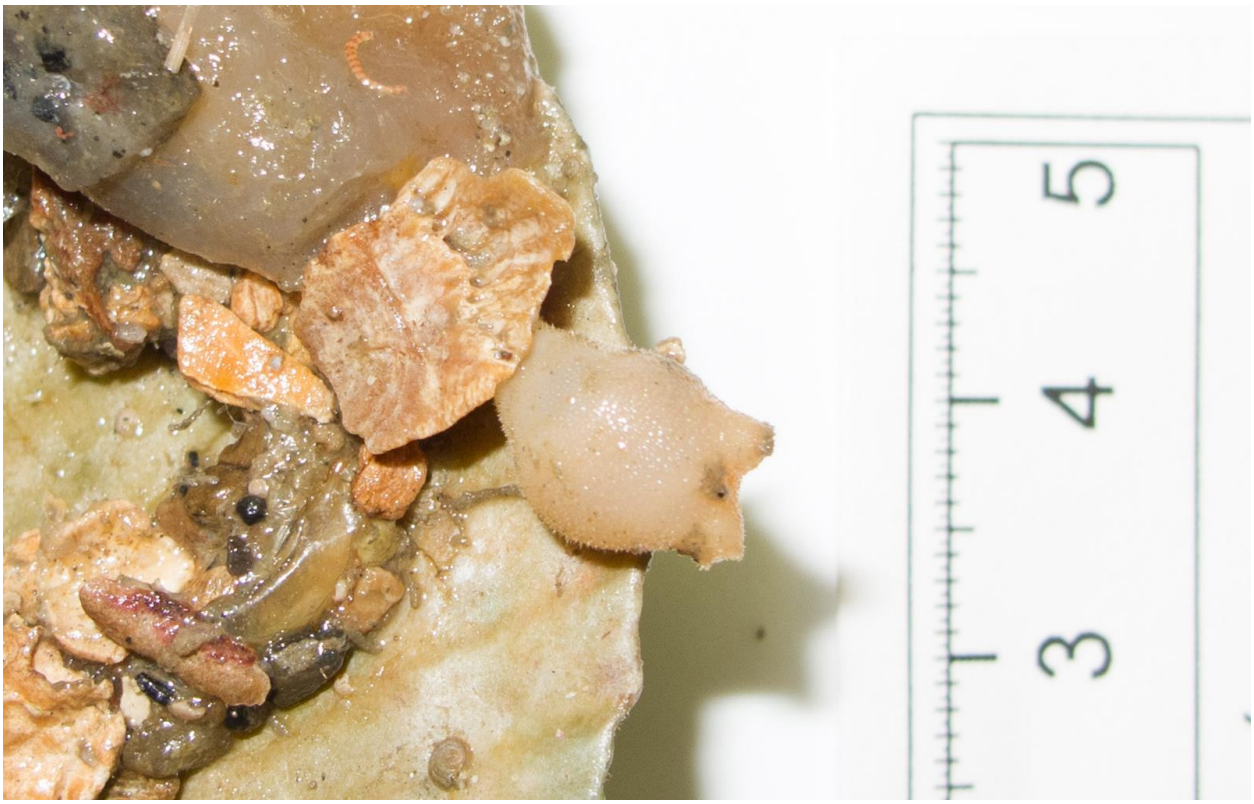
Chordata

Ascidiacea: *Ascidia* sp.



