Pacific Fisheries Resource Conservation Council

# Strait of Georgia Biodiversity in Relation to Bull Kelp Abundance

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# EXECUTIVE SUMMARY

Pacific Marine Life Surveys Incorporated (PMLS) has a unique database for Pacific Northwest marine life that includes seaweed identifications from 1983 on. Included in this database is dive log data for the Strait of Georgia, comprising some 3,137 dives in 358 sites. The data span a time period from 1967 to present. The logs contain all the species observed with a total of 1,097 algal and animal species from all major phyla.

Through a competitive bidding process and assessment of their capabilities, the firm was chosen by the Pacific Fisheries Resource Conservation Council to undertake the study leading to this report as a contribution to improved understanding of marine ecosystems and impacts on wild Pacific salmon and other species.

The presence of bull kelp *Nereocystis* was recorded in moderate to strong abundances in most regions for at least part of the time periods of observation, with three exceptions:

Lambert/Nanoose, Sunshine, and Howe Sound, all of which are in the middle latitudes of the greater Strait of Georgia area. Significant presence of sea urchins *Strongylocentrotus* occurred throughout all regions of the Strait of Georgia. Urchins, a known grazer of seaweeds, are abundant throughout the entire study area, but a few sites within the Howe Sound and Lambert Channel regions feature urchin barrens: where no seaweeds occur. It is not possible to determine why bull kelp is less abundant near the middle of the Strait of Georgia because the absence of bull kelp does not correspond to any significant shifts in ecosystem biodiversity. Instead, the seabed biodiversity of the Strait of Georgia is remarkably stable and extensive throughout the region, regardless of bull kelp presence.

# 1. INTRODUCTION

Pacific Marine Life Surveys Incorporated (PMLS) is a biological consulting business that offers a unique database for Pacific Northwest marine life that commences in 1967. This database generally includes seaweed identifications from 1983 on. Established in 1998, PMLS was created to consolidate and formalize a large volume of data generated via SCUBA dive logs. These dives (approximately 4,500 and counting) assess macro algae, invertebrates and vertebrates at sites from southern Oregon to southeast Alaska, the majority of which occurred in Washington State and British Columbia waters. This large database provides historical and current information suitable for biological assessment reports and projects.

The PMLS is an electronic database with the detailed species entries from each dive recorded via a unique program. These records can be searched, summarized and manipulated in multiple ways to provide customized data analysis by our in-house computer programmer. Flexibility for analysis within this program is fundamental.

In the early years of dive logging, data was laboriously entered by hand on paper log sheets. In 1997, not only were new electronic dive logs created via our custom program, but all previous paper logs were transcribed into the new system. Historically, as this database expanded, methods to assess species abundance have also evolved. While some information could be found before 1984, an every-species estimate became the norm near the end of that year. Each species in a report is assigned a short alphanumeric code. For algae, plants and invertebrates, this code refers the reader to *Marine Life of the Pacific Northwest* (Lamb and Hanby, 2005), which uses the same species codes. For fishes, the code is strictly for database purposes only; the reader may look up the animal by species name in *Coastal Fishes of the Pacific Northwest, 2nd edition* (Lamb and Edgell, 2010) or other comprehensive fish references.

PMLS has dive log data for the Strait of Georgia comprising some 3,137 dives in 358 sites. The data span a time period from 1967 to present. The logs contain all the species observed with a total of 1,097 algal and animal species from all major phyla.

# 2. BACKGROUND

What has now become a huge database had its origin from Andy Lamb's very first dive in 1967 and his subsequent desire to record the various organisms observed. At the time, he was employed at the Vancouver Aquarium and believed that the information he gained would assist with future specimen collection activities at the Aquarium. Lamb completed all recorded dives until 1992, when Donna and Charlie Gibbs began their participation.

Site selection has always been opportunistic and based upon the schedules and available time of the recording divers. From 1967 to 1974, virtually all sites were selected to aid in specimen collection activities for the Vancouver Aquarium. As a result of the connection with the Vancouver Aquarium Lamb developed a long-term friendship with Dr. Charles Moffett of Bellingham, Washington, who had a property at Friday Harbor, WA. This relationship resulted in the slate of sites being greatly expanded, particularly into the San Juan Islands.

The creation of a marine life identification course for divers in 1974 resulted in 25 years of additional sites. These sites were chosen because they were the homes of the regularly visited dive charter operations in areas such as Powell River, Egmont, Pender Harbour, Porpoise Bay, Whidbey Island, Puget Sound, Barkley Sound, Campbell River, Port McNeill and Port Hardy.

In 1975, Lamb became part owner of waterfront property on Mayne Island facing Active Pass, at Laura Point. This event facilitated the addition of more southern Gulf Island sites to the slate of sites assessed.

In 1976, Lamb encountered Bernie Hanby of West Vancouver, owner of several vessels and property at Pender Harbour. This friendship resulted in numerous dive trips (and resulting site additions) throughout B.C. Such activities greatly increased in the years since 1990, when the research for their publication *Marine Life of the Pacific Northwest* (Lamb and Hanby, 2005) was underway.

In 1992, via the marine life course, the Gibbs and Lamb partnership was initiated. At this point, Donna and Charlie Gibbs began contributing as divers and therefore helped generate more data site possibilities. In late 1998, Pacific Marine Life Surveys Incorporated was formed. Subsequently, and under contract to Parks Canada, PMLS produced a report summarizing biodiversity in the southern Gulf Islands.

Data from the PMLS system was utilized in Marliave et al, 2009 with respect to biodiversity in southern British Columbia, specifically the relationships between *Sebastes* species, the sponge *Aphrocallistes vastus* Schultze 1887 and other species. The PMLS data usage in that publication served as a precedent for how PMLS data is employed in this report.

In 1996, Lamb began a "volunteer diver naturalist" position with *Nautilus Explorer*, a large live-aboard dive charter vessel owned by Mike Lever. Over the following years, this relationship led to the addition of numerous sites along the central and north coasts of B.C. (including Haida Gwaii) and southeast Alaska.

From the initial dive to the present, the majority of the data collection has resulted from a *roving diver* (Martell et al., 2000) scenario, whereby the recording diver simply covers territory, guided by his or her spontaneous route choice while following safe diving practices.

Data have always been recorded as soon as possible after each dive and certainly within a 24-hour period. For the first 30 years of Lamb's project, these data were transcribed by hand onto 8 ½ x 14 in. lined paper and filed in chronological order. When Charlie and Donna Gibbs started

contributing data to the project, Charlie (a professional computer programmer) wrote a dive logging application that greatly simplified this process.

In addition to normal dive logging functions, this computer program is designed to facilitate rapid and easy entry of species observations. It does so by presenting a list of species known in the area, from which the user can make selections. Selecting from a list serves to jog the diver's memory, which ensures that species are entered that might otherwise have been forgotten. In addition, this program allows abundance estimates and comments to be entered for each species.

Once this specialized program became operational, paper logging was phased out. Having logs in machine-readable form allowed data to be easily backed up, and paved the way for Charlie Gibbs to write programs that would read the logs and perform sophisticated compilations.

At this point, Lamb had approximately 1,600 dives logged on paper. Donna Gibbs used the new program to transcribe these sheets into the growing database, an ongoing project that took nearly two years to complete. Once these data were entered, the entire database was available for electronic analysis. While Charlie Gibbs wrote additional programs to check log entries for accuracy and consistency, Donna Gibbs was able to use these tools for comprehensive proof reading of the data, further enhancing their value.

Central to all recorded data is an up-to-date species list that aids in a consistent recording process. This list constantly evolves with the insertion of additional species and appropriate taxonomic updates. The document conforms to the Integrated Taxonomic Information System (ITIS) with respect to recognized scientific names and authorships for all respective species.

In the early years, the species list was created largely from material gleaned from available guidebooks and other references available in the Vancouver Aquarium Library. As such material was added to, so the species list. Since 1974, when Lamb developed the marine life identification course for divers, he began assembling a large collection of 35 mm colour slides from various underwater photographers, and consequently the species list increased even more. These images provided excellent opportunities for verification of species identification, particularly when cross-referenced with an increasing number of academic sources. This process reached its current zenith with the publication of *Marine Life of the Pacific Northwest;* the book's species codes have been integrated into the species list. Most recently, edition 2 of *Coastal Fishes of the Pacific Northwest* has been utilized to update fish listings.

The taxonomic breadth of the species list evolved during the course of continuous data gathering and was influenced by the learning curve of the divers, particularly Lamb. From the start, fishes were of particular interest. In addition, larger and easily distinguished invertebrates in the phyla Porifera, Cnidaria, Mollusca, Arthropoda, Echinodermata and Chordata were specifically recorded and this mirrors the available references mentioned above. Temporally, additional focus was applied not only to Ctenophora, Platyhelminthes, Nemertea, Annelida, Brachiopoda and Bryozoa, but to lower, more problematic taxonomic sub-groups contained in the aforementioned phyla. Examples include the hydrozoans, mysids, isopods, amphipods, pycnogonids, cirripeds and compound tunicates. Plant and algae inclusion in the database followed a similar pattern but began somewhat later.

Throughout the evolution of the species list, a system of recording unknowns was implemented and it provided a mechanism for including these in the known species database once their identities were definitively determined. This feature was particularly useful for species in Porifera, Platyhelminthes, Nemertea, Annelida, Bryozoa and Chordata as well as the lower

taxonomic groups mentioned above. Once a positive identification of such a organism was obtained, all the corresponding temporary listings for that species were retroactively adjusted.

In a few instances, particularly for the algal component, distinguishing individual species while carrying out underwater surveys is not practical. In such situations, a general category was created. Examples include filamentous red algae and encrusting coralline algae.

These arbitrary categories required subjective interpretation by the three different data collectors. The categories manifests itself in the following ways: individual, temporal, species variability and inaccuracies of higher-level abundance estimates. Within such limitations, the charts and graphs generated in this report provide some valid general trends.

The data used to generate this report are not the result of a traditional research program involving designated and pre-determined sampling sites visited at regular intervals. All species documented were observed underwater, during the actual dive profiles, unless otherwise stated (e.g. for seals and sea lions) in the database.

Rather, the following results are derived from manipulation of a long-term monitoring effort involving sites selected for their accessibility and convenience. This effort was funded through recreational SCUBA trips and reliance on shore access or boat availability. It also reflects the available scheduling for participants – essentially holidays and weekends.

As a result of these limitations and the large geographic area involved, some gaps or inconsistencies exist during the time period studied. For example, sites in Howe Sound (the region closest to Vancouver and to the residences of the participating divers) received much more visitation. This logistical factor also lent to more night dives logged in this region, and thus nocturnally active species recorded. Consequently, the cumulative species totals for many sites within the Howe Sound region are understandably higher than many in other regions. In other words, if sites in other regions had received similar attention, their totals would likely have been higher.

Another example of an inconsistency  is the Laura Point site on Mayne Island. Lamb owned the upland property on Laura Point until 2005, which provided ready access opportunities for data collection beginning in 1977. As a result, an unusually large number of species have been logged at this particular site. Tide and current issues involved at this site, however, limited night diving activities to one, severely affecting the data collected from documented nocturnal species.

Another important consideration is the “threshold” factor for each site. Although many sites were revisited and logged numerous times, many others were sampled only once or twice. With the “roving diver” scenario, each dive varies in duration, depth and direction. Obviously, as more dives are logged at a site, such variables are evened out, resulting in a better assessment of the associated flora and fauna. It is the considered opinion of the three participating dive loggers - reinforced by computer analysis - that at least six dives are required for any reasonable data set. For the purposes of this report, any site utilized has a total of at least ten dives.

Commencing in 1997, members of this group have participated in Vancouver Aquarium field research diving programs. Such dives were various and focused on numerous objectives. Many involved detailed species recording (similar to other basic logged dives). Others were very narrowly focused, and minimal species data were gathered. Where possible, and respecting the “threshold factor” of ten dives, these data were integrated into this report.

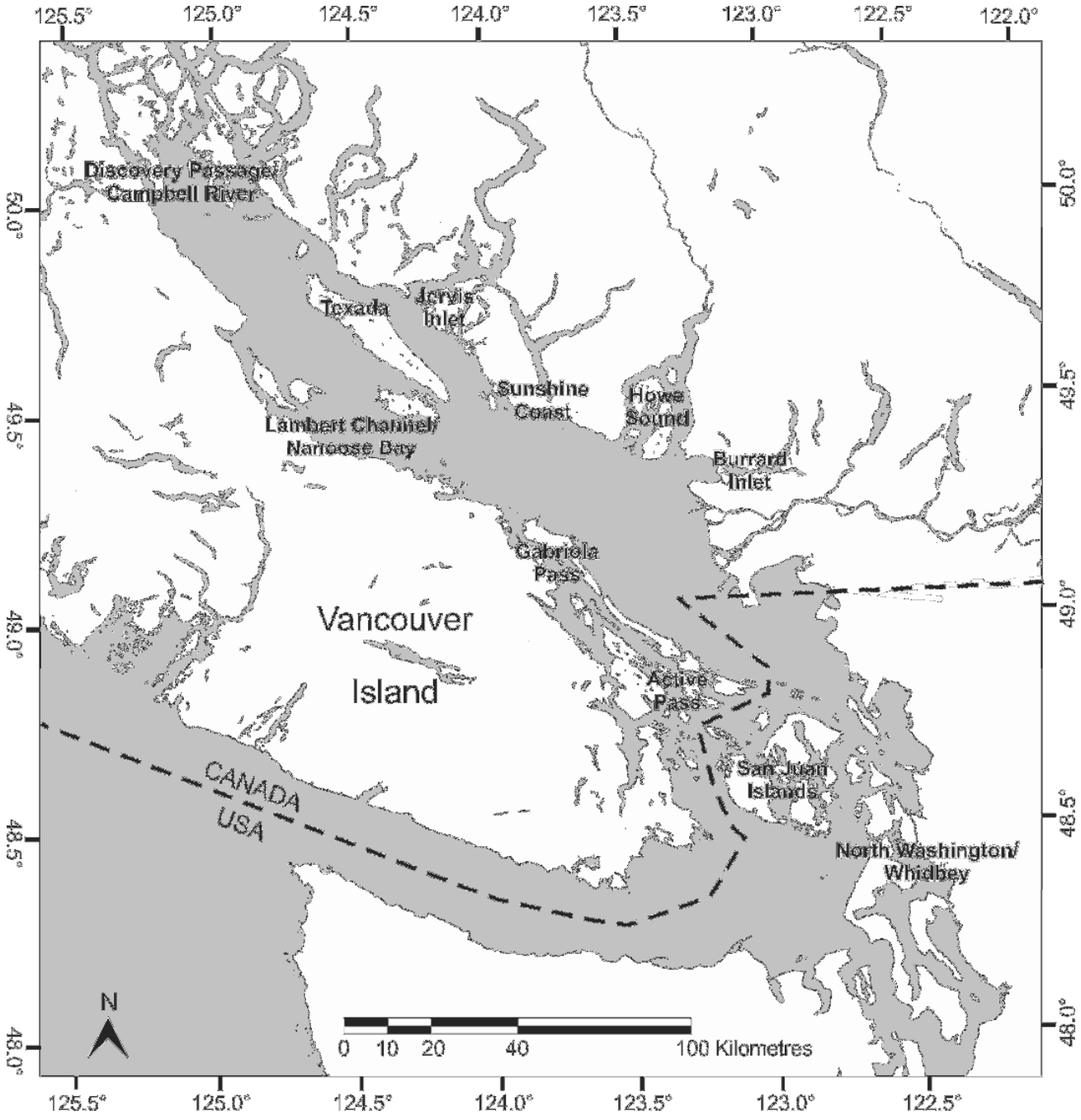
The entire Pacific Marine Life Surveys, Inc. database was reviewed and relevant material was selected that is pertinent to the geographic area of interest, the greater Strait of Georgia region

that includes all marine waters from Discovery Passage in the north to the San Juan Islands and northern Puget Sound in the west and south as illustrated in Figure 1. These areas contributed 3,137 dives, each involving some of a list of 1,097 potential species being utilized in the preparation of this report.

