

Observations on the Gorgonian Coral *Primnoa pacifica* at the Knight Inlet sill, British Columbia 2008 to 2013



By Neil McDaniel¹ and Doug Swanston²

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Background

The fjords of British Columbia are glacially-carved troughs that snake their way through the coastal mountains, attaining depths as great as 760 m. Knight Inlet is especially long, extending 120 km northeast from an entrance located 240 km northwest of Vancouver, near the north end of Vancouver Island. Despite a maximum depth of 540 m it has a relatively shallow sill lying between Hoeya Head and Prominent Point with a maximum depth of only 65 m. Due to the shallow nature of the sill, tidal currents frequently exceed 0.5 m/second.

¹ neil.mcd@telus.net

² seacology@telus.net

The site has been of particular interest to oceanographers as the classical shape of this sill results in the presence of internal gravity waves and other interesting hydraulic phenomena (Thompson, 1981). As a result, university and federal government scientists have undertaken a number of oceanographic surveys of these features.

In the early 1980s researchers surveying the depths of Knight Inlet with the submersible *Pisces IV* encountered large fans of gorgonian coral on the flanks of the sill at depths of 65 to 200 m (Tunncliffe and Syvitski, 1983). Boulders of various sizes were found scattered over the sill, many colonized by impressive fans of *Primnoa*, the largest 3 m across. The fact that this gorgonian coral was present was noteworthy, but the scientists observed something else extremely curious. Behind some of the boulders were long drag marks, evidence that when the coral fan on a particular boulder became big enough it acted like a sail in the tidal currents. This was theorized to cause the boulder to be gradually transported until it was removed from the influence of the current or until the fan caused the boulder to tip over, thus spilling the “wind” from the sail created by the fan.

In April 1982, after speaking with the *Pisces* pilots, Ralph Delisle and Dave Wardell dived the sill and found some coral fans at 30 m. Delisle took some underwater pictures, but at the time did not realize the significance of their remarkable find; i.e. the shallowest sighting of this gorgonian ever in BC waters.

Neil McDaniel and a group of divers aboard the M.V. *Oceaner* explored the sill in June 1982 but did not locate the coral. However they encountered two bigmouth sculpins, *Hemitripterus bolini*, a species rarely seen in shallow water. The sighting represented a new southernmost record for this species in BC (previously Hakai Pass) and a new shallow record (previously -122 m) of -10 m.

In June 2008, Doug Deproy, Phil Edgell, Jackie Hildering, Andy Lamb, and Neil McDaniel explored the area armed with a specific location provided by Ralph Delisle. They were successful in finding *Primnoa* at depths as shallow as -15 m (photo at right) and collected samples for identification. The specimens were sent to Dr. Stephen Cairns at the Smithsonian Institution. He confirmed their identity as *Primnoa pacifica* Kinoshita, 1907.

An unusual specimen of demosponge was identified as *Amphilectus infundibulus* by Dr. Bill Austin, an expert in NE Pacific sponge taxonomy. This sighting proved to be a much shallower record for this sponge in BC waters (photo at right).

In November 2009, Joe Doiron, Mike Kalina, Neil McDaniel,

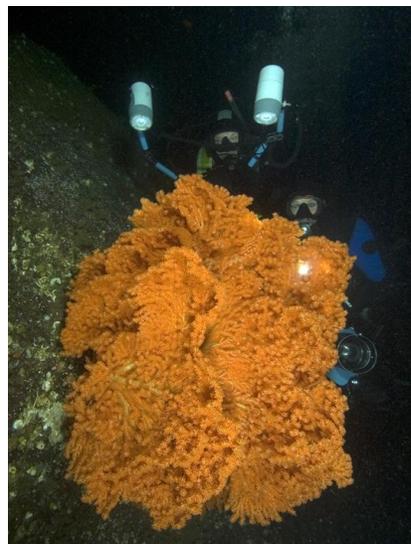


Tom Sheldon and Paul Sim visited the sill to further survey the area and acquire more photographs. This expedition was cut short by bad weather, permitting only one day of diving at the sill. Tidal currents were strong and prevented extensive exploration. However, Kalina was able to photograph some large (20 cm diameter) specimens of *Amphilectus infundibulus*.