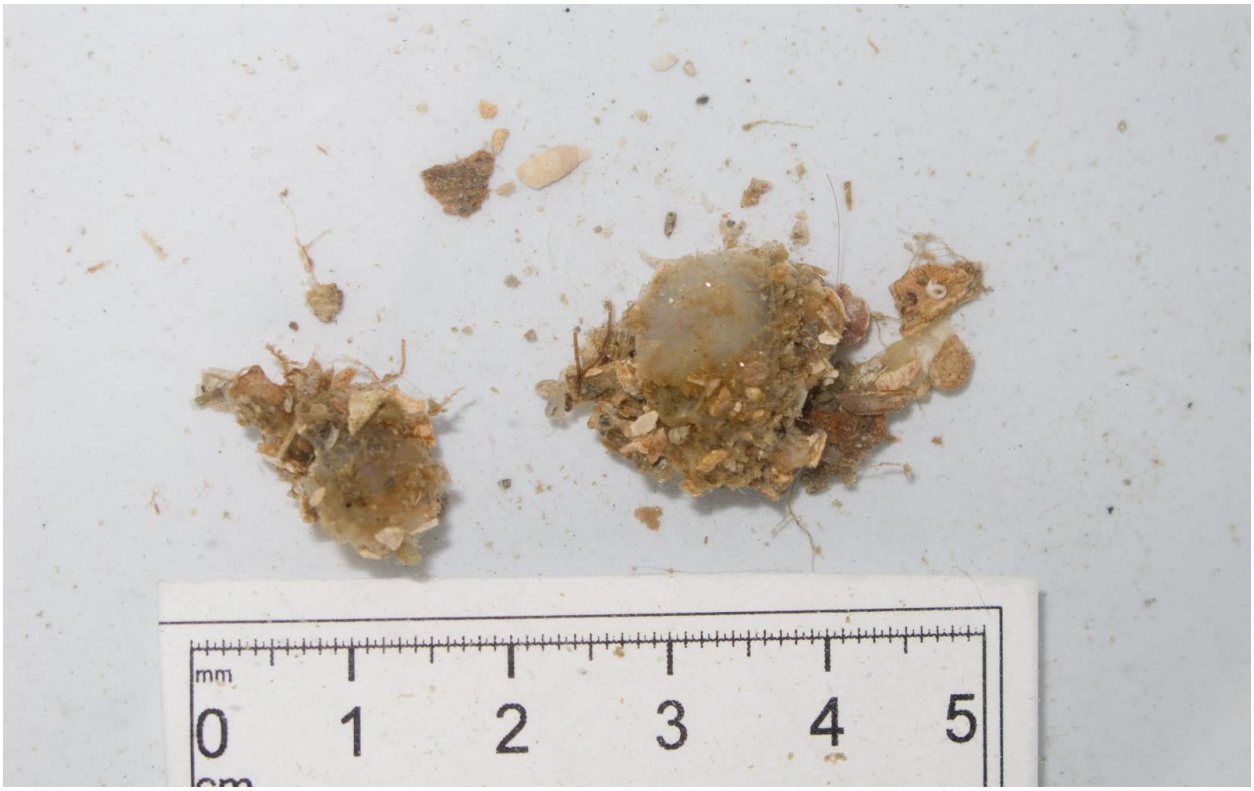
Ascidiacea: *Molgula griffithsii*

Chordata

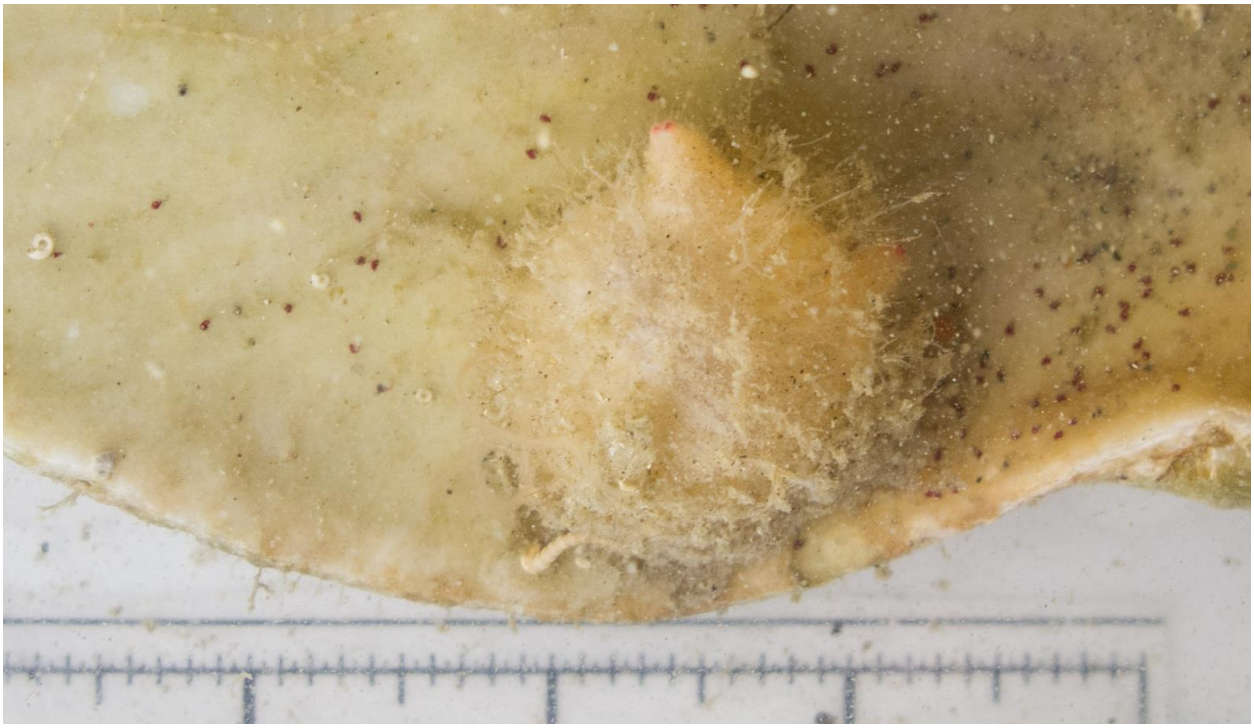


Ascidiacea: *Molgula pedunculata*

Chordata



Ascidiacea: *Molgula retortiformis*

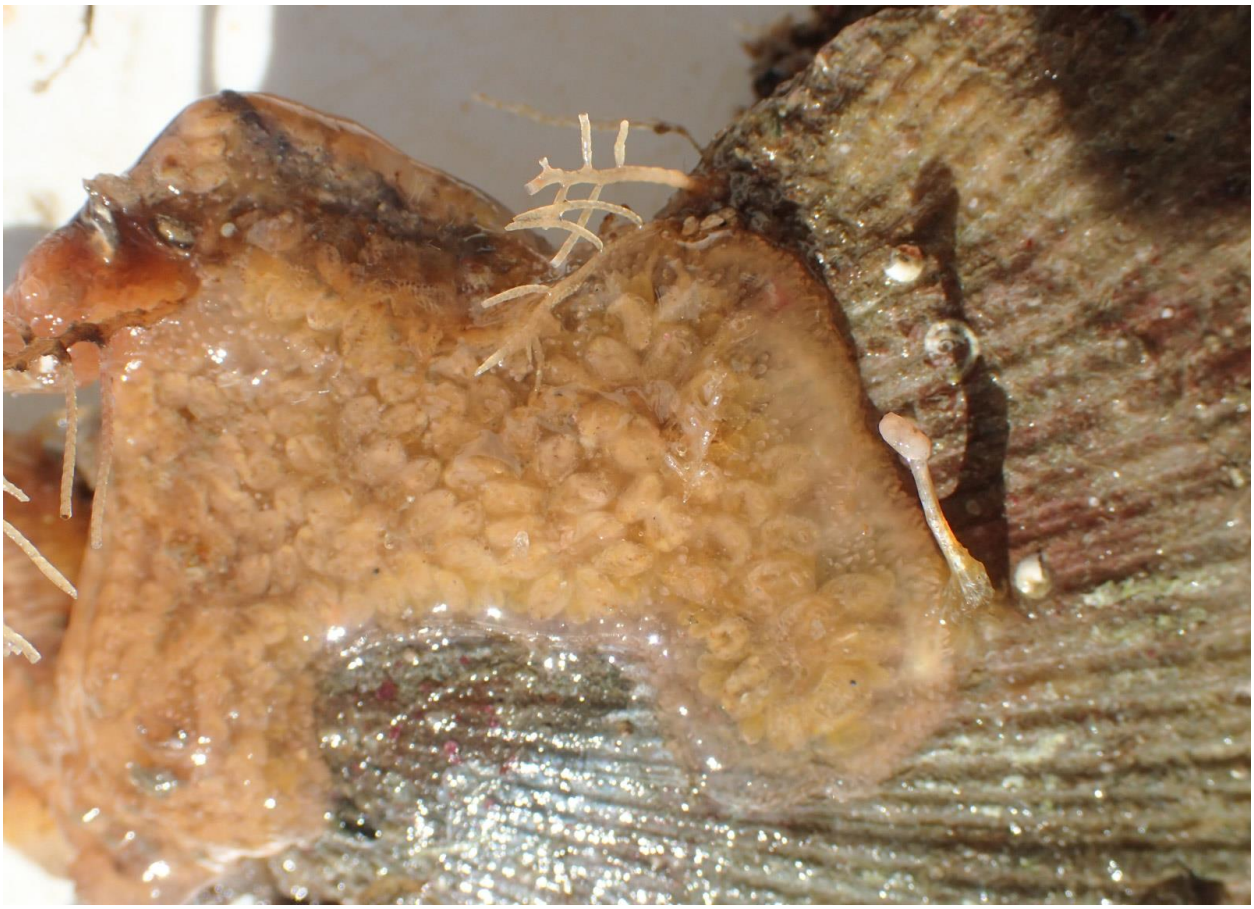