In graphs of abundance, a quotient is used along the vertical axes. For each species recorded on each dive, the quotient is developed as follows: 0 = none sighted; 1 = few sighted (<10); 2 = some sighted (<25); 3 = many sighted (<50); 4 = very many sighted (<100); 5 = abundant sighted (<1,000); 6 = very abundant sighted (>1,000). For each species, the values for all dives are averaged and then scaled so that the average appearing along the vertical axis is a number from 0 to 100 rather than 0 to 6.

For the Strait of Georgia region, all dives were tabulated electronically or plotted in a histogram. Regional compilation and comparisons were accomplished by providing comparable temporal and effort levels (number of dives). This provided the basis for the investigation that is the backbone of this report. The primary topic for the report is the abundance of bull kelp *Nereocystis luetkeana* and its potential relationships with other species.

**FIGURE 1 – Regional Map for data areas regarding Bull Kelp, Urchins and biodiversity in the Greater Strait of Georgia.**



Using an appropriately delineated map of the study area, the relevant sites were then sorted into eleven regions (Figure 1). These eleven regions provide the organization by which the findings concerning *Nereocystis* abundance and possible relationships with other species are presented. This study employed sophisticated correlation algorithms to assess potential relationships between *Nereocystis* and any of the other species observed during the diver surveys. In order to arrive at such connections, several steps had to be followed.

An initial focus centred on *Nereocystis* and sea urchins (*Strongylocentrotus* spp.). This relationship is well documented in literature and was suggested as a place to begin analysis. A series of eleven histograms (one for each region – Figures 2a to 2k) were created from the database using the computerized methodology previously mentioned. While this effort resulted in no real correlation, an interesting geographic trend did appear and will be discussed in the results. As a consequence of this trend, another direction for investigation was taken – one that focuses on a very wide array of possible species relationships with *Nereocystis.*

Due to the sheer volume of species data collected it was necessary to step back and take each species, as far back in time as possible, and enter it by phylum. After processing this massive amount of information, fourteen sites within the eleven regions proved noteworthy. In particular, some data selected were especially worthy of further detailed analysis. This material appears as histograms.

Appendix 1 is a list of all species (common name, scientific name, and author) that were observed in the study area.

# 3. DIVE LOG DATA STRUCTURE AND PROCESSING

All reports are compiled directly from dive log data, which are stored as a set of CSV files. Each log contains general information such as date, time, location, depth, diver name, and overall comments. In addition, a specific entry is made for each species observed on the dive. Each of these consists of at least the species name, and may also include abundance estimates or comments (e.g. age or behaviour of specimens).

Although this structure may seem primitive in comparison with similar databases, it has the advantage of simplicity. Individual dive logs can be examined (and, if necessary, damaged portions repaired) with simple tools such as text editors and standard command-line utilities. Any updates to the dive logs will be reflected immediately in subsequent reports. The structure also makes it easy to write custom programs that analyze the data and generate results. A species list table file provides general information for each species (e.g. author and date). Another table file, keyed by location name, allows locations to be grouped into regions. By applying data mining techniques to the log entries (particularly the comments fields), we have been able to add habitat information by location.

Central to the reporting process is a very flexible search program. This program scans all the dive log files, and can select dives based on various criteria such as location, date range, or the presence of a given species. For each dive that meets the selection criteria, the statistics are accumulated by species, and a report is produced showing the number or percentage of dives where each species appeared, and the abundance of that species averaged over all the dives.

These reports are stored in intermediate files. By doing multiple runs with different selection parameters, a set of report files can be generated that show, for instance, species abundance over the years for a given location. A location table file groups individual locations into regions, allowing statistics to be averaged over the entire region.

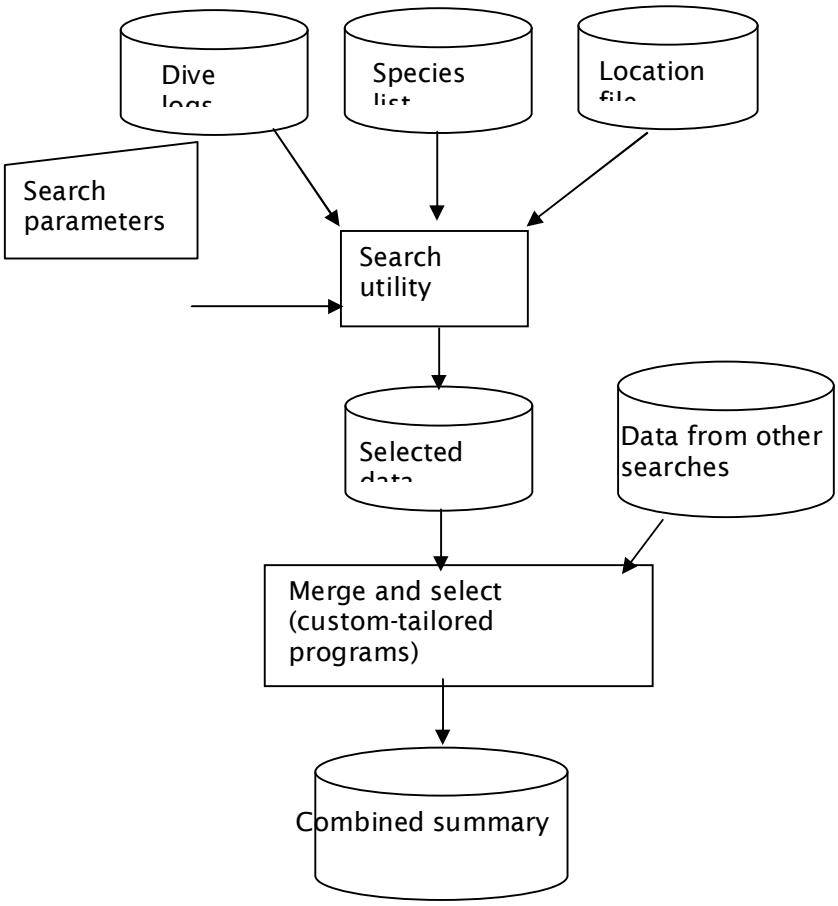
For a more fine-grained analysis, the search program must be run many times. This process has been automated by custom programs that take a list of selection criteria, generate all possible combinations, and schedule the individual search runs without requiring manual intervention, which would be labour intensive and prone to errors.

Data from the files produced by the initial search runs are selected, merged, and re-formatted so that they can be brought into a spreadsheet and used to generate tables and graphs. This extra processing is done by custom programs that can be modified or re-written to process the data in whatever way is desired. Based on results from intermediate runs, the processing programs can be modified and fine-tuned to bring out meaningful results, or discarded and re-written if existing algorithms prove unsatisfactory.

One data selection was for sites in different regions where bull kelp was present and then absent in different years. Sets of such years were selected and then presented in tabular form with all of the species that matched the pattern of occurrence. The matching species were categorized into three groupings that reflected a perceived relevance to *Nereocystis*. However, the vast majority of matches appear to have little or no significance to *Nereocystis.* These species often comprise a large list, sometimes with some commonality, and may appear on several of the lists for other sites. They will be recorded below for each site, simply as the number of insignificant species. The second category of matches contains species that have some relevance to *Nereocystis* but not in a major or definitive sense. Each of these species will be discussed as it appears in each of the following site presentations. The third category of matches is made up of species that have a

significant relationship with *Nereocystis*, and as with the second category, each will be discussed as it appears in the following site presentations.

A typical search operation works as follows:




The result can be placed into a spreadsheet and used to generate charts and tables.

## Processing for Figure 2 (regions – bull kelp / urchin comparisons)

To generate the graphs in Figure 2, the search program scheduler was commanded to run the search program once for each year in each region. In other words, the search parameters for a single run consisted of a single year, plus the region name. To do this, the dive locations are looked up in the location file that in turn contain the corresponding region name for matching. For each region, the merge program combines individual years' search results to produce the final result file from which the region's graph is generated.

## Processing for Figure 3 (regions – taxon)

The search program is run once per region. All species' data are written to an intermediate file, each species is looked up in the species list, and its corresponding phylum is appended. The merge program counts all species by phylum to generate the final result. Please note that all the seaweed and flowering plant divisions (phyla) are grouped together.

## Processing for Figure 4 (regions – seaweeds)

Processing is similar to that of Figure 3, but only plants are selected. Seaweed and flowering plant divisions (phyla) are displayed individually.

## Processing for Figure 5 (sites – bull kelp / urchin comparison)

Processing is similar to that of Figure 2, but yearly runs are done for selected individual sites, rather than grouping the sites' data by region.

# 4. RESULTS

For the purposes of this report, this presentation will focus on the red sea urchin *Strongylocentrotus franciscanus* (A. Agassiz, 1863) and the green sea urchin *Strongylocentrotus droebachiensis* (O.F. Müller, 1776), as these are the predominant species recorded within our study area. Consequently, when *"Strongylocentrotus"* appears, it refers to these two species.

Two other species, the purple sea urchin *Strongylocentrotus purpuratus* (Stimpson, 1857) and the white sea urchin *Strongylocentrotus pallidus* (G.O. Sars, 1871) were recorded within our study area. Our database shows that *Strongylocentrotus pallidus* has been logged in various locations throughout the study area without noteworthy abundances or location patterns. Alternatively, the location pattern for *Strongylocentrotus purpuratus* is specific and illustrated particularly well by our data from the San Juan Islands. *Strongylocentrotus purpuratus*, unlike the other three species, primarily dwells along shorelines directly exposed to Pacific surge. It is not found within the protected waters of the Strait of Georgia and Puget Sound. The San Juan Islands represent a "transition zone." Particularly along the western shoreline of San Juan Island – a location that is arguably directly exposed to the Pacific influence – *Strongylocentrotus purpuratus* is common and routinely recorded. Moving east and north through the Archipelago, its abundance quickly dissipates; it is not recorded north and east of San Juan Island.

The data presented by the eleven regional histograms in Figure 2 show the presence of *Nereocystis* in all the regions. It was recorded in strong to moderate abundances in most regions for at least part of the time periods of observation, with three exceptions: Lambert/Nanoose, Sunshine, and Howe Sound. With respect to Lambert/Nanoose, it is the one region within the study area with proportionately fewer dive log records, combined with it being one of the larger regions in area. In the case of Sunshine, *Nereocystis* presence shows a temporal trend. Up until 1995, it was rather consistently logged, whereas after that it was not. In addition, *Strongylocentrotus* species were recorded throughout the total time period, as in all other regions of the Strait of Georgia.

## 4.1 Abundance of bull kelp and urchins in the Greater Strait of Georgia

*The dark/red bars are red urchins, the gray/green bars are green urchins, and the pale bars are bull kelp*