In March 2010, Joe Doiron, Gord Brow, Neil McDaniel, Tom Sheldon and Doug Swanston visited the sill aboard the M.V. *Mamro*. Sea conditions were calm and dives were scheduled according to predicted slack currents. Visibility was relatively good, enabling the team to locate and photograph one of the richest areas found so far. *Primnoa* fans were found as shallow as -12 m, attached to variously sized boulders. Many damaged coral fans were observed lying on the bottom.

In March 2011, Joe Doiron, Gord Brow, Mike Kalina, Neil McDaniel, Tom Sheldon and Doug Swanston made another trip to the sill aboard the M.V. *Mamro*. The objectives of the trip were to obtain more photographic and video documentation of the *Primnoa* and other marine life, assess the amount and extent of damaged corals, map the distribution of the coral within diving depths and prepare a preliminary species list of conspicuous algae, invertebrates and fishes found at the sill (Table 1).

In March 2012, Joe Doiron, Lou Lehmann, Neil McDaniel, Mike Perdue, Tom Sheldon and Doug Swanston visited the area again aboard the M.V. *Mamro*. Moderate to strong SE winds made diving on the exposed sill difficult, so more time was spent exploring the north and south slopes of the inlet. At two sites just west of Lull Bay on the north side of the inlet, intact and seemingly healthy fans of *Primnoa* (right) were found in deeper water (-30 m and below). Some of these fans reached more than 1.5 m in height. Additional sponges were collected for examination by Dr. Bill Austin, including one (*Hymetrochota* sp.) which may represent a new record for the NE Pacific. Several specimens of an undescribed sea star, *Solaster* sp. were collected for Dr. Roger Clark. Specimens of the soft coral *Thrombophyton trachydermum* were collected for the Royal BC Museum (via Jim Boutillier, Pacific Biological Station).



In April 2013 exploratory dives were made by Lou Lehmann, Neil McDaniel and Tom Sheldon on the south side of the fjord adjacent to the sill. Phenomenal numbers of feather stars (*Florometra serratissima*) carpet the bottom here, and even the dead skeletons of many large *Primnoa* fans in deeper water (below 30 m) were covered with them. Live *Primnoa* fans were found, but even they were densely covered with crinoids. Several sea stars were found at usually shallow depths (-5 m), including *Ceramaster patagonicus* and *Hippasteria phrygiana*. A large population of the pink hydrocoral *Stylaster norvigicus verrillii* was found in shallow water (-10 m).

Distribution of *Primnoa pacifica*

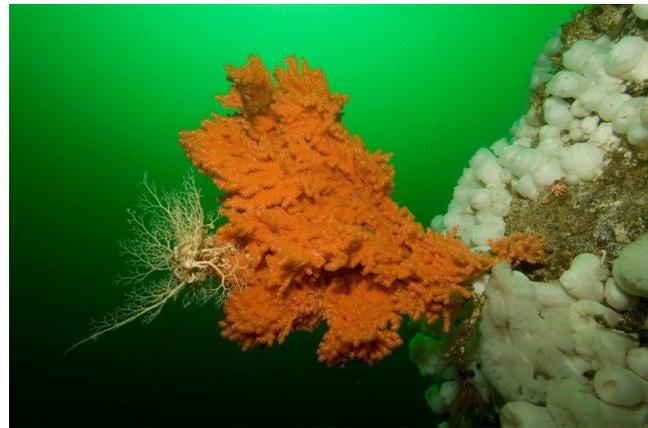
Primnoa pacifica ranges from the Sea of Japan westward across the Aleutian archipelago and south to La Jolla, California, generally at depths of 64 to 800 m. Off the BC coast, it appears to be widespread and attains considerable size, with the biggest fans reaching more than three metres tall. In very large specimens the main stem can reportedly be more than six cm in diameter and cross-sections reveal growth rings much like a tree. The 2009 *Finding Coral Expedition* by the Living Oceans Society found *Primnoa* utilizing Nuytco *DeepWorker* submersibles. They discovered extensive deep-water coral beds near Dundas Island, in Portland Canal and in Juan Perez Sound.