Ascidiacea: *Boltenia echinata*

Chordata

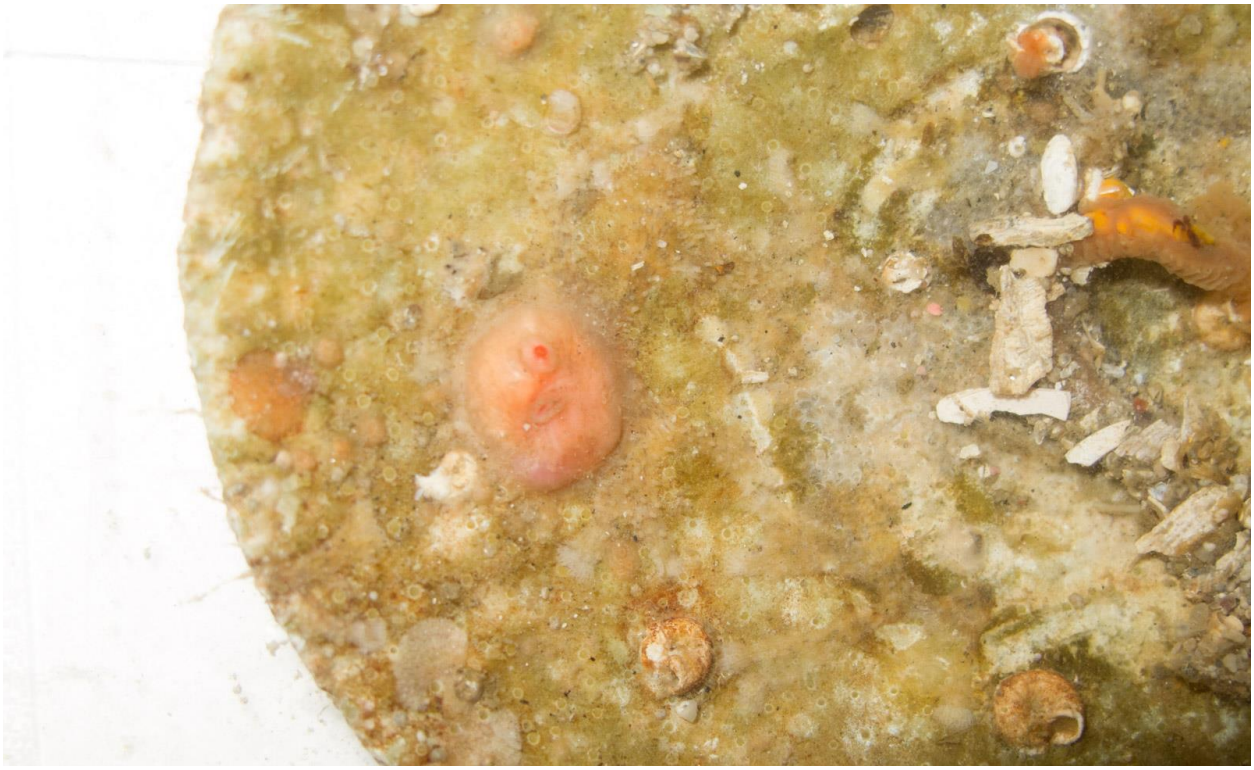
Ascidiacea: *Boltenia ovifera*

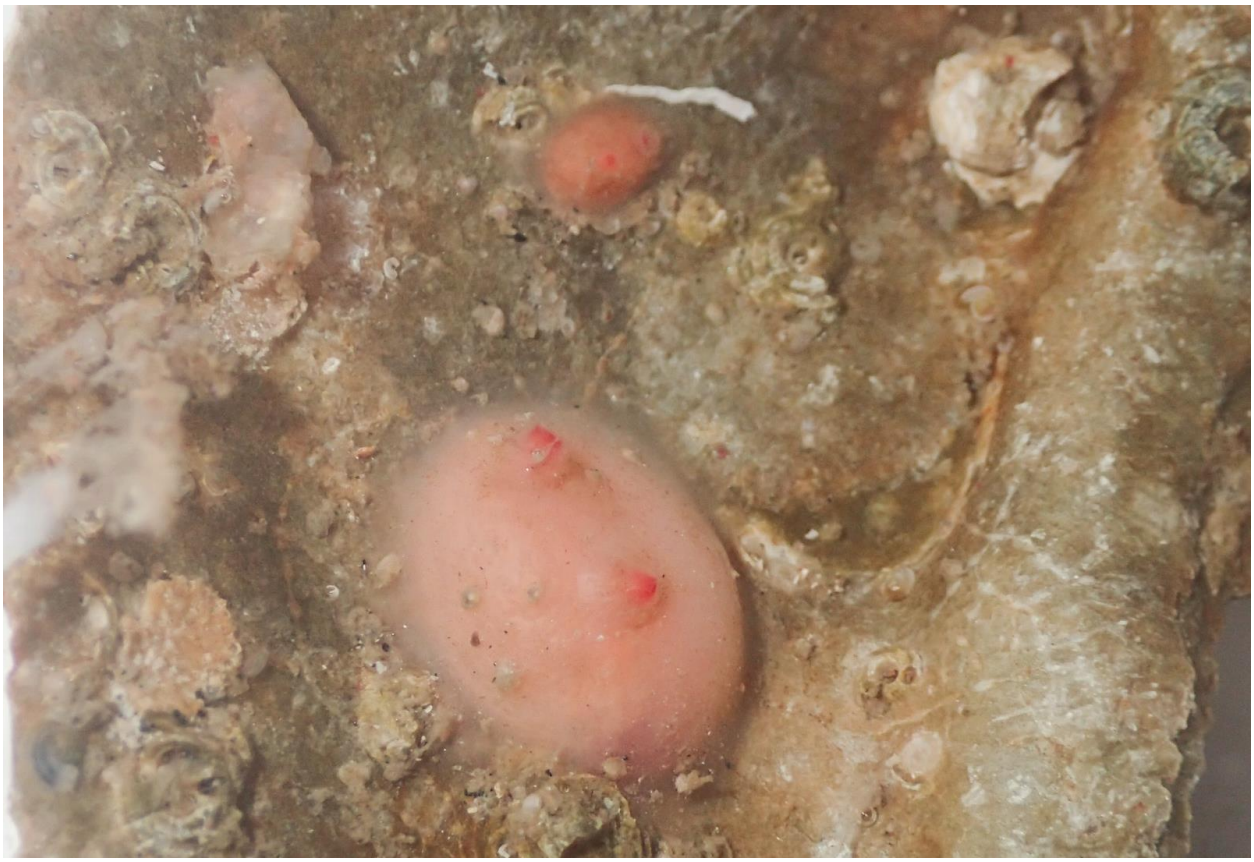
Ascidiacea: *Halocynthia pyriformis*



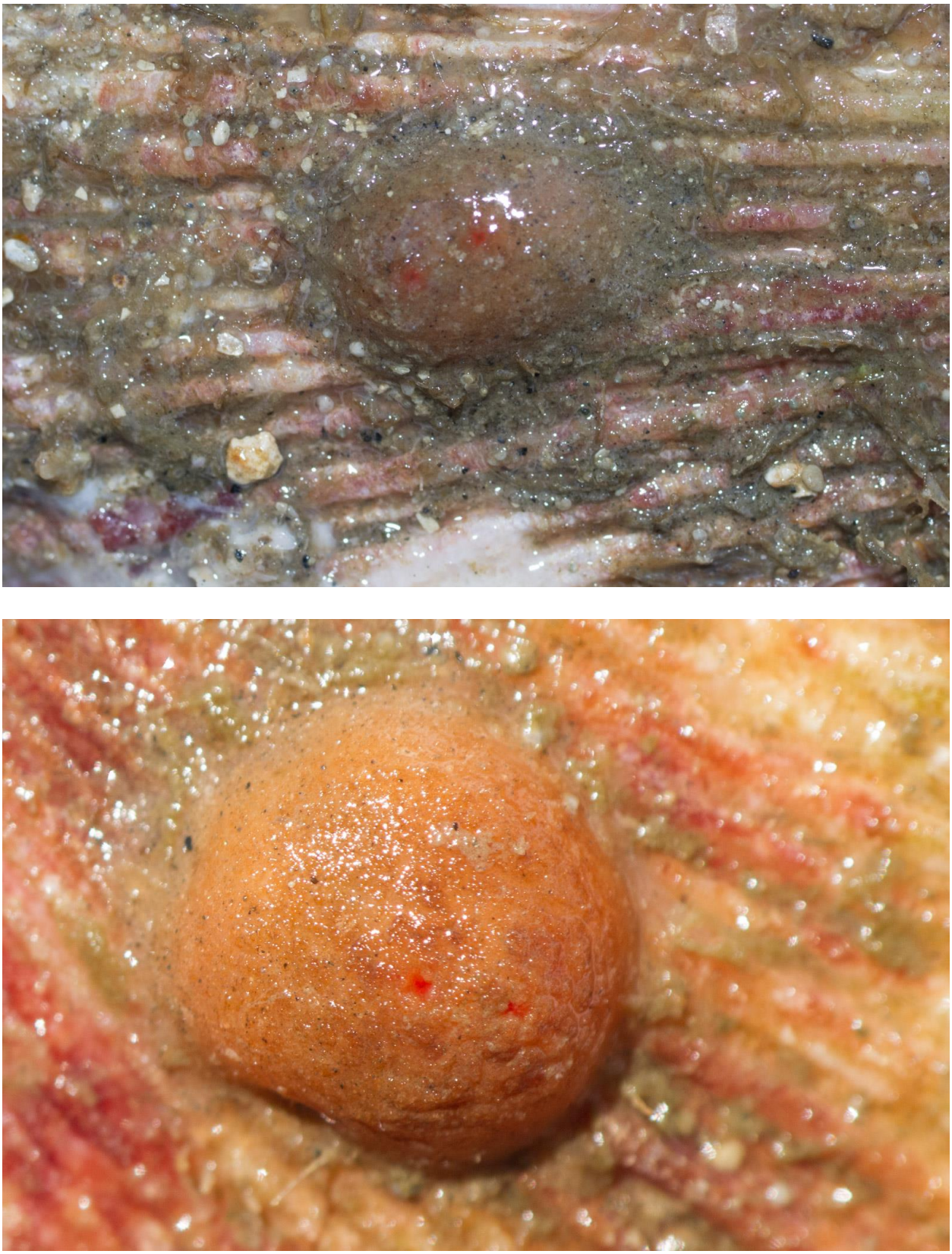
Ascidiacea: *Botrylloides aureus*