**FIGURE 2a - N. Washington / Whidbey**

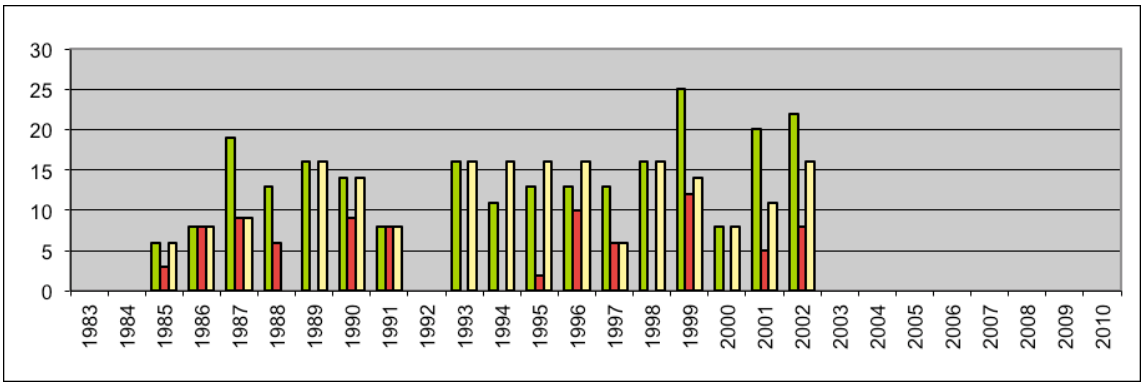



**FIGURE 2b - San Juan Islands**

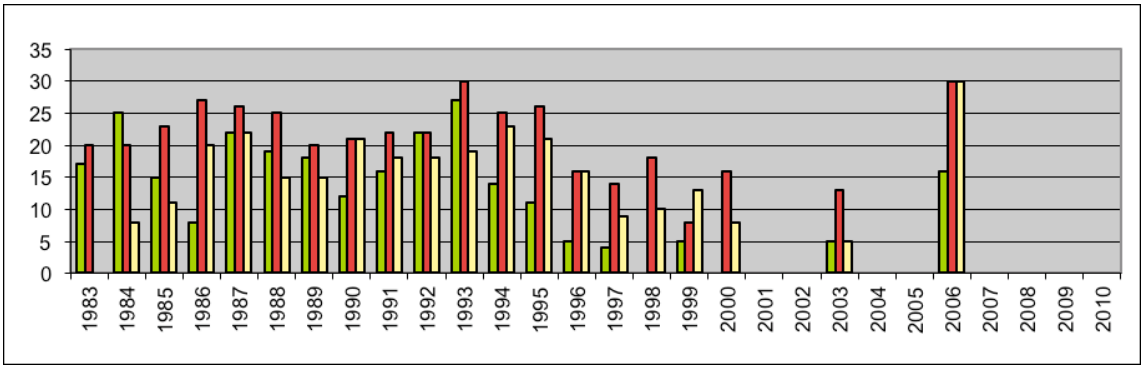



**FIGURE 2c - Active Pass**

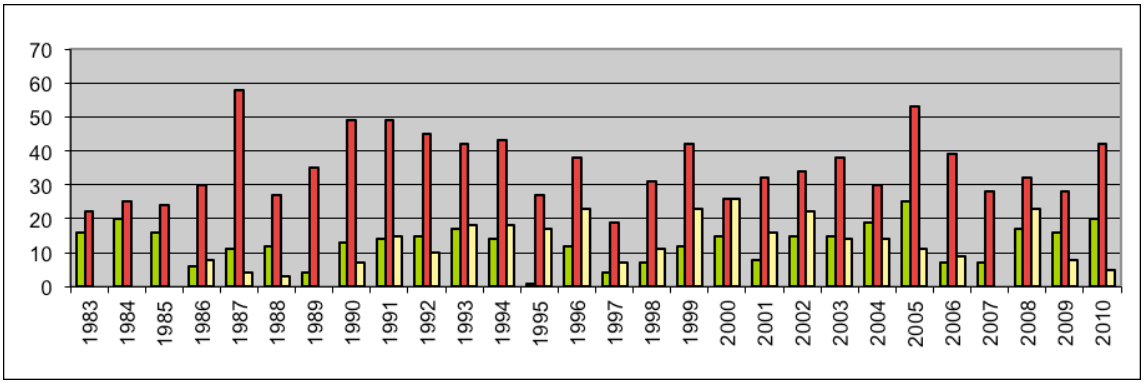


**FIGURE 2d - Gabriola Pass**

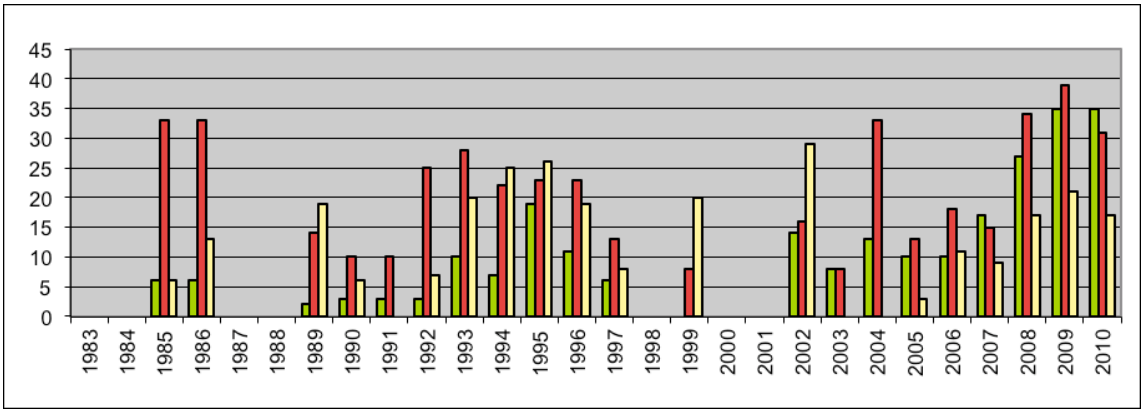



**FIGURE 2e - Lambert Channel / Nanoose Bay**

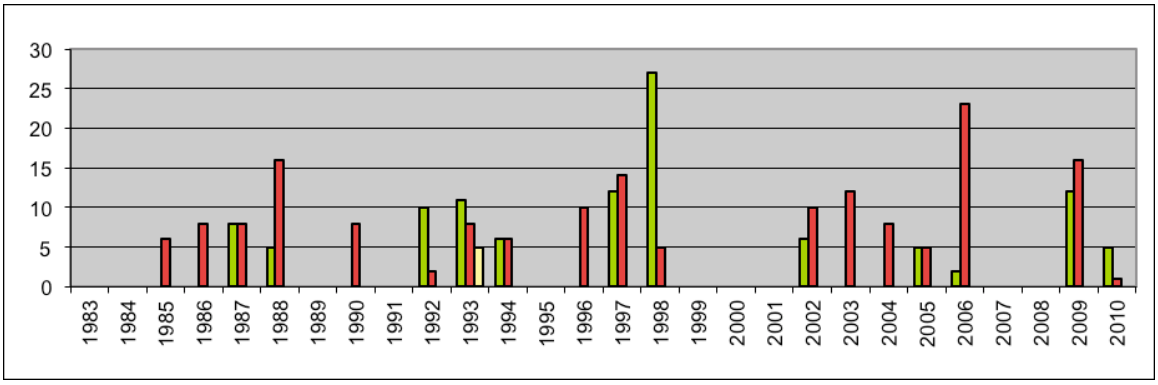



**FIGURE 2f - Discovery Passage / Campbell River**

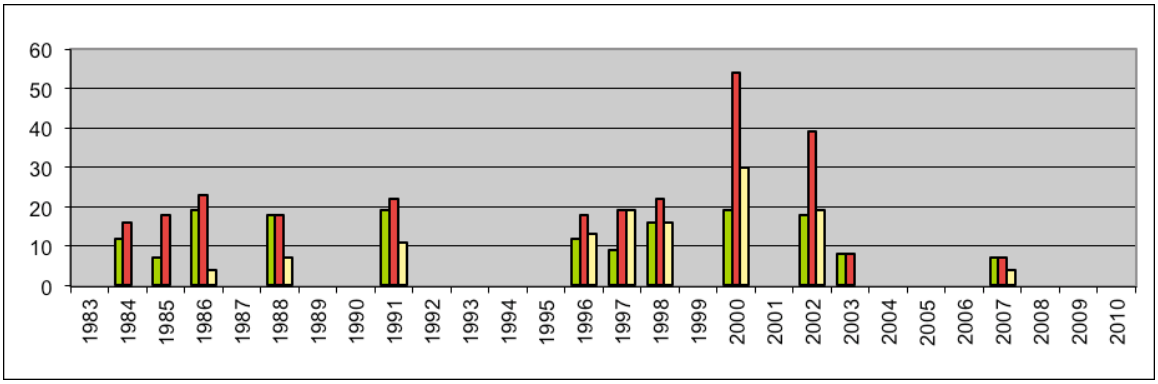


**FIGURE 2g - Texada**

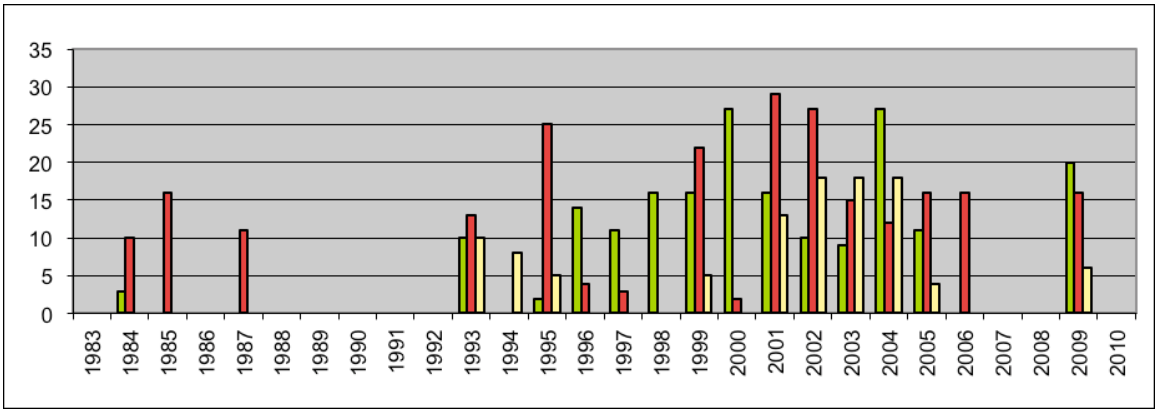



**FIGURE 2h - Jervis Inlet**

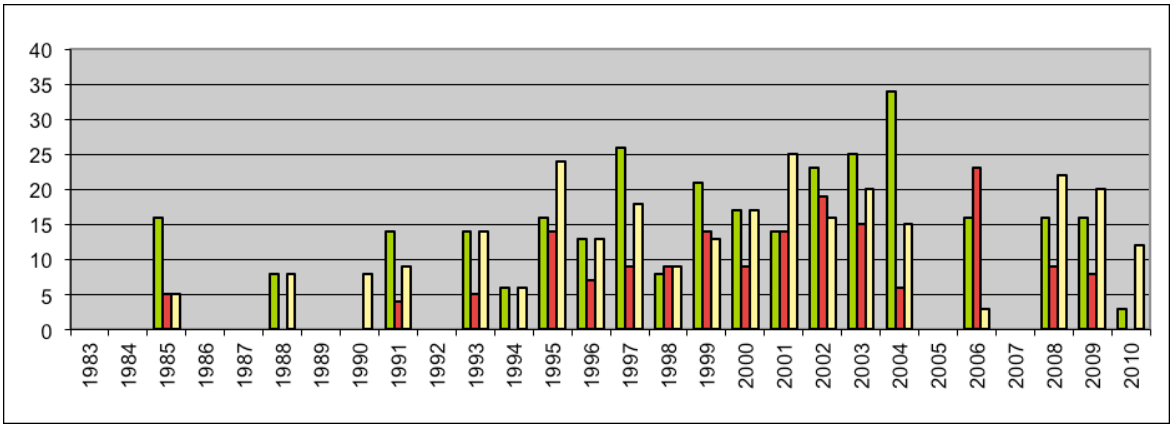



**FIGURE 2i - Sunshine Coast**

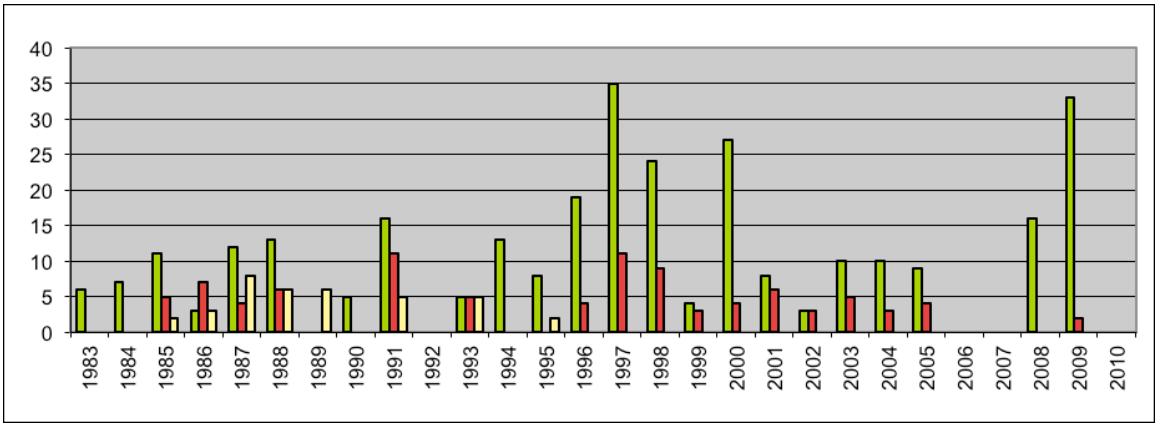


**FIGURE 2j - Howe Sound**

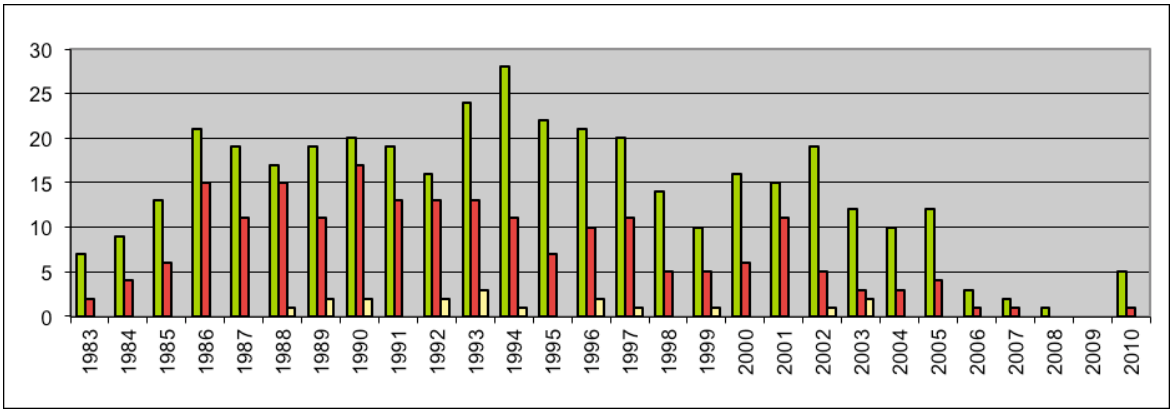
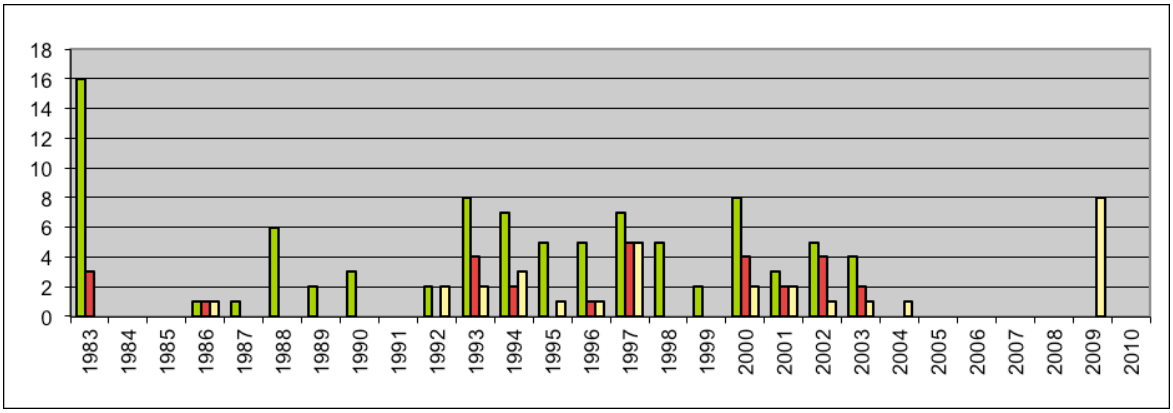



**FIGURE 2k - Burrard Inlet**




Further inspection of the histograms in Figure 2 show significant presence of *Strongylocentrotus* throughout all regions. Both species are very significant within the biodiversity of the entire study area. However, a few sites within the Howe Sound region would qualify as featuring urchin barrens. Popham Island (which was particularly well logged and is featured in Figure 3) is an excellent example. Note, however, that urchin barrens do not surround all parts of a site like Popham Island and the impacts do not always extend to all depths. From 1983 through 2010 there were three five year periods of urchin barrens at Popham Island, whereas at nearby Grace Islets to the north in Howe Sound, one urchin barren persisted for over a decade through the 1990s. Norris Rocks in the Lambert Channel region, which is at the same latitude as Howe Sound, also tends to have urchin barrens.