The shallowest that we have found *Primnoa* at the Knight Inlet sill is 12 m below datum, however it has been found in even shallower water in Glacier Bay and Tracy Arm fjord, Alaska (Stone et al, 2005). These gorgonians were observed during scuba surveys as shallow as 9 m deep. Alaskan researchers suggest that low temperature, stable salinity and low ambient light levels encourage *Primnoa* to colonize the rocky drop-offs. Because there is an accurate record of the deglaciation of Glacier Bay, they were also able to estimate the growth rates for these corals at 2.4 cm per year, an important figure when trying to determine the time it might take for damaged corals to recover.

Despite their strong holdfasts and wiry, moderately flexible branches, *Primnoa* fans are often destroyed by bottom trawling and other fishing methods such as long-lining and trapping. *Primnoa* is easily the largest coral found off the Pacific coast—in the Gulf of Alaska a gigantic specimen seven metres tall was reportedly observed during a submersible dive.

Preliminary Biophysical Description of the Knight Inlet Sill

The substrate on the crest of the sill within diving depths of 30 m is predominantly cobble trapped in coarse sands and gravel. However, in certain areas there are numerous boulders, some reaching very large dimensions (greater than 5 m in diameter). These boulder fields are located in the appropriate conditions to provide stable attachment for a diversity of invertebrates in the significant tidal currents that upwell over the ridge.



The largest *Primnoa* fans are nearly 1.5 m in diameter, attached to the sides and upper surfaces of variously-sized boulders. There are many detached and damaged fans, some with few living polyps, others seemingly recently broken, lying on the bottom.

Other conspicuous invertebrates include sponges such as the cloud sponge *Aphrocallistes vastus* (at the unusually shallow depth of 15 m), the soft goblet sponge *Amphilectus infundibulus*, the green sponge *Halichondria (Eumastia) sitiens* and many other encrusting demosponges; the zoanthid *Epizoanthus scotinus*; hydrocorals, especially *Stylaster norvigicus verrillii*; hydroids (many species, including *Aglaophenia* spp., *Thuiaria* spp., *Thuiaria thuja*); anemones, including the plumose anemone *Metridium farcimen*, the crimson anemone *Cribrinopsis fernaldi* and the spotted swimming anemone *Stomphia coccinea*; echinoderms, including the basket star *Gorgonocephalus eucnemis* (photo above), spiny red star *Hippasteria phrygiana*, gunpowder star *Gephyreaster swifti*, white urchin *Strongylocentrotus pallidus*, an undescribed species of sun star *Solaster* sp. and feather star *Florometra serratissima* (photo below).



In addition to the population of *Primnoa* gorgonian coral, of particular interest was the finding of several rarely-seen soft goblet sponges, *Amphilectus infundibulus*, several more than 20 cm in diameter. An alcyoniid soft coral collected that was presumed to be *Thrombophyton trachydermum* has been determined by Dr. Catherine McFadden to possibly be another, unidentified species.



Rationale for Protecting the Sill

Scuba explorations to date show that the Knight Inlet sill represents a remarkable and unique habitat on the British Columbia coast. Several deepwater and/or rare species (the gorgonian coral *Primnoa pacifica*, the soft goblet sponge *Amphilectus infundibulus*, the cloud sponge *Aphrocallistes vastus*, the shrimp *Eualus townsendi* and the bigmouth sculpin *Hemitripterus bolini*) are found at shallower than normal depths. There may be other rare deep-water species living on the sill. Well beyond scuba depths (at -150 m and deeper) there are colonies of the rare branching white coral *Lophelia pertusa* (pers. comm., Jim Boutillier, PBS).

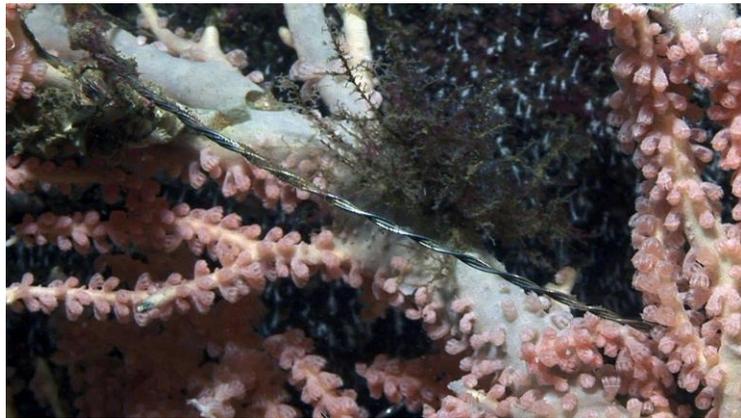
In March 2011, we located the part of the sill with the greatest number of *Primnoa* fans within diving depths. This was an area on the crest of the sill comprised of boulders lying on a cobble/coarse sand substrate. The boulders vary widely in size, but some are as much as 5 m in diameter. These very large boulders sometimes supported half a dozen large fans or more.