Ascidiacea: *Cnemidocarpa finmarkiensis*





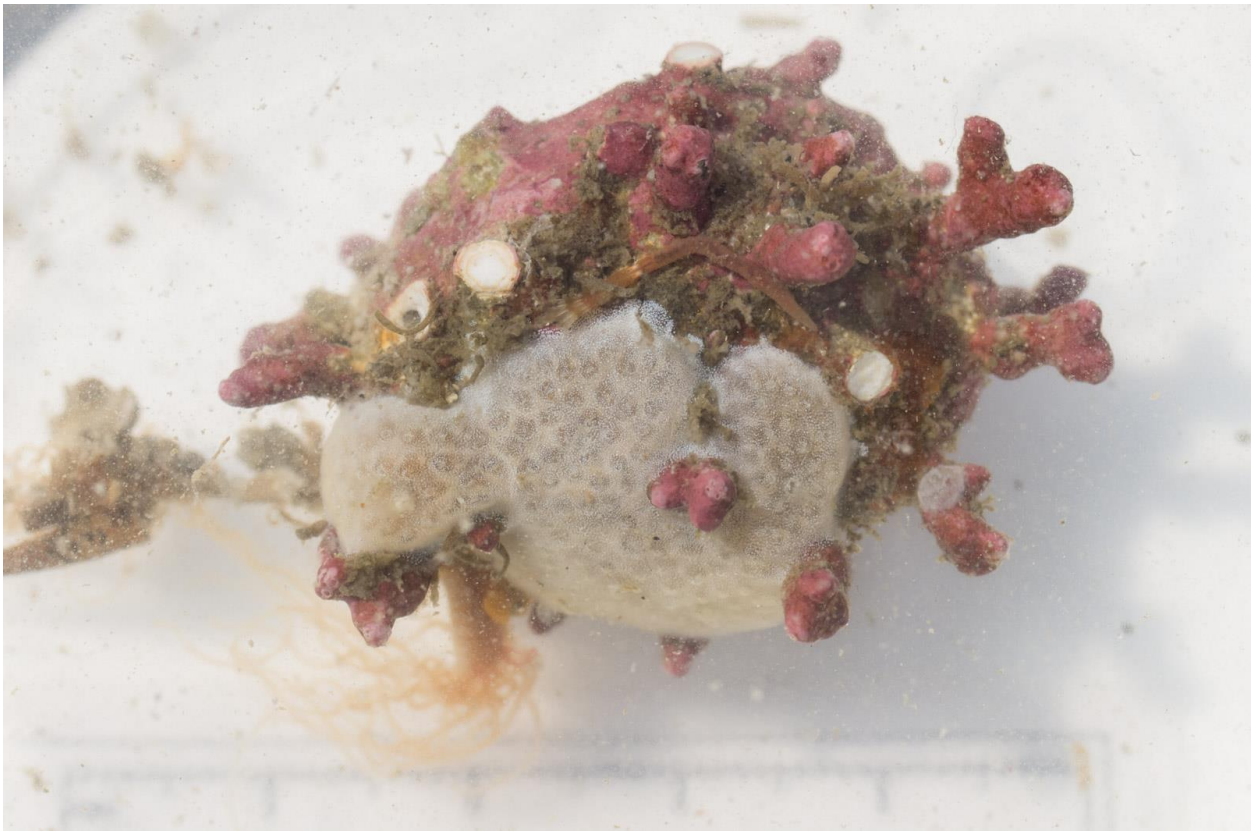
Ascidiacea: *Dendrodoa carnea*



Ascidiacea: *Styela coriacea* (top: specimen confirmed by G. Lambert)

Ascidiacea: *Styela rustica* (bottom: specimen confirmed by G. Lambert).