**FIGURE 3 - Urchin barren (green urchins) at Popham Island, Howe Sound**

*Photo courtesy of Donna Gibbs photo*

In contrast, Dionisio Reef in the Gabriola Pass region illustrates a very different case in point. Dionisio Reef is primarily a subtidal (from a depth of 3 to 28m) rocky outcrop that extends from the shore of Galiano Island west, approximately two thirds the width of Porlier Pass toward Valdez Island. Beginning in September, 2006, there have been 40 logged dives at Dionisio Reef. These dives have occurred in all 12 months of the year and bear witness to the yearly cycle of *Nereocystis.* Dive log entries made at this site consistently record *Strongylocentrotus franciscanus* and *S. droebacheinsis,* in various age classes, as all being "abundant" or "very abundant". Within its seasons of obviousness, *Nereocystis* is similarly recorded. There are no urchin barrens here.

In the majority of sites throughout all regions of the greater Strait of Georgia study area, the physical stature of *Nereocystis luetkeana* appears similar. Individual specimens are large, robust, and of dark colour, with thick, long fronds and significant holdfasts. They are all also very strongly attached to the substrate. Those present in the aforementioned Dionisio Reef site are excellent examples.

However, at one site in particular, the specimen stature of *Nereocystis luetkeana* is very different. At Anderson Bay in the Texada region, a small kelp bed is consistently present at the southeast end of the island that, in part, forms the bay. Logged dives began in 1995 and number

approximately 30. Travel logistics have primarily, though not exclusively, restricted diving at this site to "non winter and good weather" opportunities. The *Nereocystis* specimens at this location are small, slender, of lighter colour, with thin, short fronds and small holdfasts, and are easily dislodged from their substrate. They are the antithesis of specimens at most other sites and in a word – wimpy. A potentially similar wimpy *Nereocystis* population has repeatedly been noted at Seymour Bay on Bowen Island in Howe Sound (Donna Gibbs, personal observation). So why the disparity of *Nereocystis* stature at different sites?

Figure 4 consists of eleven regional histograms that document biodiversity. It records a total number of species in relation to the total number of logged dives for each of the eleven regions. These results indicate a very stable and robust biodiversity overall. This includes both the *Nereocystis* and the *Strongylocentrotus* species. Biodiversity is especially high in areas rich in seaweeds, like Active Pass and Gabriola Pass, but also in Howe Sound, where bull kelp is absent except near the southern entrance.

Appendix 2 lists all species observed in the study area, with average abundances shown by region.