Scattered around the bottom near the bases of these boulders we found many broken and damaged coral fans. Some were entangled with monofilament fishing line (photo right) and had been damaged by sport fishing tackle. Various flashers and downrigger weights were also found.

Some broken fans were wrapped or tangled with downrigger wire (below, right). Heavier rope, possibly part of commercial trap-lines, was also found.

We also found some large, nearly intact fans that were not fouled with fishing gear and which may have broken free of their attachment naturally due to their large size and the force of the strong tidal currents.

We attempted to "right" some of these fans by inserting their bases into tight crevices between boulders so that they would stand upright in the currents. We observed that fans lying on the substrate appeared unhealthy, with many dead and dying polyps (photo right). They were also more likely to be preyed upon by the orange-peel nudibranch *Tritonia gigantea*.



Protecting the Knight Inlet Sill

We believe it is imperative to protect this unique marine site without further delay. This remarkable habitat features:

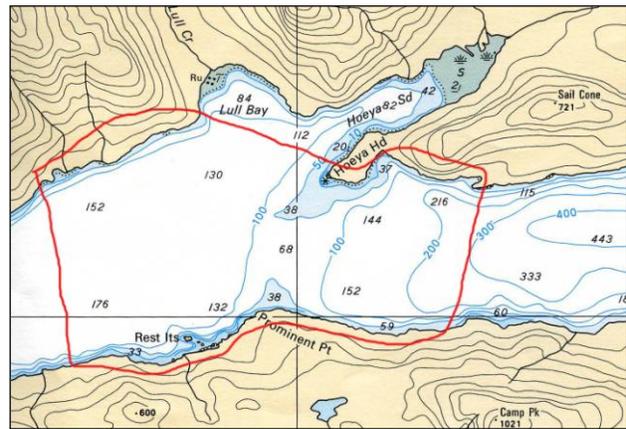
1/ The **shallowest known population of the gorgonian coral *Primnoa pacifica* on the coast of British Columbia** and the only one accessible to study using scuba. The site offers the rare opportunity to study growth rates, distribution, predators and other aspects of its biology.

2/ **Several deep-water and/or rarely seen species** such as the sponge *Amphilectus infundibulus*, the shrimp *Eualus townsendi*, the bigmouth sculpin *Hemitripterus bolini* and other species yet to be observed.

In order to prevent unnecessary and further damage to this site we recommend the following steps be taken immediately with regard to the area of the sill and adjacent sea floor approximately within the red outlined area shown in Figure 1:

1/ Closure to recreational fishing. Most of the observed damage to the coral fans appears to have been caused by recreational fishing tackle such as monofilament lines, downrigger wires and downrigger weights.

2/ Closure to commercial fishing. Ground tackle of crab or prawn sets can cause extensive damage to the coral fans and other bottom life. Bottom trawling could destroy the corals and other marine life on the inlet floor.



3/ Closure to log dumping and storage activities. Sinking wood debris can cause physical damage to delicate corals and sponges and accumulations of organic debris can smother bottom sediments for decades.

4/ Ban on the harvesting of corals or collection of any marine life from the area without a scientific collecting permit. Note that *Primnoa* has been harvested in Alaska for the production of jewellery.

5/ Ban on anchoring within the designated area. Anchors and ground tackle can cause significant damage to delicate corals and sponges.