Chordata

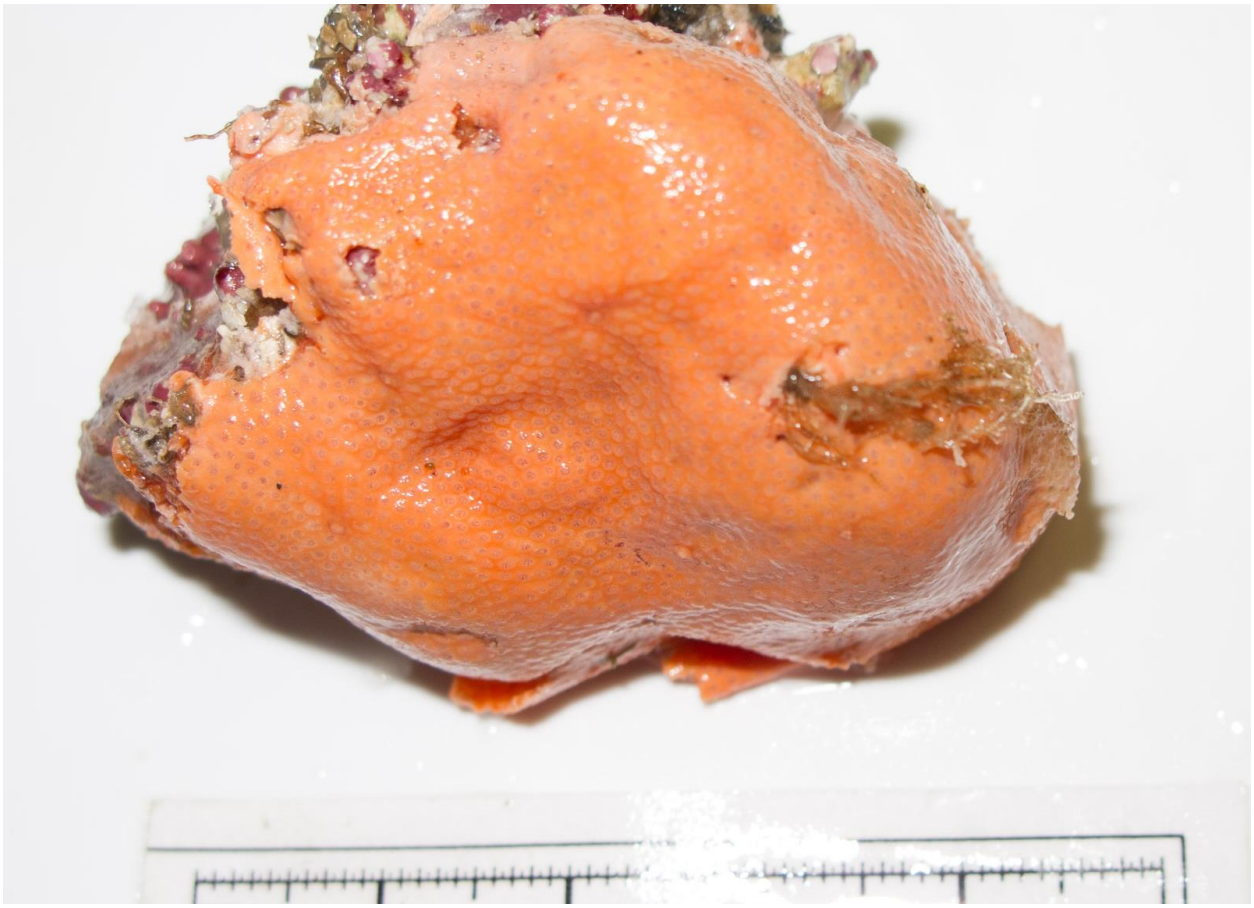


Ascidiacea: *Didemnum albidum*

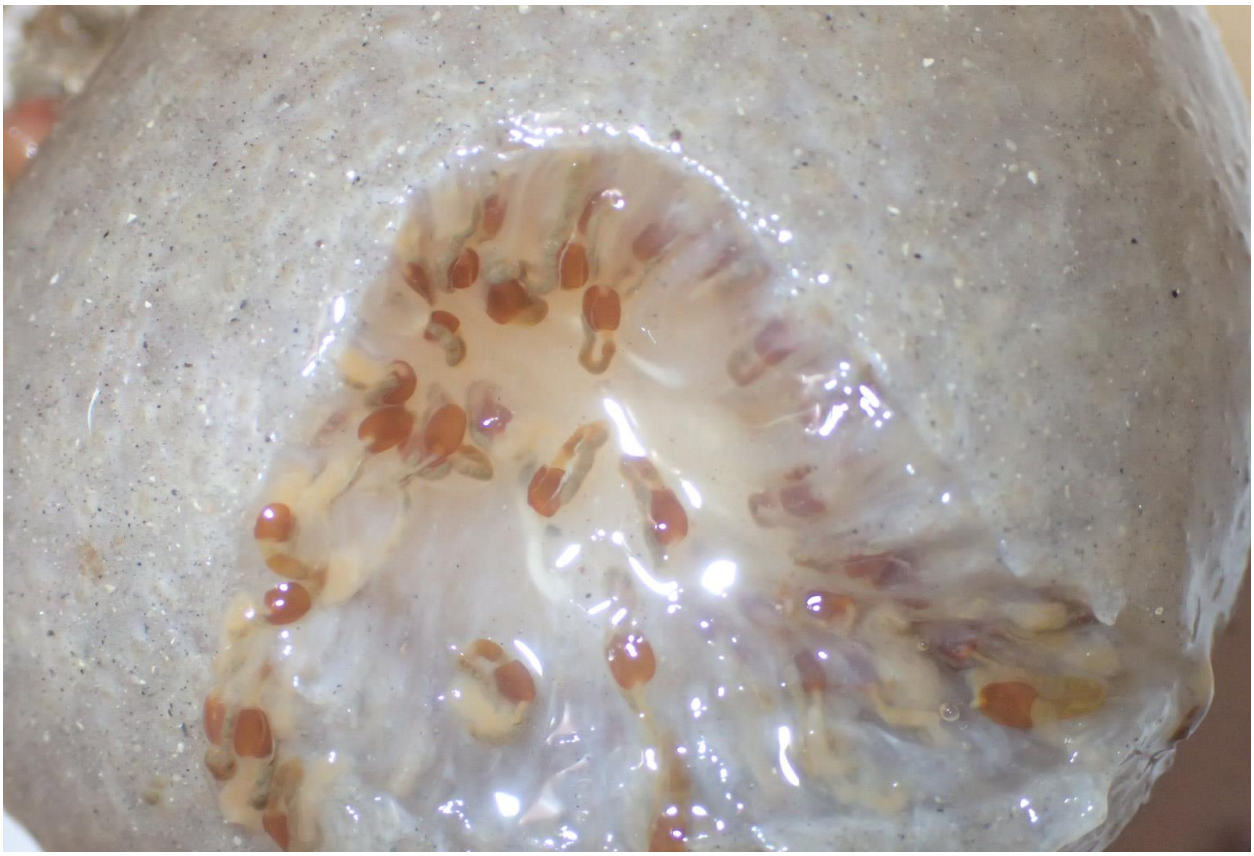
Chordata

Ascidiacea: *Tridemnum tenerum*

Chordata



Ascidiacea: Didemnidae (undetermined)