## 4.2 Figure 4 – Biodiversity in Straight of Georgia Regions

*Numbers of species in major groups (phyla, other higher taxa).*

**FIGURE 4a - N. Washington / Whidbey**

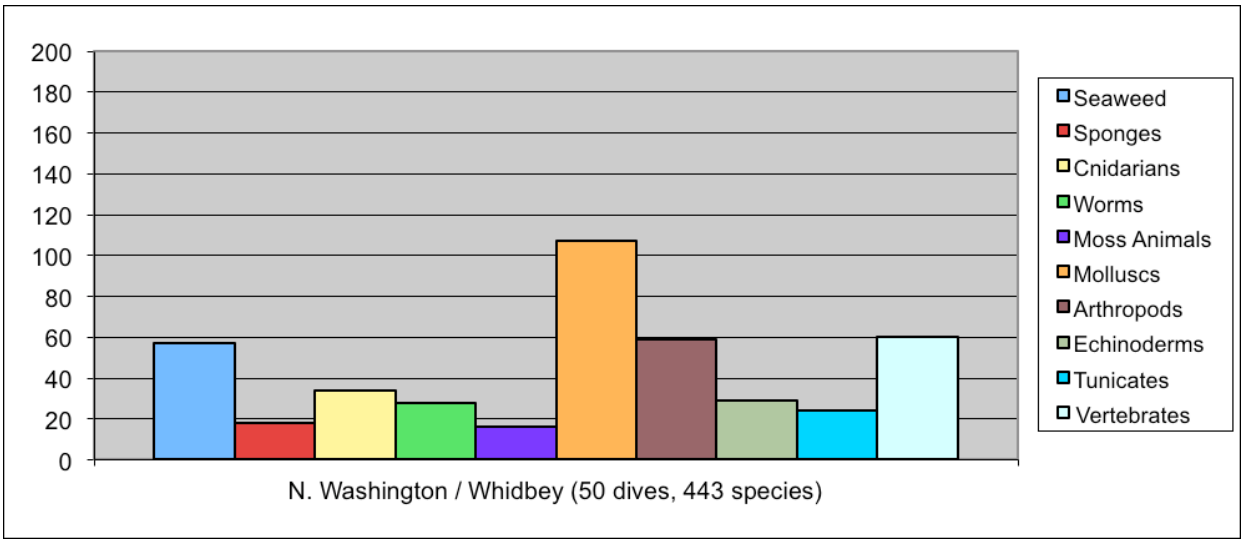



**FIGURE 4b - San Juan Islands**

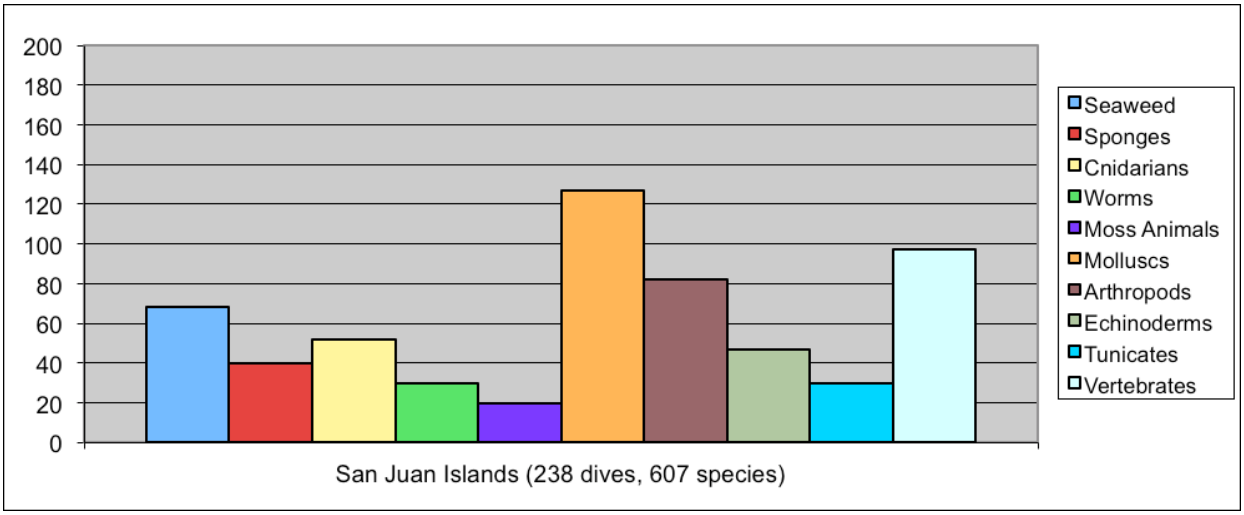


**FIGURE 4c - Active Pass**

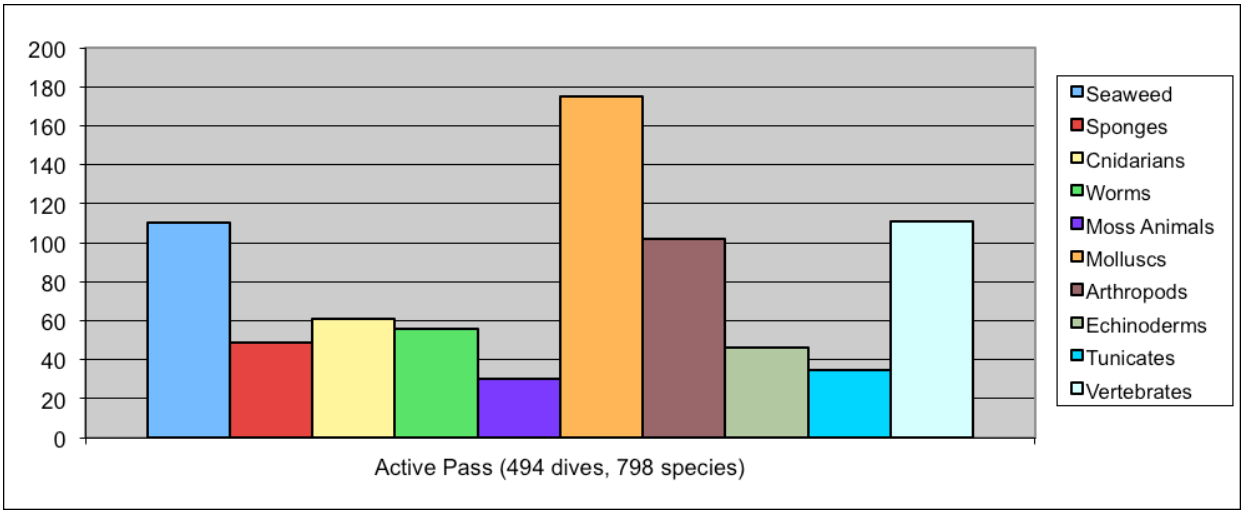



**FIGURE 4d - Gabriola Pass**

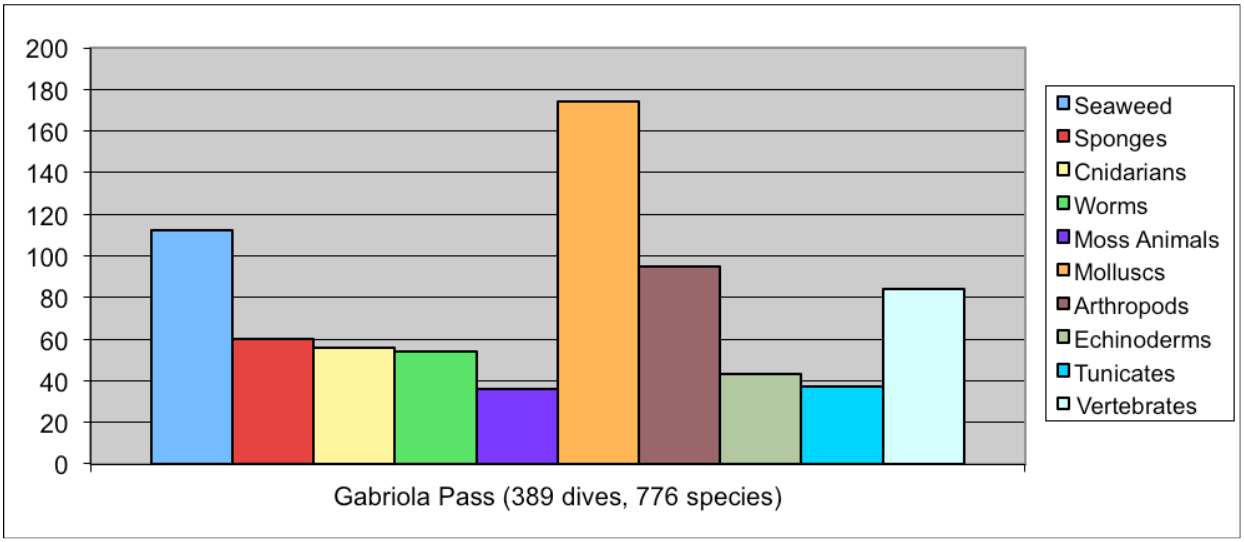


**FIGURE 4e - Lambert Channel / Nanoose Bay**

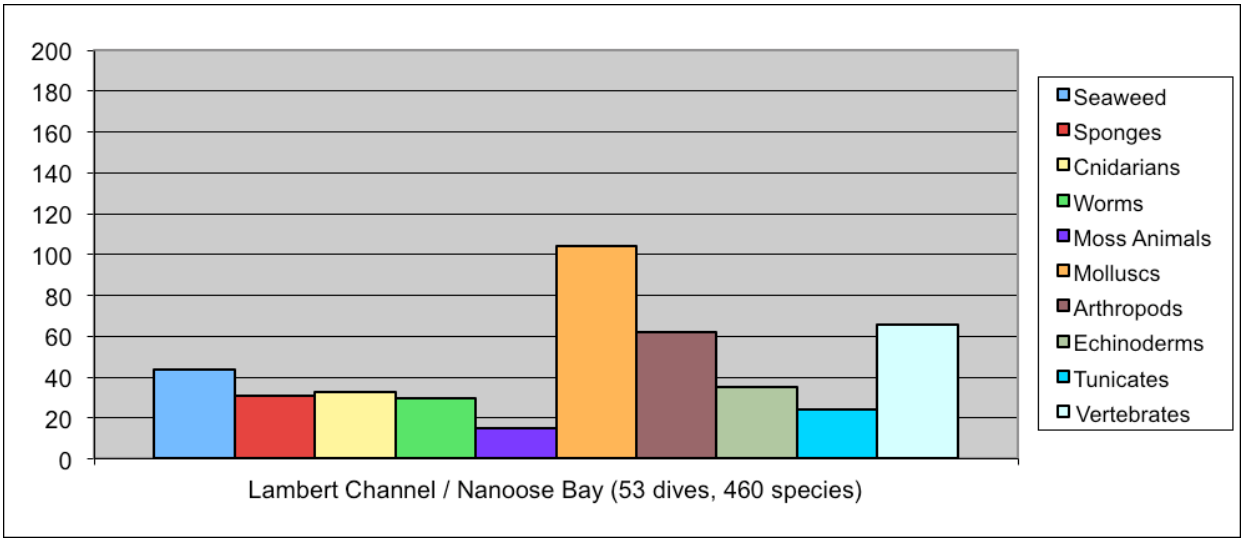



**FIGURE 4f - Discovery Passage / Campbell River**

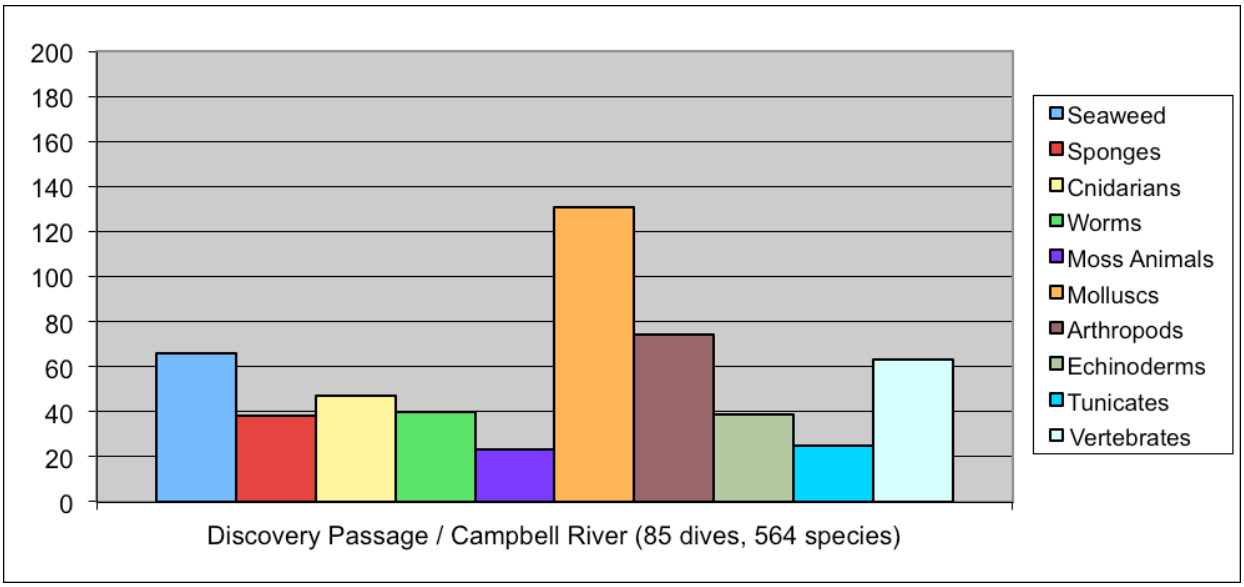


**FIGURE 4g - Texada**

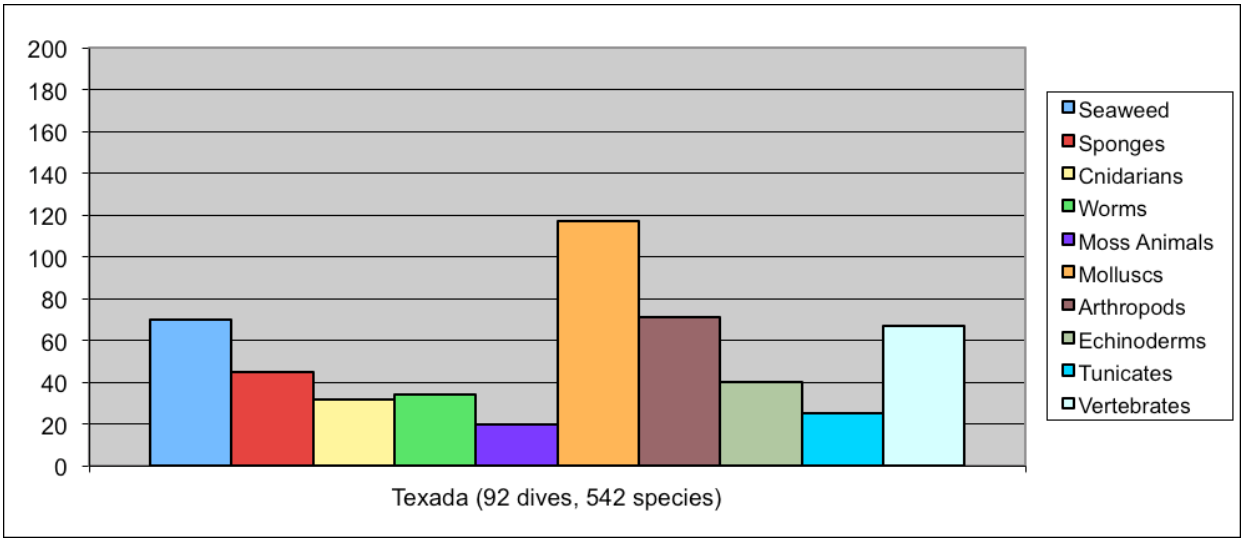



**FIGURE 4h - Jervis Inlet**

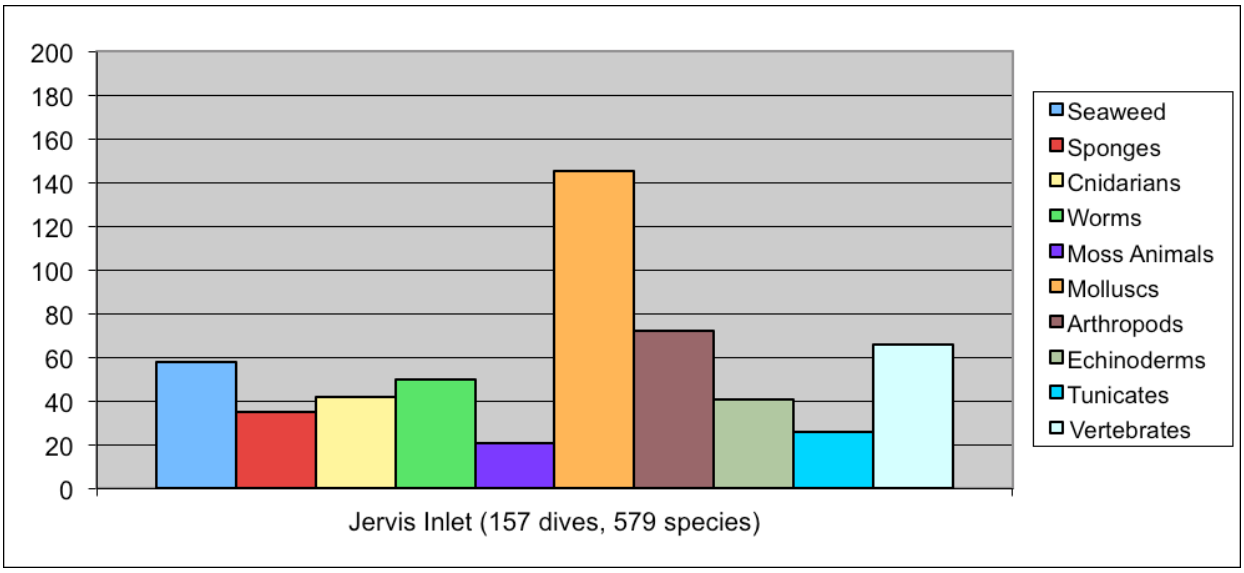


**FIGURE 4i - Sunshine Coast**

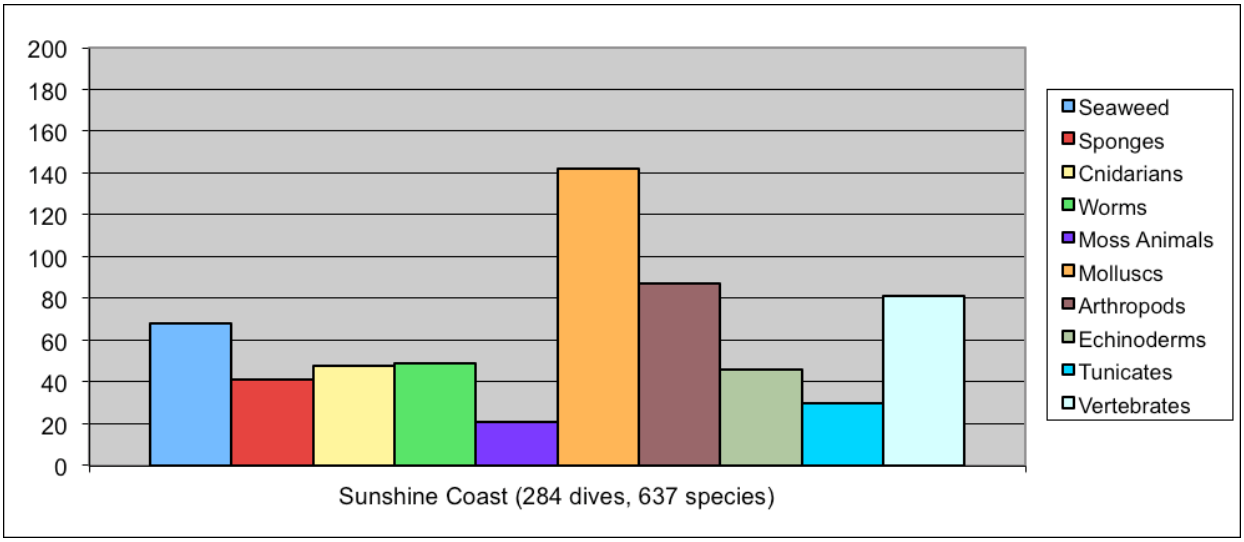



**FIGURE 4j - Howe Sound**

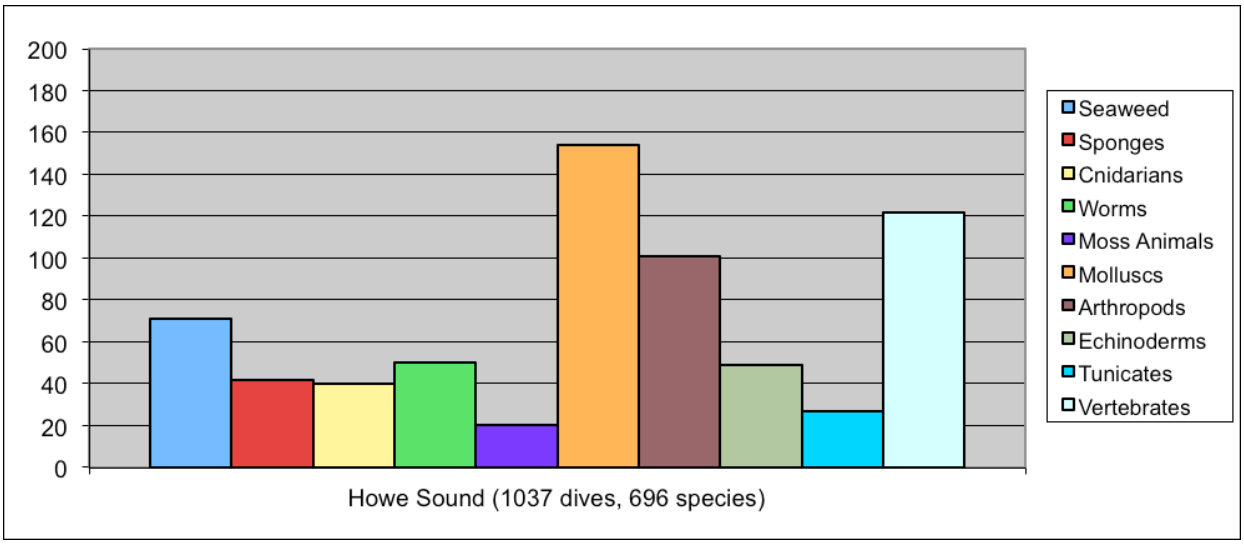


**FIGURE 4k - Burrard Inlet**

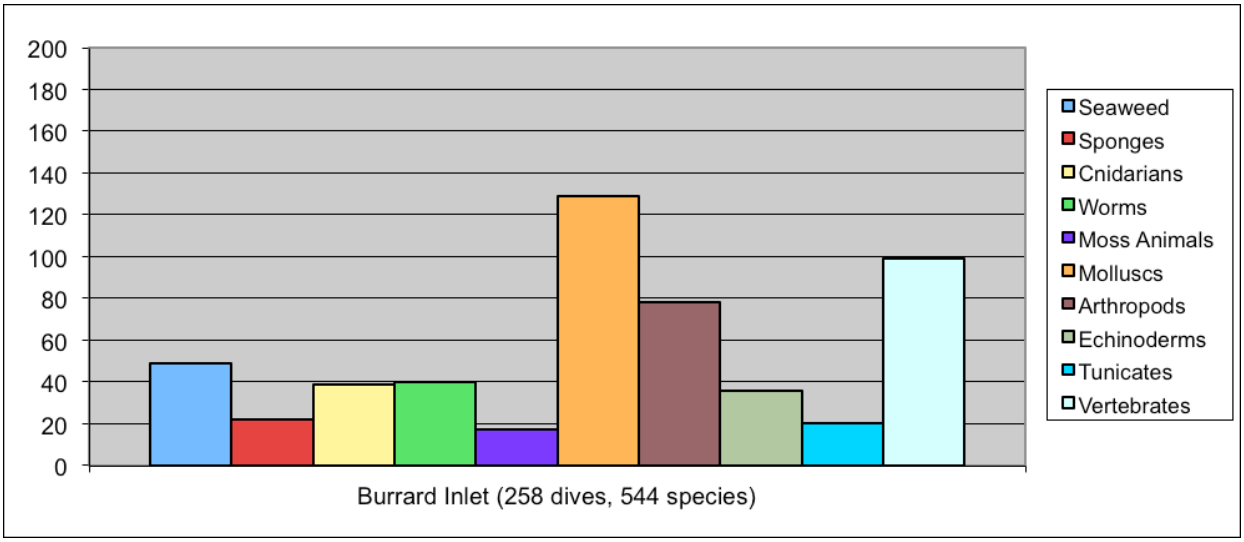


**FIGURE 5 – Map of selected sites with 10 dives or more with both presence and absence of bull kelp during different years**