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Table 1: List of Conspicuous Invertebrates, Fishes and Marine Mammals from Knight Inlet Sill (as of May 1, 2013 with additions by Andy Lamb, sponges identified by Dr. Bill Austin)

TAXON	COMMON NAME	COMMENTS
ALGAE	SEAWEEDS	
<i>Ulva</i> sp.	sea lettuce	
<i>Codium setchellii</i>	spongy cushion	
<i>Fucus distichus</i> subsp. <i>evanescens</i>	rockweed	
<i>Alaria marginata</i>	broad winged-kelp	
<i>Saccharina latissima</i>	sugar wrack kelp	
<i>Laminaria sinclairi</i>	dense-clumped kelp	
<i>Desmarestia</i> sp.	thin acid kelp	
<i>Nereocystis luetkeana</i>	bull kelp	
<i>Agarum fimbriatum</i>	fringed sea colander kelp	
Various spp.	filamentous red algae	
<i>Clathromorphum</i> spp.	crustose corallines	
<i>Callophyllis</i> sp.	beautiful leaf seaweed	
<i>Opuntia californica</i>	prickly pear seaweed	
PORIFERA	SPONGES	
<i>Sycandra</i> cf. <i>utriculus</i>	leather bag sponge	
<i>Rhabdocalyptus dawsoni</i>	sharp-lipped boot sponge	
<i>Aphrocallistes vastus</i>	cloud sponge	
<i>Amphilectus rigidus</i>	orange finger sponge	
<i>Amphilectus infundibulus</i>	flabby bowl sponge	Shallow record for BC at -20 m
<i>Asbestopluma occidentalis</i>	pipecleaner sponge	
<i>Iophon lamella</i>	white reticulated sponge	
<i>Halichondria (Eumastia) sitiens</i>	green-tinged sponge	
<i>Semisuberites cribrosa</i>	funnel sponge	
<i>Halsarca/Oscarella</i> sp.	sponge	
<i>Mycale adhaerens</i>	sponge	
<i>Suberites latus</i>	hermit crab sponge	
Raspailiidae	sponge	
<i>Hymetrochota</i> sp.	sponge	New record for NE Pacific? (W. Austin)
<i>Weberella</i> sp.	sponge	
<i>Lissodendoryx</i> sp.	sponge	
<i>Plakina atka</i>	brain sponge	Southern record?
CNIDARIA	ANEMONES, CORALS	
<i>Metridium farcimen</i>	giant plumose anemone	
<i>Cribrinopsis fernaldi</i>	crimson anemone	
<i>Urticina crassicornis</i>	painted anemone	
<i>Stomphia didemon</i>	swimming anemone	

<i>Stomphia coccinea</i>	spotted swimming anemone	
<i>Epizoanthus scotinus</i>	orange zoanthid	
<i>Balanophyllia elegans</i>	orange cup coral	
<i>Thrombophyton trachydermum</i>	pale soft coral	
<i>Alcyonium</i> sp. <i>indeterminate</i>	red soft coral	See Williams, 2013
<i>Ptilosarcus gurneyi</i>	orange sea pen	
<i>Virgularia</i> cf. <i>tuberculata</i>	white sea pen	
<i>Halipteris willemoesi</i>	sea whip	
<i>Primnoa pacifica</i>	red tree gorgonian coral	Shallow record for BC at -12 m
<i>Stylaster norvigicus verrillii</i>	branching pink hydrocoral	
<i>Aglaophenia</i> spp.	ostrich plume hydroids	
<i>Thuiaria</i> spp.	embedded sea fir hydroids	
<i>Plumularia</i> sp.	delicate plume hydroid	
<i>Clava</i> sp.	white hydroid	
<i>Thuiaria thuja</i>	bottlebrush hydroid	
<i>Ectopleura marina</i>	solitary pink-mouth hydroid	
<i>Grammaria</i> sp.	spindly embedded hydroid	
<i>Lafoea dumosa</i>	muff hydroid	
ANNELIDA	SEGMENTED WORMS	
<i>Serpula columbiana</i>	red trumpet calcareous tubeworm	
<i>Eudistylia catharinae</i>	roll-top feather duster worm	
<i>Diopatra ornata</i>	ornate tubeworm	
<i>Halosydna brevisetosa</i>	eighteen-scaled worm	
<i>Protula pacifica</i>	white-crowned calcareous tubeworm	
<i>Chone aurantiacea</i>	orange feather-duster	
<i>Demonax medius</i>	parasol feather-duster	
<i>Bispira</i> sp.	twin-eyed feather-duster	
<i>Myxicola infundibulum</i>	slime-tube feather-duster	
BRYOZOA	MOSS ANIMALS	
<i>Schizoporella japonica</i>	orange encrusting bryozoan	
<i>Microporina borealis</i>	stick bryozoan	
BRACHIOPODA	LAMPSHELLS	
<i>Laqueus californicus</i>	California lamp shell	
<i>Terebratalia transversa</i>	transverse lamp shell	
<i>Terebratulina unguicula</i>	snake's head lamp shell	
<i>Hemithrys psittacea</i>	black lamp shell	
MOLLUSCA	CHITONS, BIVALVES, SNAILS...	
<i>Tonicella undocaerulea</i>	blue-lined chiton	
<i>Tonicella lineata</i>	lined chiton	
<i>Mopalia muscosa</i>	mossy chiton	
<i>Lepidozona mertensii</i>	Merten's chiton	