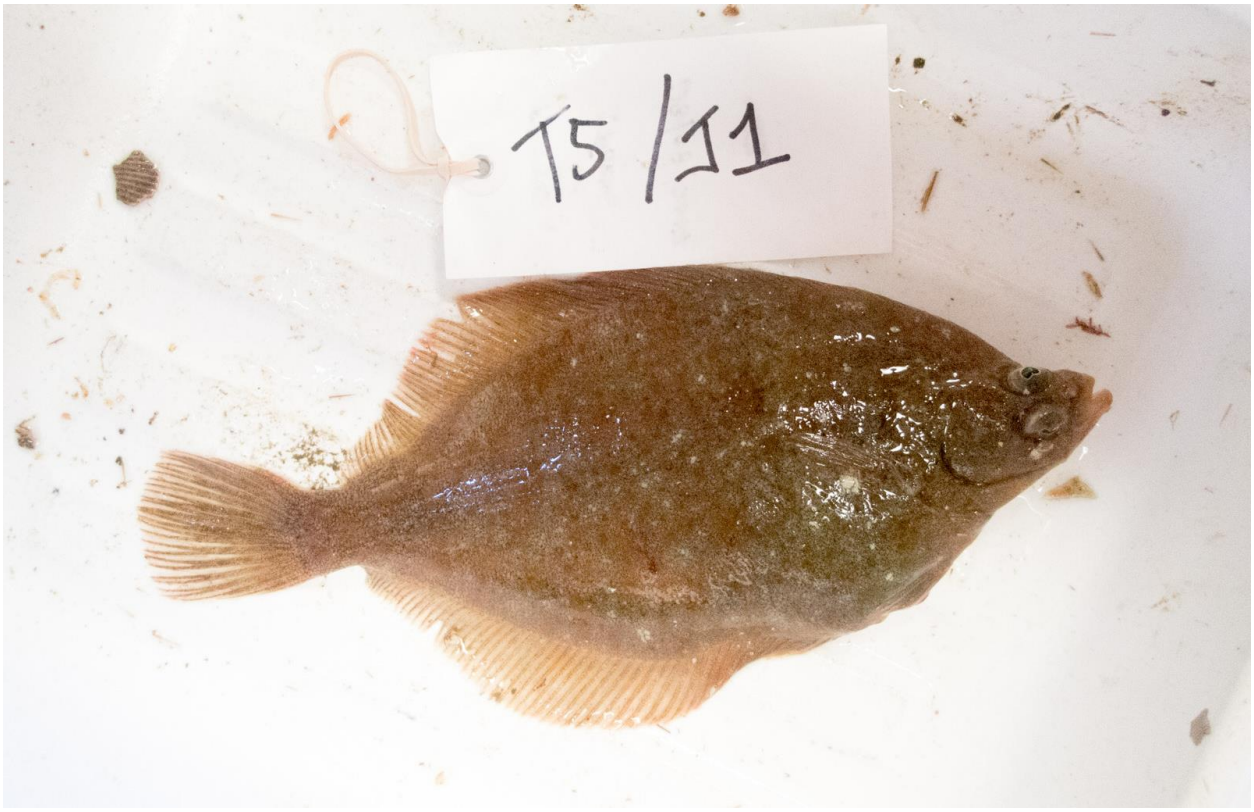


Ascidiacea: *Synoicum pulmonaria*

Teleostei: Gadidae: *Gadus* (cf. *morhua*)

Teleostei: Pleuronectidae: *Hippoglossoides platessoides*

Teleostei: Pleuronectidae: *Hippoglossus hippoglossus*



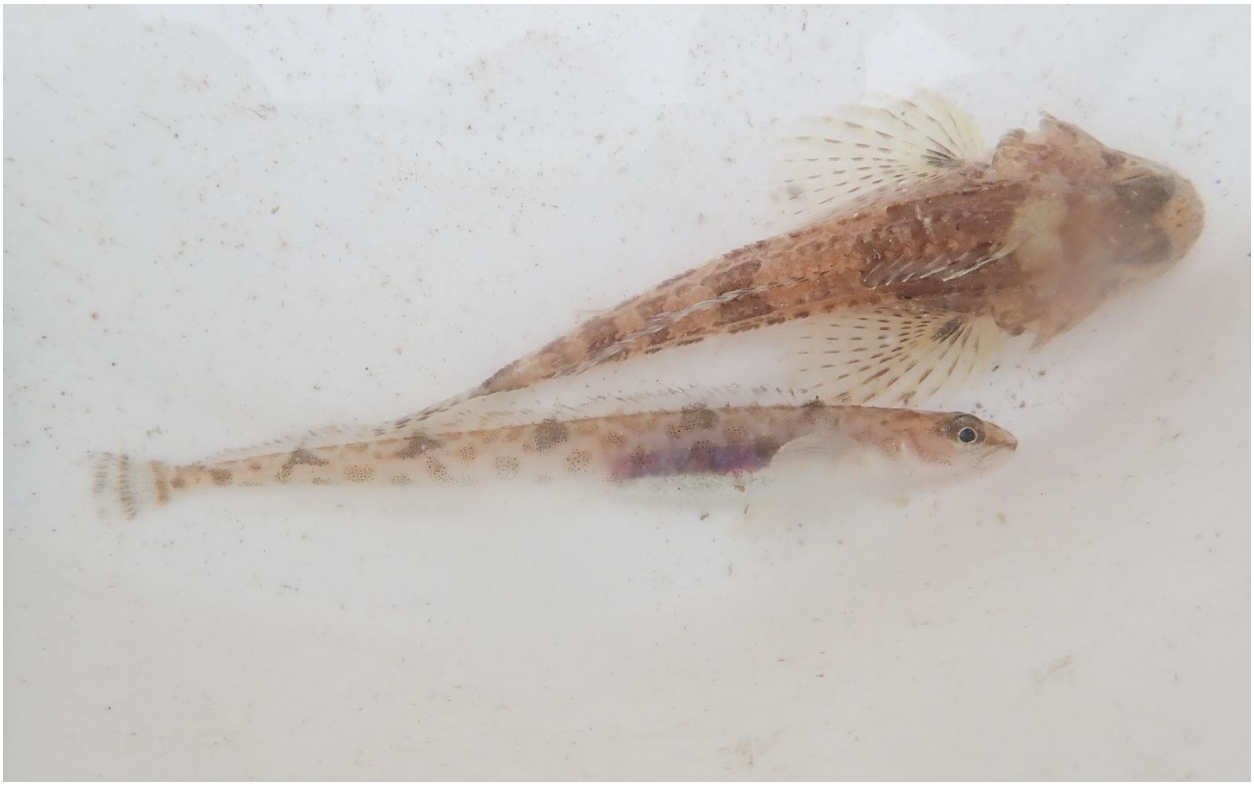
Teleostei: Pleuronectidae: *Limanda ferruginea*

Teleostei: Ammodytidae: *Ammodytes* sp.