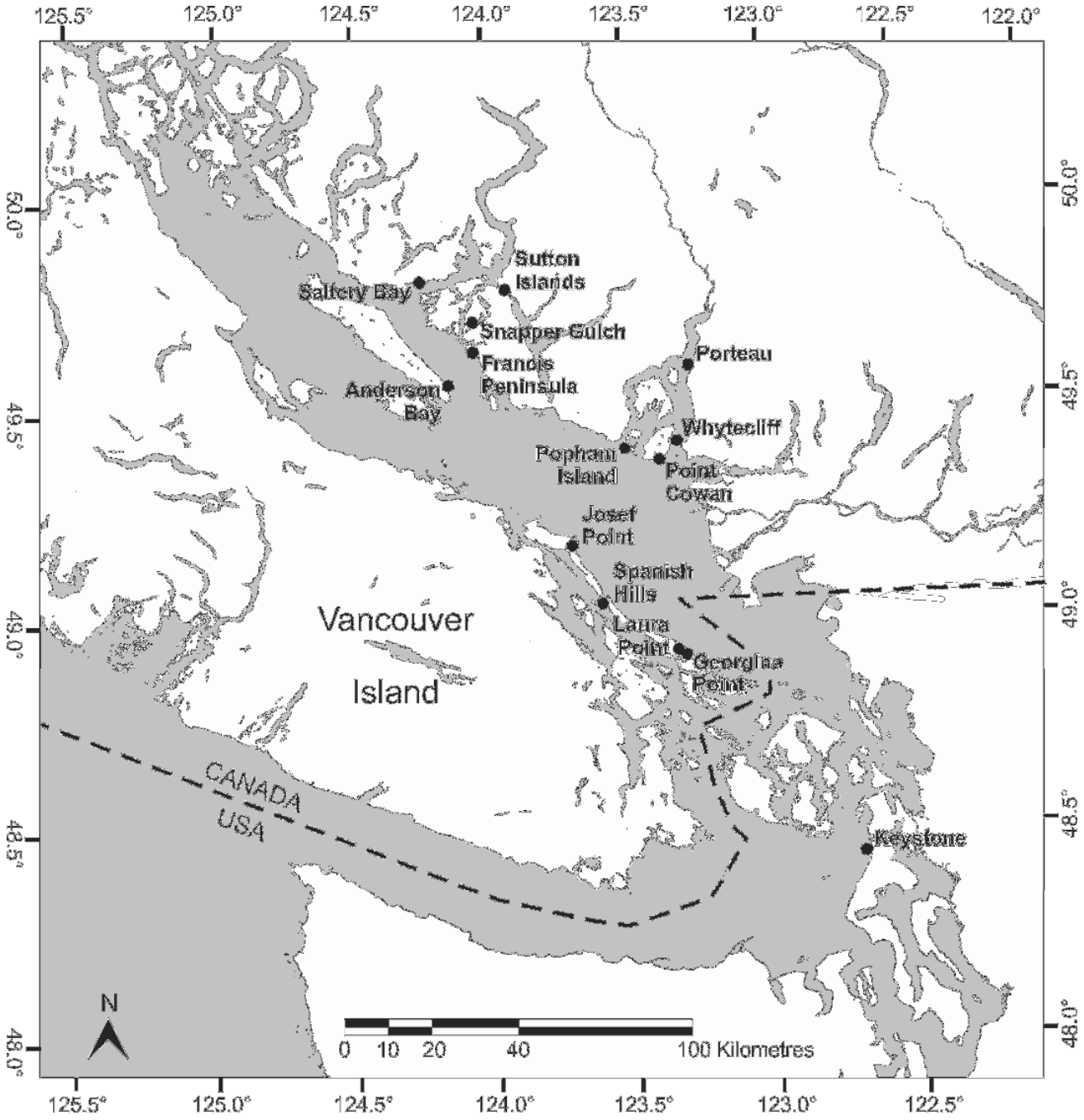


Figure 5 shows a map of the selected sites for which 10 or more dives and both presence and absence of bull kelp in different years occurred. Figure 6 shows histograms of urchin and bull kelp average abundance for all of the sites mapped in Figure 5. From these selected sites, particular pairs or groups of years were selected that demonstrate the pattern of bull kelp disappearing and then reappearing; these years are indicated in the legends in Figure 6. From this set of selected years it is possible to find matches in Table 1 of the "bull kelp profile" (yearly presence/absence of bull kelp) to the profile of any other species at a given site. Because varying numbers of years were selected for presence/absence at different sites, some sequences of years that were longer than others. Comparable to a sort of "slot machine" effect, it is more likely that matches will be made from fewer columns (fewer years) than from an extensive series of columns. Consequently, more matches were generated for some sites than others and these results are explained below. Note that because this investigation focuses upon *Nereocystis* and its relationships with benthic organisms, cnidarian jellies were eliminated from the potential matching species.

## 4.3 Figure 6 – Selected sites with 10 dives or more with both presence and absence of bull kelp during different years

*Years for analysis in parentheses; dark = red urchins, gray = green urchins, pale = kelp*