<i>Cryptochiton stelleri</i>	giant Pacific chiton	
<i>Placiphorella rufa</i>	red veiled chiton	
<i>Modiolus rectus</i>	straight horse mussel	
<i>Clinocardium nuttallii</i>	Nuttall's cockle	
<i>Saxidomus gigantea</i>	Washington butter clam	
<i>Hiatella arctica</i>	arctic nestler	
<i>Mya truncata</i>	truncated softshell clam	
<i>Diadora aspera</i>	rough keyhole limpet	
<i>Bathybembix bairdi</i>	Baird's margarite	
<i>Ocenebrina interfossa</i>	sculptured rocksnail	
<i>Chlamys hastata</i>	spiny pink scallop	
<i>Ceratostoma foliatum</i>	leafy hornmouth	
<i>Nucella lamellosa</i>	wrinkled dogwinkle	
<i>Amphissa columbiana</i>	wrinkled amphissa	
<i>Boreotrophon stuarti</i>	winged trophon	
<i>Calliostoma variegatum</i>	variable topsnail	
<i>Fusitriton oregonensis</i>	Oregon triton	
<i>Trichotropis cancellata</i>	checkered hairsnail	
<i>Tritonia festiva</i>	diamondback nudibranch	
<i>Onchidoris bilamellata</i>	barnacle-eating nudibranch	
<i>Triopha catalinae</i>	clown nudibranch	
<i>Tritonia tetraquetra</i>	pink tritonia	
<i>Tritonia gigantea</i>	orange-peel nudibranch	
<i>Enteractopus dofleini</i>	giant Pacific octopus	
ARTHROPODA	SHRIMPS, CRABS, BARNACLES...	
<i>Erichthonius rubricornis</i>	tube-dwelling sea flea	
<i>Heptacarpus decorus</i>	elegant coastal shrimp	
<i>Eualus townsendi</i>	Townsend's eualid	Shallow record for BC at -20 m
<i>Heptacarpus kincaidi</i>	Kincaid's shrimp	
<i>Lebbeus grandimanus</i>	candy stripe shrimp	
<i>Pandalus eous</i>	spiny pink shrimp	
<i>Pandalus danae</i>	coonstripe shrimp	
<i>Cancer productus</i>	red rock crab	
<i>Metacarcinus magister</i>	dungeness crab	
<i>Pugettia gracilis</i>	graceful decorator crab	
<i>Hyas lyratus</i>	Pacific lyre crab	
<i>Chorilia longipes</i>	longhorn decorator crab	
<i>Acantholithodes hispidus</i>	hairy-spined crab	
<i>Cryptolithodes typicus</i>	butterfly crab	
<i>Rhinolithodes wosnessenskii</i>	rhinoceros crab	
<i>Phyllolithodes papillosus</i>	heart crab	