Teleostei: Anarhichadidae: *Anarhichas lupus* (juvenile)

Teleostei: Stichaeidae: *Eumesogrammus praecisus*

Teleostei: Stichaeidae: *Ulvaria subbifurcata*



Teleostei: Stichaeidae: *Leptoclinus maculatus* (*Icelus* above)

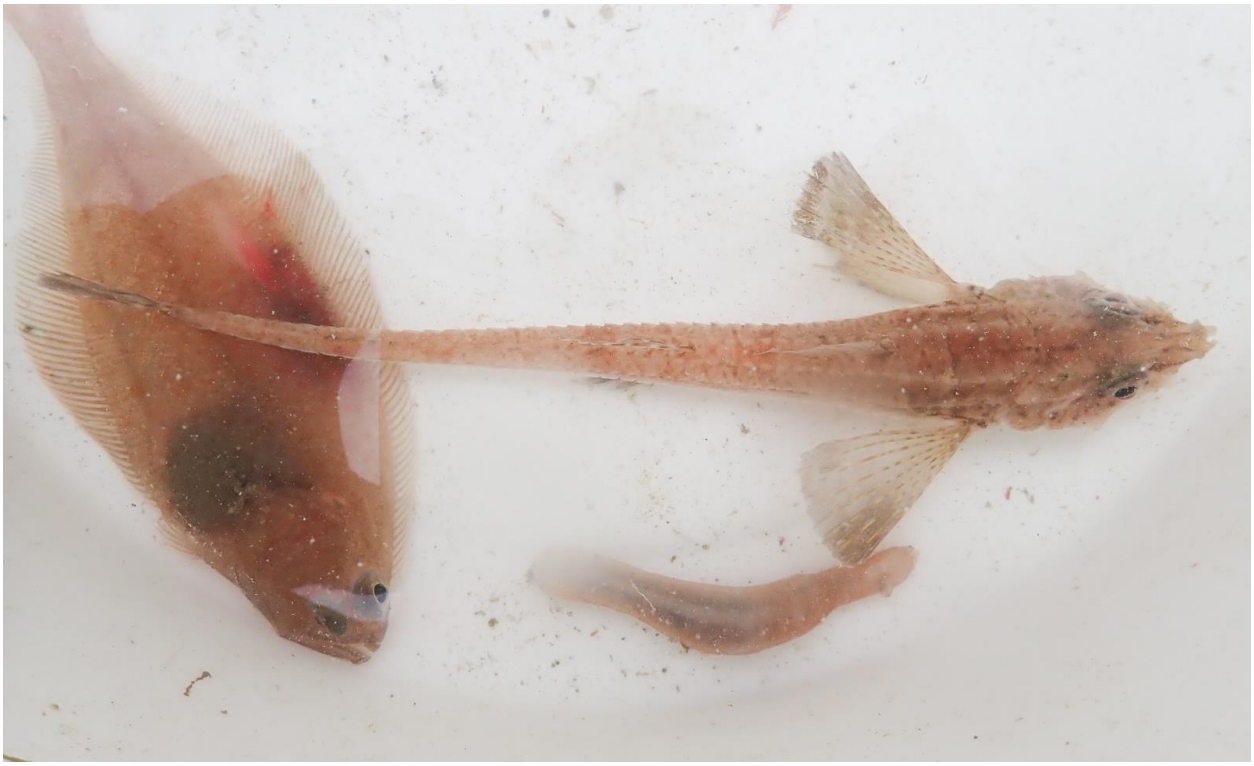
Teleostei: Stichaeidae: *Stichaeus punctatus*

Teleostei: Zoarcidae: *Gymnelus viridis*

Teleostei: Zoarcidae: *Lycodes lavalaei* (juvenile)

Teleostei: Zoarcidae: *Zoarces americanus*

Teleostei: Agonidae: *Aspidophoroides monopterygius*



Teleostei: Agonidae: *Leptagonus decagonus*

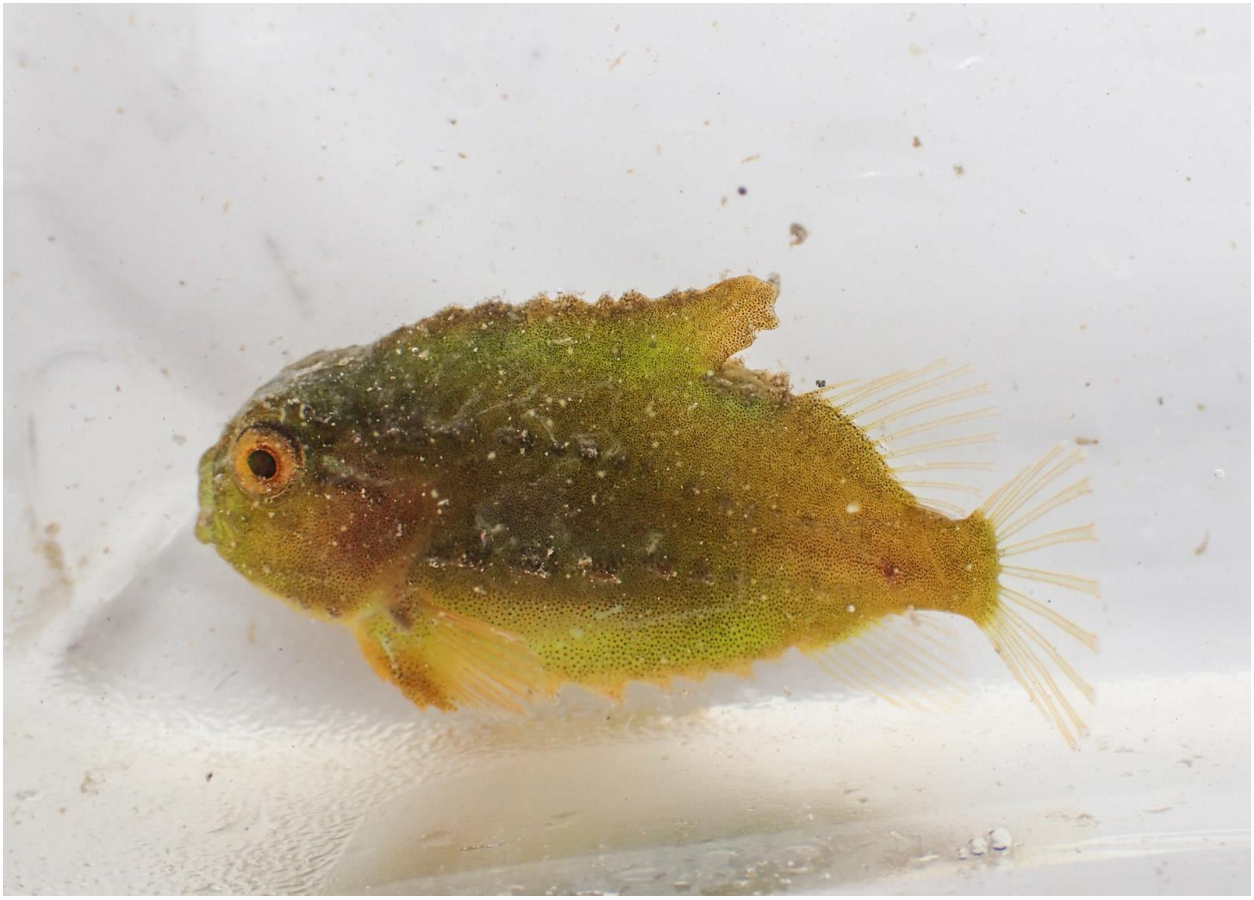
Teleostei: Cottidae: *Gymnocanthus tricuspis*