**FIGURE 6a -N. Washington / Whidbey, Keystone (1987,1988, 1989, 1995, 1998)**

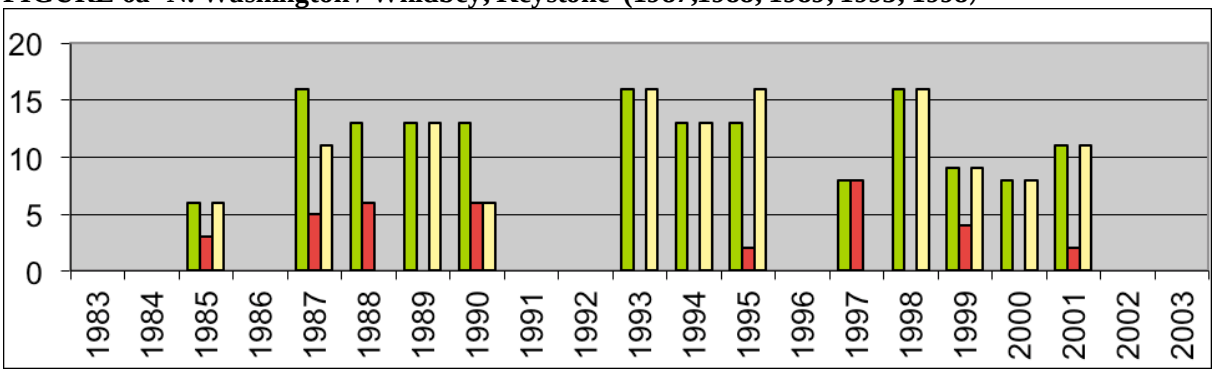



**FIGURE 6b - Active Pass, Laura Point (2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008)**

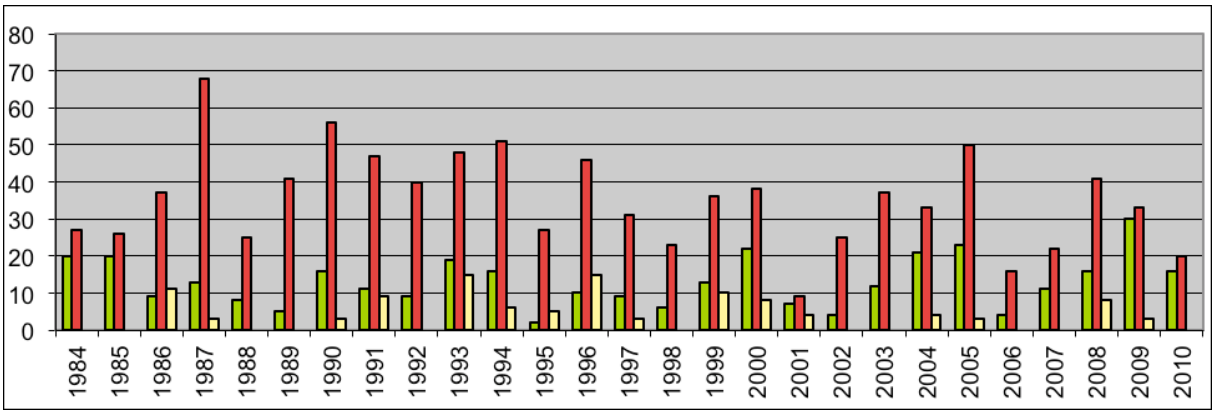


**FIGURE 6c - Active Pass, Georgina Point (2004, 2005, 2006, 2007, 2008, 2009)**

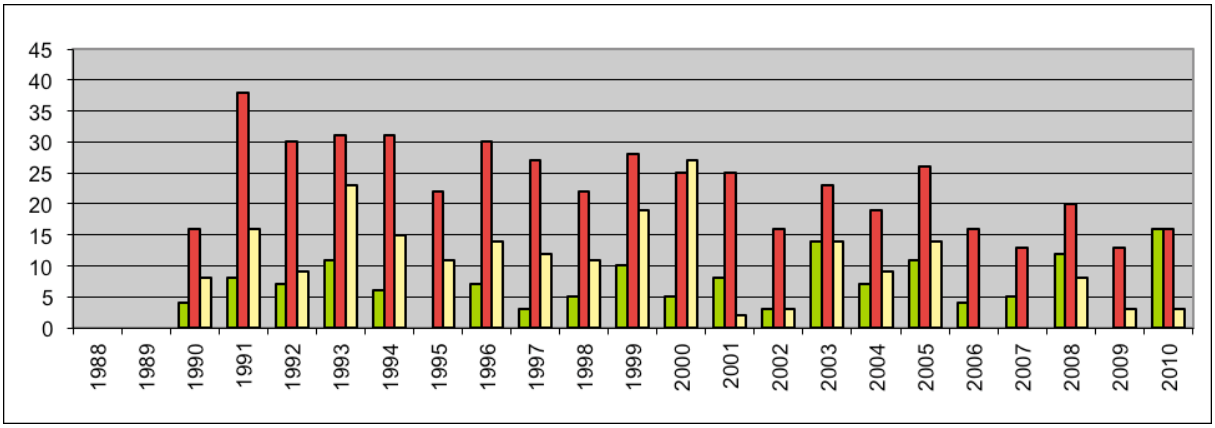



**FIGURE 6d - Gabriola Pass, Josef Point (1994, 1995, 1996, 1997, 2008, 2009)**

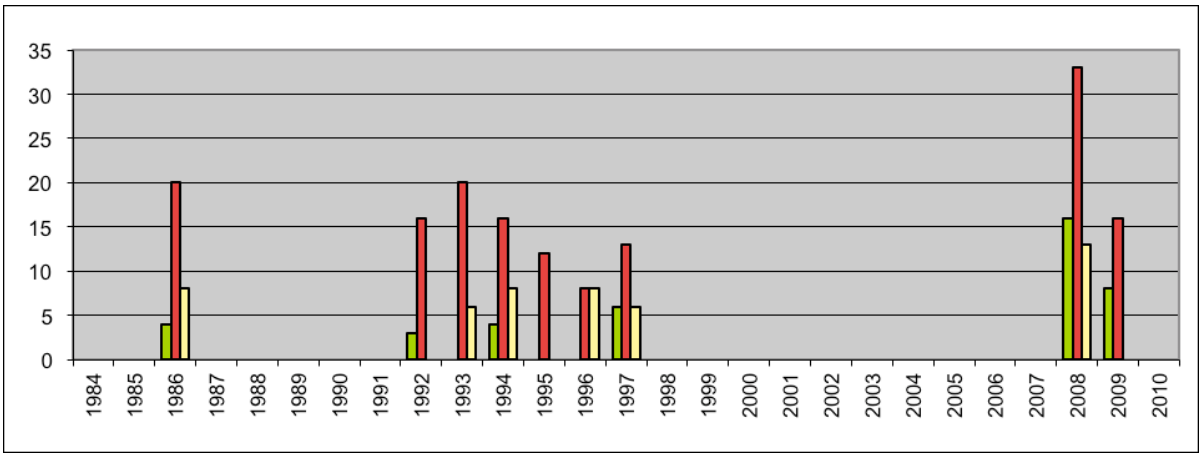



**FIGURE 6e - Gabriola Pass, Spanish Hills (1993, 1994, 1995, 1996)**

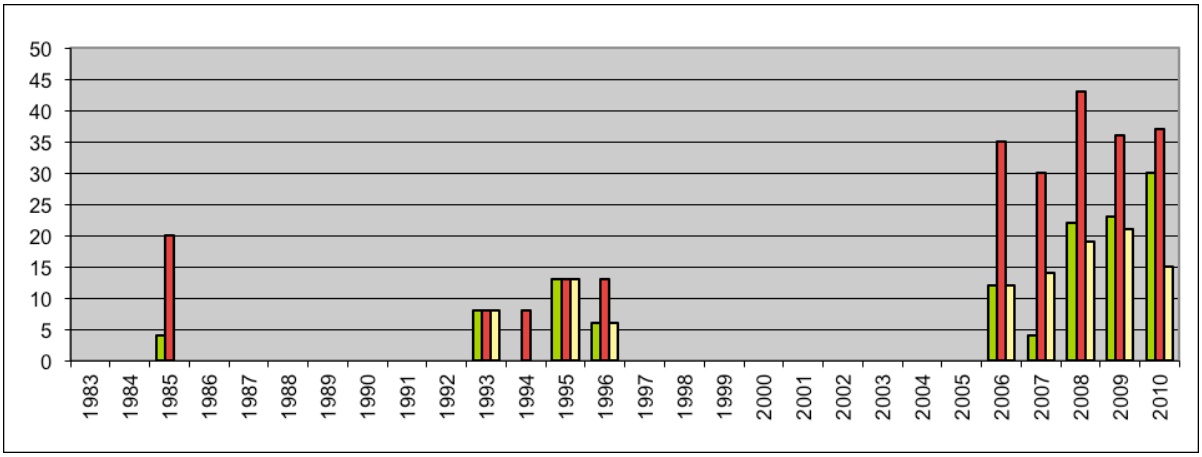


**FIGURE 6f - Texada, Saltery Bay (1998, 1999, 2000)**

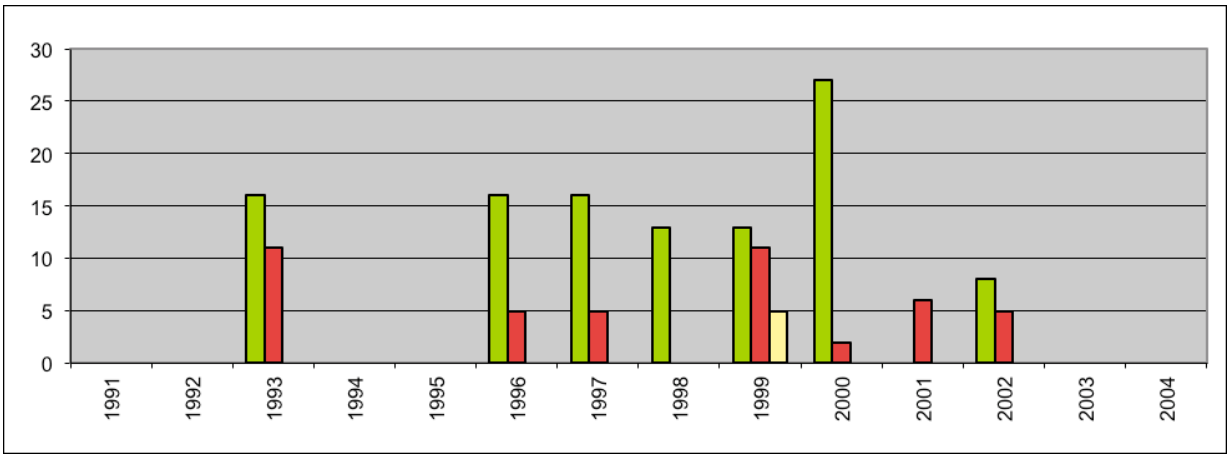



**FIGURE 6g - Texada, Anderson Bay (2004, 2005, 2006, 2009)**

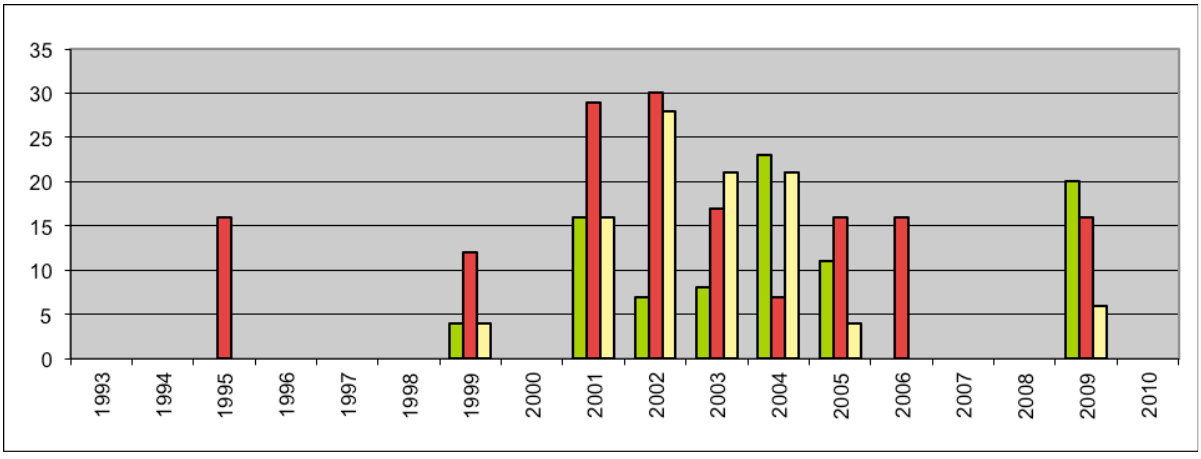


**FIGURE 6h - Jervis Inlet, Sutton Islands (1996, 1997, 1998, 1999, 2000)**

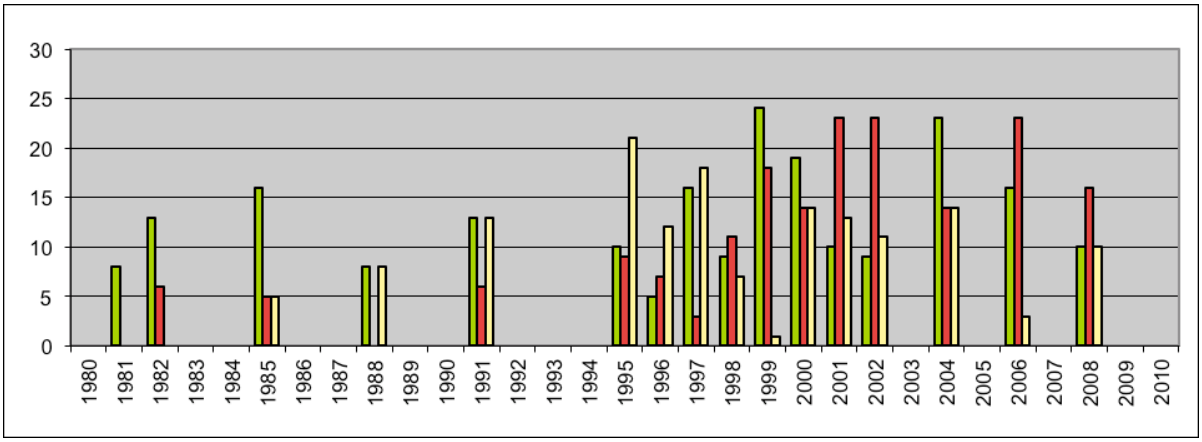



**FIGURE 6i - Sunshine Coast, Snapper Gulch (1991, 1993, 1996, 1997)**

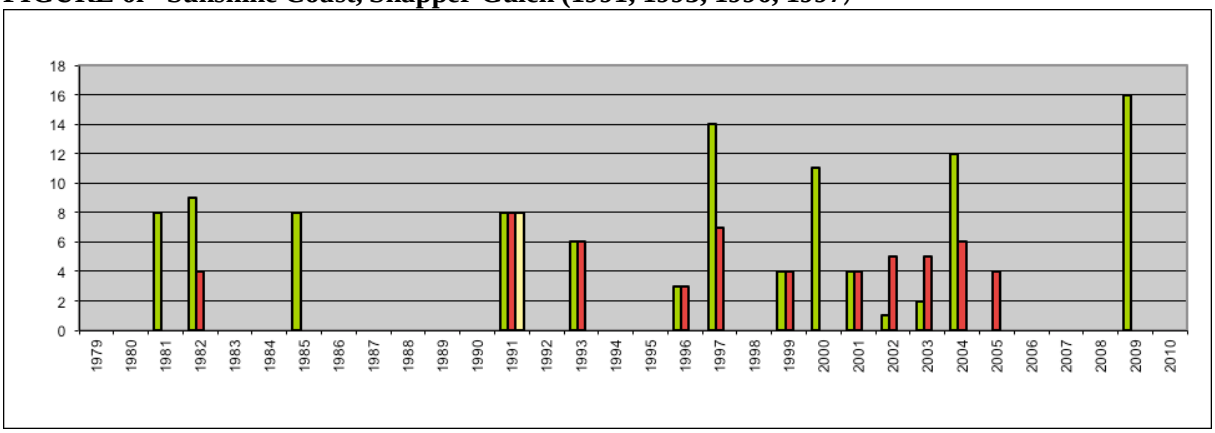



**FIGURE 6j - Sunshine Coast, Francis Peninsula (1987, 1989, 1990, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003)**

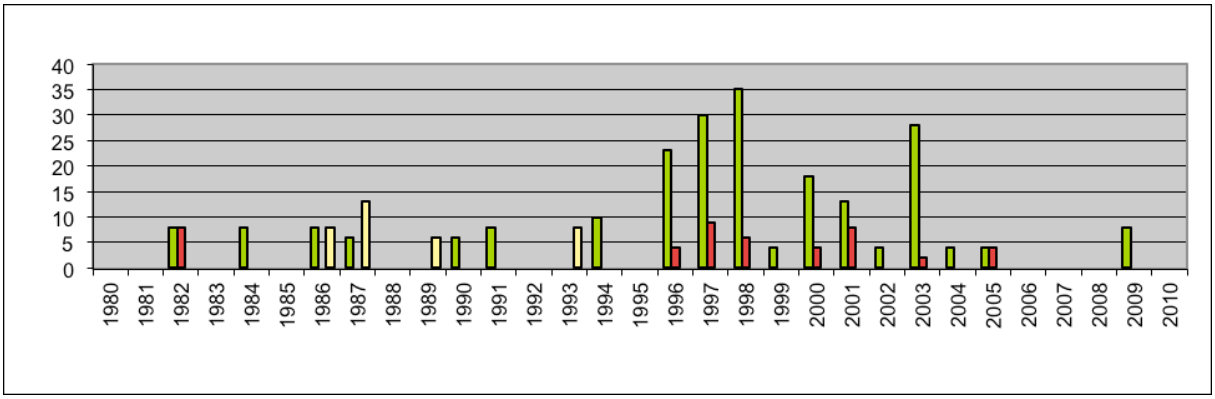


**FIGURE 6k - Howe Sound, Porteau (1993, 1994, 1995, 1999, 2002, 2003)**

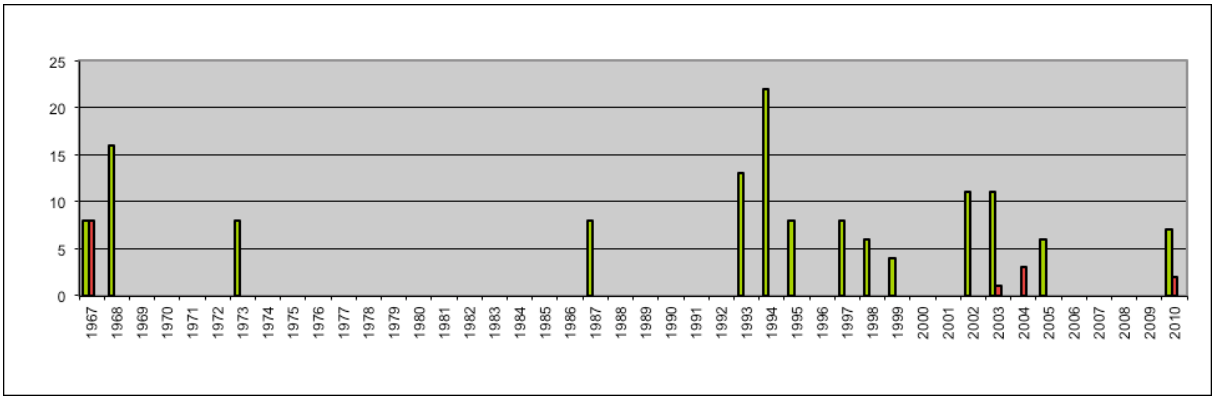



**FIGURE 6l - Howe Sound, Popham / Worlcombe (1994, 1995, 1997, 1998, 2001, 2002)**

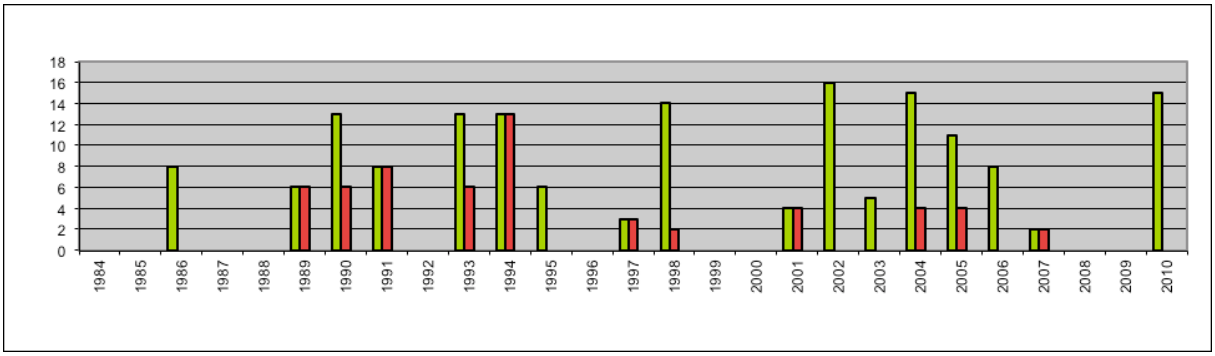



**FIGURE 6m - Howe Sound, Point Cowan (1986, 1998, 1999)**

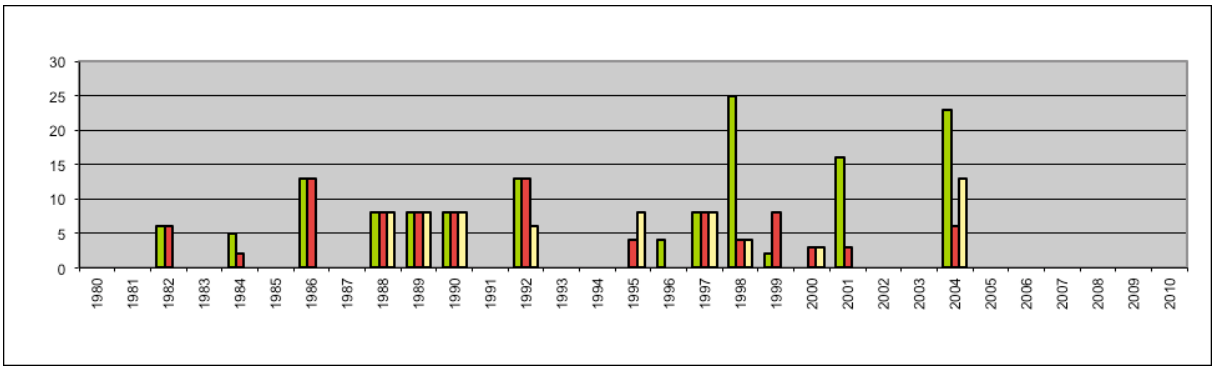
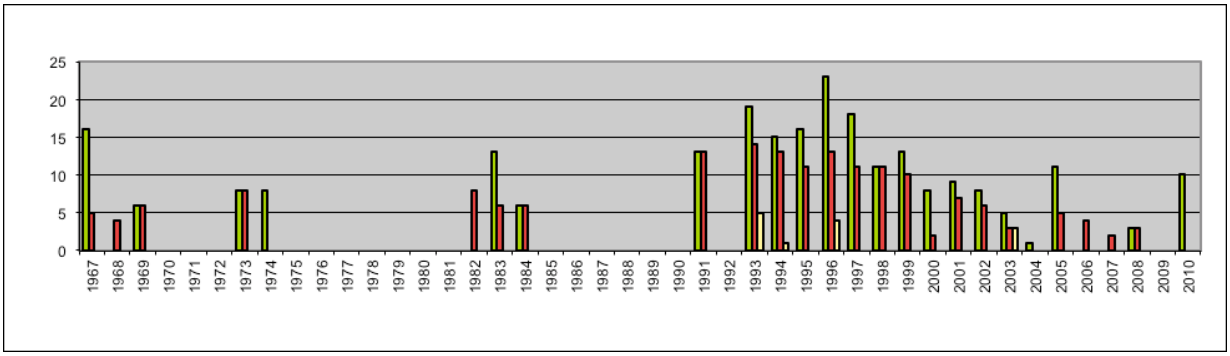


**FIGURE 6n - Howe Sound, Whytecliff (1991, 1993, 1995, 1996, 1997, 1999)**



Regarding the species matches with bull kelp occurrence for the Whidbey region, the Keystone site was selected. Keystone consists of a short, boulder jetty with adjacent sandy areas and piling/dock structure on the east side. A total of 13 dives occurred over the 6-year assessed time frame. See the Keystone match file for details of yearly sequence *Nereocystis* presence and absence detail. Eleven matches registered (see Table 1), two of which are category 2, with a minor relation to *Nereocystis*. The graceful kelp crab *Pugettia gracilis (*Dana, 1851) lives from the intertidal zone through the subtidal depth range of *Nereocystis* and well beyond. It sometimes crawls about on *Nereocystis* and may use pieces of the alga as camouflage as well as a food source by attaching them to its exoskeleton. The decorator crab *Oregonia gracilis (*Dana, 1851) lives from the intertidal zone through the subtidal range of *Nereocystis* and well beyond. It sometimes crawls about on *Nereocystis* and also may use pieces of this alga as camouflage by attaching them to its exoskeleton.

For the Active Pass region, Laura Point is a selected site. The site consists of a steep rocky shoreline of wall/boulder formation and very little shell hash substrate. A total of 28 dives occurred over the 8-year assessed time frame. See the Laura Point match file for details of yearly sequence *Nereocystis* presence/absence detail. Only one match registered and it is a category 1 (no ecological significance; random match). For the Active Pass region, Georgina Point is another selected site. This stepped shoreline site consists of several wide sandy plateaus bordered by rocky outcrop slopes. A total of 15 dives occurred over the 6-year assessed time frame. See the Georgina match file for details of the yearly sequence *Nereocystis* presence/absence detail. Only three matches registered, of which one is a category 2: the fringed filament-worm *Dodecaceria fewkesi (*Berkley and Berkley, 1954) forms mound-like colonies from the intertidal zone through the subtidal depth range of *Nereocystis* and beyond. These mounds sometimes provide a site of attachment for *Nereocystis.*

For the Sunshine Coast region, Francis Peninsula is a selected site. The stepped shoreline site consists of several flat, rocky, boulder-strewn, often sandy plateaus bordered by rocky walls. A total of 42 dives occurred over the 13-year assessed time frame. No matches registered in the 13 years for the Francis Peninsula match file for the yearly sequence *Nereocystis* presence/absence detail, so no listing occurs for this site in Table 1.