<i>Lopholithodes mandtii</i>	Puget Sound king crab	
<i>Lopholithodes foraminatus</i>	brown box crab	
<i>Placetron wosnessenskii</i>	scaled crab	
<i>Munida quadrispina</i>	galatheid crab	
<i>Pagurus beringanus</i>	Bering hermit	
<i>Pagurus armatus</i>	backeyed hermit	
<i>Elassochirus tenuimanus</i>	widehand hermit	
<i>Elassochirus gilli</i>	orange hermit crab	
<i>Balanus glandula</i>	common acorn barnacle	
<i>Balanus rostratus</i>	rostrate barnacle	
<i>Balanus nubilus</i>	giant acorn barnacle	
ECHINODERMATA	SEA STARS, URCHINS, CUCUMBERS	
<i>Evasterias troschelii</i>	mottled star	
<i>Mediaster aequalis</i>	vermilion star	
<i>Gephyreaster swifti</i>	gunpowder star	
<i>Ceramaster patagonicus</i>	cookie star	
<i>Hippasteria phrygiana</i>	spiny red star	
<i>Pteraster militaris</i>	wrinkled star	
<i>Pteraster tessellatus</i>	slime star	
<i>Henricia leviuscula</i>	blood star	
<i>Henricia sanguinolenta</i>	fat blood star	
<i>Pycnopodia helianthoides</i>	sunflower star	
<i>Crossaster papposus</i>	rose star	
<i>Solaster dawsoni</i>	morning sun star	
<i>Solaster endeca</i>	northern sun star	
<i>Solaster "paxillatus"</i>	orange sun star	Undescribed (R. Clark, Pers. comm.)
<i>Ophiopholis aculeata</i>	daisy brittle star	
<i>Gorgonocephalus eucnemis</i>	basket star	
<i>Florometra serratissima</i>	feather star	
<i>Strongylocentrotus droebachiensis</i>	green sea urchin	
<i>Strongylocentrotus pallidus</i>	white sea urchin	
<i>Parastichopus californicus</i>	giant sea cucumber	
<i>Cucumaria miniata</i>	red sea cucumber	
<i>Psolus chitonoides</i>	creeping pedal sea cucumber	
CHORDATA	TUNICATES	
<i>Corella willmeriana</i>	transparent tunicate	
<i>Ascidia paratropa</i>	glassy tunicate	
<i>Didemnum</i> sp.	compound tunicate	
<i>Cnemidocarpa finmarkiensis</i>	broadbase tunicate	
<i>Pyura haustor</i>	warty tunicate	
<i>Didemnum carnulentum</i>	Pacific white crust	

<i>Cystodytes</i> sp.	compound tunicate	
FISHES		
<i>Aulorhynchus flavidus</i>	tubesnout	
<i>Microgadus proximus</i>	Pacific tomcod	
<i>Ronquilus jordani</i>	norther ronquil	
<i>Hexagrammus stelleri</i>	whitespotted greenling	
<i>Artedius harringtoni</i>	scalyhead sculpin	
<i>Triglops pingelii</i>	ribbed sculpin	
<i>Podothecus accipenserinus</i>	sturgeon poacher	
<i>Lepidopsetta bilineata</i>	rock sole	
<i>Parophrys vetulus</i>	English sole	
<i>Platichthys stellatus</i>	starry flounder	
<i>Chirolophis decoratus</i>	decorated warbonnet	
<i>Lumenus sagitta</i>	snake prickleback	
<i>Sebastes caurinus</i>	copper rockfish	
<i>Sebastes maliger</i>	quillback rockfish	
<i>Sebastes melanops</i>	black rockfish	
<i>Sebastes ciliatus</i>	dark rockfish	
<i>Sebastes emphaeus</i>	Puget Sound rockfish	
<i>Hexagrammos decagrammus</i>	kelp greenling	
<i>Ophiodon elongatus</i>	lingcod	
<i>Jordania zonope</i>	longfin sculpin	
<i>Hemilepidotus hemilepidotus</i>	red Irish lord	
<i>Enophrys bison</i>	buffalo sculpin	
<i>Enophrys lucasi</i>	leister sculpin	Southern record for BC?
<i>Myoxocephalus polyacanthocephalus</i>	great sculpin	
<i>Hemitripteris bolini</i>	bigmouth sculpin	Southern & shallow record at -10 m
<i>Rhamphocottus richardsonii</i>	grunt sculpin	
<i>Nautichthys oculofasciatus</i>	sailfin sculpin	
<i>Liparis dennyi</i>	marbled snailfish	
<i>Agonopsis vulsa</i>	northern spearnose poacher	
<i>Pleuronichthys coenosus</i>	C-O sole	
<i>Ptilichthys goodei</i>	quillfish	
MAMMALS		
<i>Eumetopias jubatus</i>	Steller sea lion	
<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin	
<i>Megaptera novaeangliae</i>	Humpback whale	