Teleostei: Cottidae: *Icelus spatula*

Teleostei: Cottidae: *Myoxocephalus* (*aenaeus,* or juvenile *scorpius*)

Teleostei: Cottidae: *Myoxocephalus scorpius*

Teleostei: Cottidae: *Triglops murrayi*

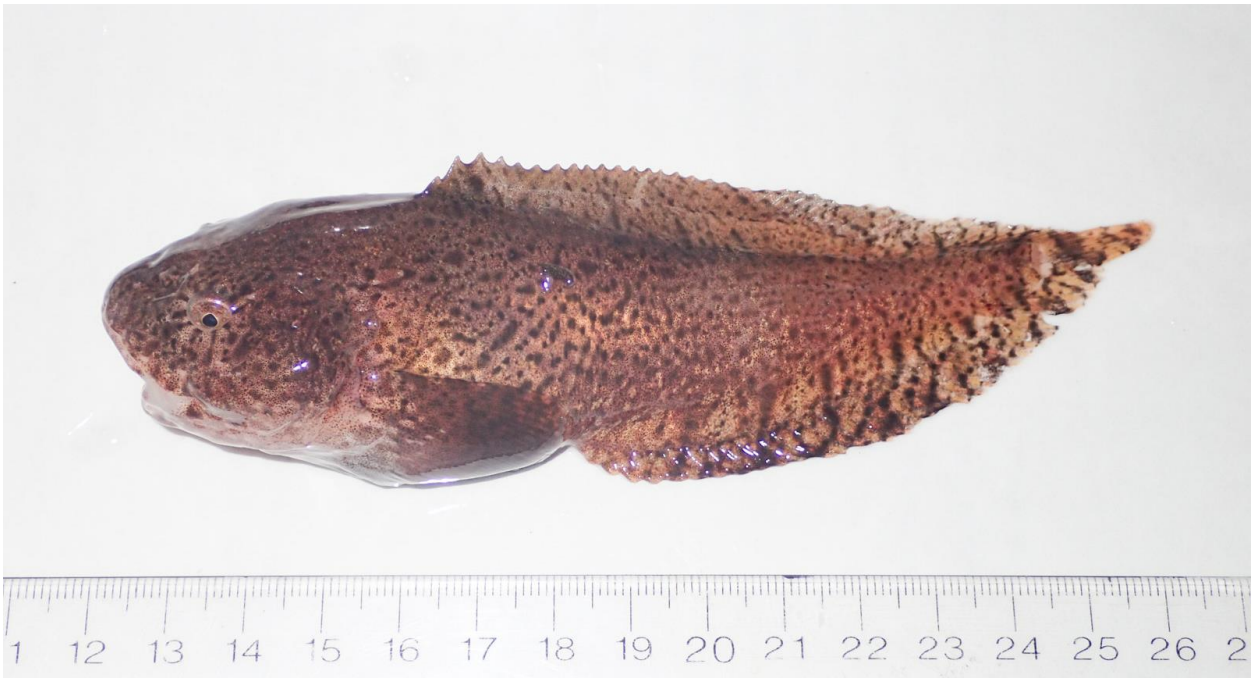


Teleostei: Cyclopteridae: *Cyclopterus lumpus* (juvenile)

Teleostei: Cyclopteridae: *Eumicrotremus terraenovae*

Teleostei: Hemitripteridae: *Hemitripterus americanus*

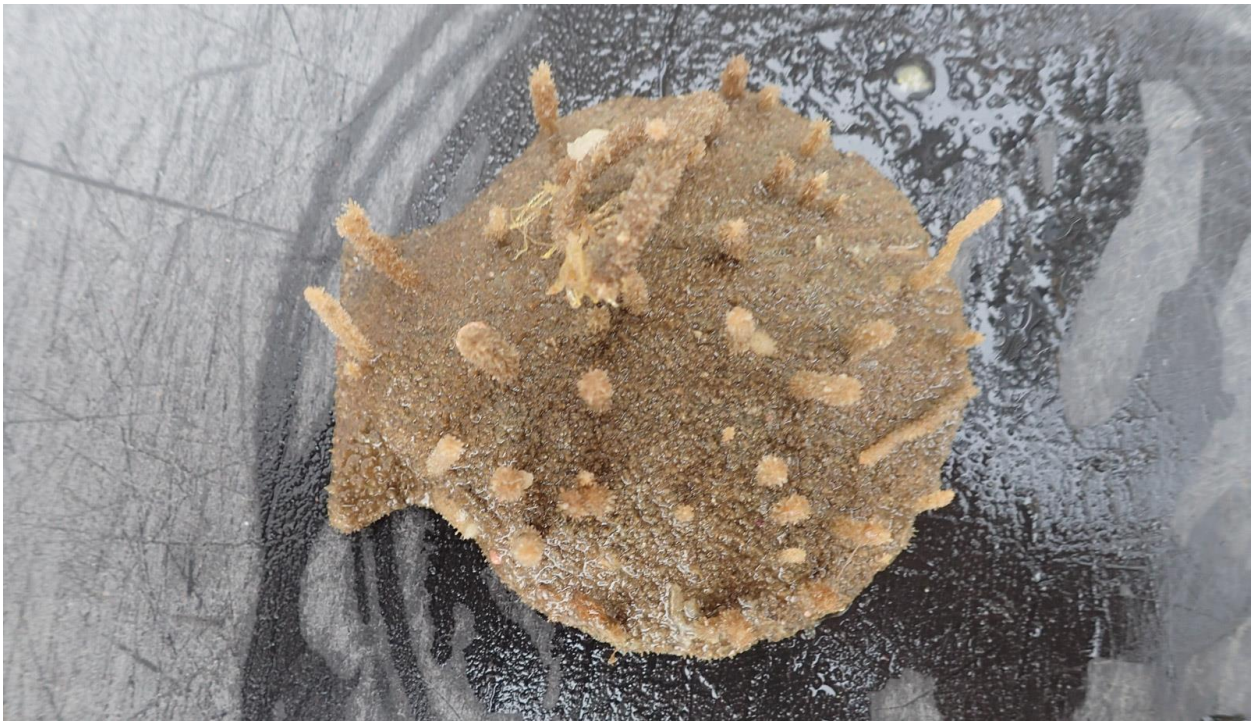
Teleostei: Liparidae: *Liparis* sp.



Teleostei: Liparidae: *Liparis bathyarcticus*

Teleostei: Sebastidae: *Sebastes* (cf. *mentella*)

Animalia



Animalia (unknown erect and encrusting brown organism often seen covering scallop shells)