**TABLE 1 – Species whose abundance variations over time match that of bull kelp**

| KEYSTONE | 1987 | 1988 | 1989 | 1995 | 1998 | Notes |
|---|---|---|---|---|---|---|
| Nereocystis luetkeana | 11 | . | 13 | 16 | 16 | |
| Strongylocentrotus franciscanus | 5 | 6 | . | 2 | . | |
| Strongylocentrotus droebachiensis | 16 | 13 | 13 | 13 | 16 | |
| Pileolaria spp. (spirorbids) | 11 | . | 6 | 11 | 11 | |
| Myxicola infundibulum | 16 | . | 6 | 8 | 11 | |
| Pododesmus macrochisma | 11 | . | 6 | 11 | 16 | |
| Tresus capax | 11 | . | 6 | 11 | 16 | |
| Triopha catalinae | 5 | . | 6 | 8 | 2 | |
| Pugettia gracilis | 11 | . | 6 | 8 | 16 | Category 2 |
| Oregonia gracilis | 11 | . | 13 | 5 | 16 | Category 2 |
| Evasterias troschelii | 5 | . | 13 | 13 | 16 | |
| Eupentacta quinquesemita | 16 | . | 13 | 13 | 16 | |
| Rhinogobiops nicholsii | 11 | . | 6 | 5 | 5 | |
| Enophrys bison | 5 | . | 13 | 5 | 19 | |

| GEORGINA POINT | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | notes |
|---|---|---|---|---|---|---|---|
| Nereocystis luetkeana | 9 | 14 | . | . | 8 | 4 | |
| Strongylocentrotus franciscanus | 19 | 26 | 16 | 16 | 20 | 16 | |
| Strongylocentrotus droebachiensis | 7 | 11 | 4 | 6 | 12 | . | |
| Neorhodomela larix | 11 | 11 | . | . | 25 | 20 | |
| Dodecaceria fewkesi | 4 | 2 | . | . | 8 | 8 | Category 2 |
| Elassochirus tenuimanus | 2 | 2 | . | . | 4 | 4 | |

| LAURA POINT | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | notes |
|---|---|---|---|---|---|---|---|---|---|
| Nereocystis luetkeana | 6 | . | . | 4 | 3 | . | . | 8 | |
| Strongylocentrotus franciscanus | 13 | 25 | 37 | 33 | 50 | 16 | 26 | 41 | |
| Strongylocentrotus droebachiensis | 10 | 4 | 12 | 21 | 23 | 4 | 13 | 16 | |
| Mytilimeria nuttalli | 3 | . | . | 7 | 1 | . | . | 5 | |

| FRANCIS PENINSULA | 1987 | 1989 | 1990 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nereocystis luetkeana | 13 | 6 | . | . | . | . | . | . | . | . | . | no matches |
| Strongylocentrotus franciscanus | . | . | . | 4 | 9 | 6 | . | 4 | 8 | . | 2 | |
| Strongylocentrotus droebachiensis | 6 | . | 6 | 23 | 30 | 35 | 4 | 18 | 13 | 4 | 28 | |

| POINT COWAN | 1986 | 1998 | 1999 | notes |
|---|---|---|---|---|
| Nereocystis luetkana | . | 4 | . | |
| Strongylocentrotus franciscanus | 13 | 4 | 8 | |
| Strongylocentrotus droebachiensis | 13 | 25 | 2 | |
| Halichondria bowerbankia | . | 4 | . | |
| Stomphia coccinea | . | 4 | . | |
| Tonicella lineata | 6 | 4 | 5 | Category 3 |
| Mopalia lignosa | . | 4 | . | Category 3 |
| Scabrotrophon maltzani | . | 4 | . | |
| Trichotropsis cancellata | . | 4 | . | |
| Dendronotus iris | . | 4 | . | |
| Dirona albolineata | . | 4 | . | |
| Janolus fuscus | . | 4 | . | |
| Pandalus stenolepis | . | 8 | . | |
| Munida quadrispina | . | 8 | . | |
| Pagurus beringanus | . | 4 | . | Category 3 |
| Balanus nubilus | . | 4 | . | Category 3 |
| Ophiopholis aculeata | . | 8 | . | |
| Pleuronichthys coenosus | . | 4 | . | |

| WHYTECLIFF | 1991 | 1993 | 1995 | 1996 | 1997 | 1999 | notes |
|---|---|---|---|---|---|---|---|
| Nereocystis luetkeana | . | 5 | . | 4 | . | . | |
| Strongylocentrotus franciscanus | 13 | 15 | 13 | 14 | 11 | 10 | |
| Strongylocentrotus droebachiensis | 13 | 20 | 18 | 25 | 18 | 13 | |
| Triopha catalinae | . | 1 | . | 2 | . | . | |
| Dirona pellucida | . | 1 | . | 2 | . | . | |
| Sebastes ruberrimus | . | 2 | . | 2 | . | . | |

For the Howe Sound region, Point Cowan is a selected site. This shoreline site is a rocky outcrop wall that at its east end fronts a steep sloping sandy bottom, and to the west a continuous steep face. A total of 10 dives occurred over the 7-year assessed time frame. See Point Cowan match file for the yearly sequence *Nereocystis* presence/absence detail. 16 matches registered, of which 4 are category 3. The white-line chiton *Tonicella* insignis (Reeve, 1847) attaches to rocky substrate ranging from the low intertidal zone through the subtidal depth range of *Nereocystis* and well beyond. As a grazing herbivore, it is a likely predator of very young *Nereocystis* specimens. The woody chiton *Mopalia lignosa* (Gould, 1846) attaches to rocky substrate from the mid intertidal to the shallow subtidal. Its depth range overlaps very closely with *Nereocystis* and, as a grazing herbivore, is a likely predator of very young *Nereocystis* specimens. The Bering hermit *Pagurus beringanus* (J.E. Benedict, 1892) primarily inhabits rocky substrates that overlap the depth range of *Nereocystis* and considerably deeper. It is often observed crawling about on *Nereocystis*, likely seeking prey and shelter. The giant acorn barnacle *Balanus nubilus* (Darwin, 1854) attaches to rocky and other solid substrates that overlap the depth range of *Nereocystis* and considerably deeper. At the appropriate depths, *Nereocystis* may attach to *Balanus nubilus* individuals and colonies. Such attachments can be tenuous and may result in *Nereocystis* (and possibly its *Balanus nubilus* attachment site) being detached from the substrate.

For the Howe Sound region, Whytecliff is another selected site. It is a variable shoreline site with steep, outcrop walls, a marked, rocky reef and numerous sloping sand gullies and one large bay. A total of 48 dives occurred over the 6 year assessed time frame. See the Whytecliff match file in Table 1 for the yearly sequence of *Nereocystis* presence/absence detail. Only three matches registered and they were all category 1.

Species in category 1 (random match from ca. 1,000 species; no discernable ecological linkage to *Nereocystis*) are listed phylogenetically as follows, together with the site(s) where they co-occur (from Table 1) in the same years with *Nereocystis*:

Black pine *Neorhodomela larix* (Turner) Masuda – Georgina Point

Bowerbank's crumb-of-bread sponge *Halichondria bowerbankia (*Burton, 1930) – Point Cowan

Spotted swimming anemone *Stomphia coccinea* (Müller, 1776) – Point Cowan

Dwarf calcareous tubeworms *Pileolaria* spp. (Cladarede, 1870) – Keystone

Slime tube feather-duster *Myxicola infundibulum* (Renier, 1804) – Keystone

Green false-jingle *Pododesmus macrochisma* (Deshayes, 1839) – Keystone

Bladder clam *Mytilimeria nuttalli (*Conrad, 1837) – Laura Point

Fat gaper *Tresus capax* (Gould, 1850) – Keystone

Sandpaper trophon *Scabrotrophon maltzani* (Kobelt and Kuster, 1878) – Point Cowan

Checkered hairy snail *Trichotropsis cancellata (*Hinds, 1849) – Point Cowan

Clown nudibranch *Triopha catalinae* (J.G. Cooper, 1863) – Keystone, Whytecliff

Giant nudibranch *Dendronotus iris* (J.G. Cooper, 1863) – Point Cowan

Frosted nudibranch *Dirona albolineata (*MacFarland, 1905) – Point Cowan

Golden dirona *Dirona pellucida* (Volodchenko, 1941) - Whytecliff

White-and-orange-tipped nudibranch *Janolus fuscus (*O'Donohue, 1924) – Point Cowan

Rough patch shrimp *Pandalus stenolepis (*M.J. Rathbun, 1902) – Point Cowan

Squat lobster *Munida quadrispina* (J.E. Benedict, 1902) – Point Cowan

Mottled star *Evasterias troschelii* (Stimpson, 1862) - Keystone

Stiff-footed sea cucumber *Eupentacta quinquesemita* (Selenka, 1867) - Keystone

Blackeye goby *Rhinogobiops nicholsii* (Bean, 1882) - Keystone

Yellow-eye rockfish *Sebastes ruberrimus* (Cramer, 1895) - Whytecliff

Buffalo sculpin *Enophrys bison* (Girard, 1854) - Keystone

C-O Sole *Pleuronichthys coenosus (*Girard, 1854) – Point Cowan

These random matches (above) with *Nereocystis* only occur at two sites for the one species *Triopha catalinae*, which is not an ecological match, so is most likely just by chance. The two sites with numerous random matches have either a single year for match (Point Cowan – 1998) or mismatch (Keystone – 1988), so the analysis would very likely change if different years were selected, and does not indicate any ecosystem function of *Nereocystis* that is driving biodiversity of the seabed.

Seaweeds appear to differ in diversity especially at Active and Gabriola Passes (Figure 7). The red algae (Rhodophyta) are particularly abundant in the narrow passes and adjacent locations in the Gulf Islands (as shown in the Active and Gabriola regions). These channels are subject to strong tidal flow and usually have extensive gently sloped rocky outcrop substrate most conducive for algal growth. Finally, the Gulf Islands generally get more sunshine hours yearly than other regions (e.g. Howe Sound, with heavier rainfall, thus overcast) and that greater lighting would also enhance the abundances. The list of seaweeds in Table 2 demonstrates, however, that these red algae species occur in trace abundances, in contrast to the red algae (see Appendix 1) that occur in all regions at high abundances.

## 4.4 Figure 7 – Seaweed biodiversity in all regions

**FIGURE 7a - N. Washington / Whidbey**

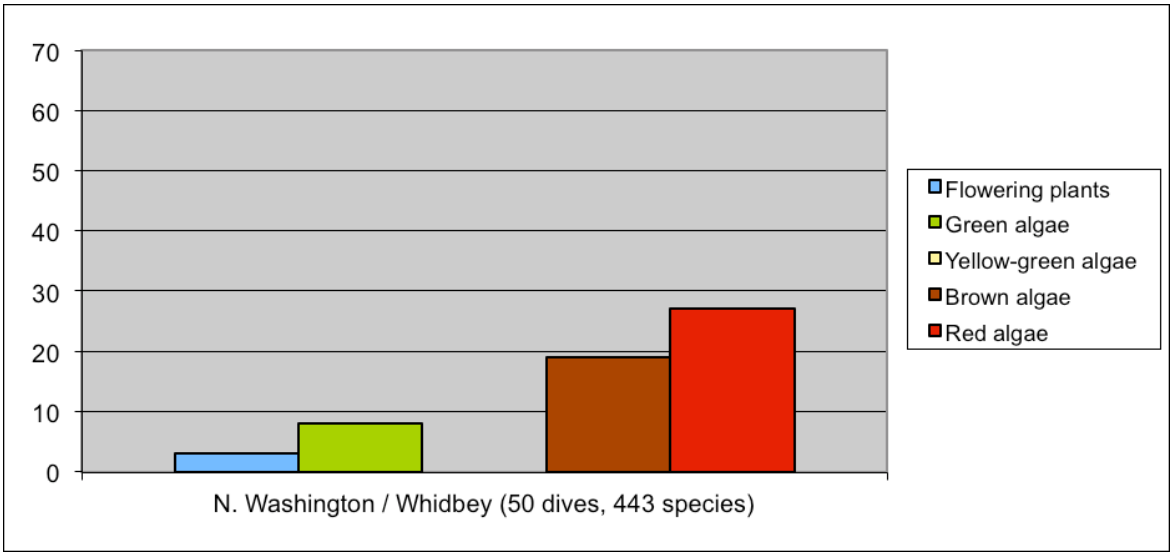



**FIGURE 7b - San Juan Islands**

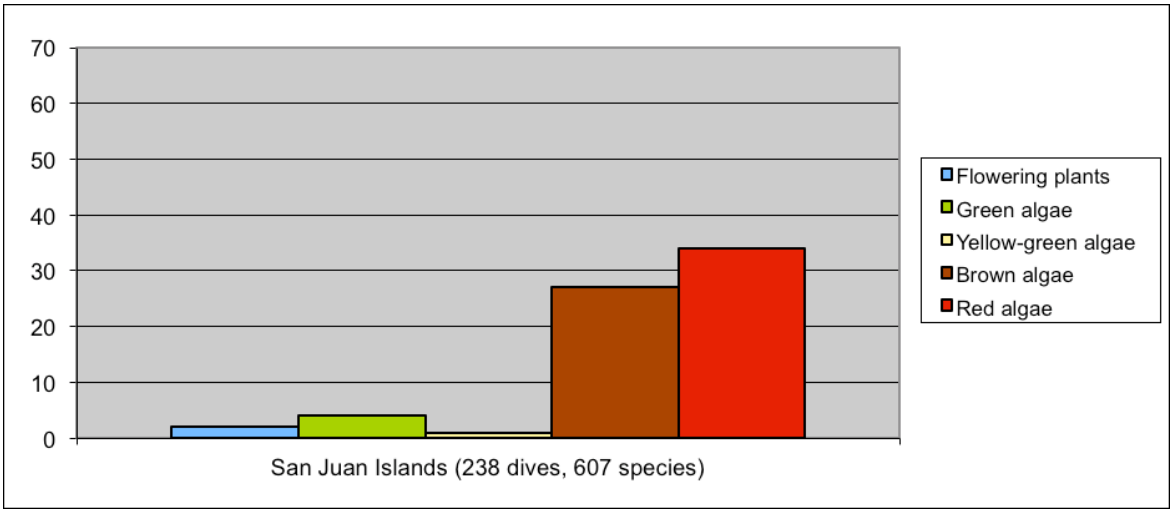


**FIGURE 7c - Active Pass**

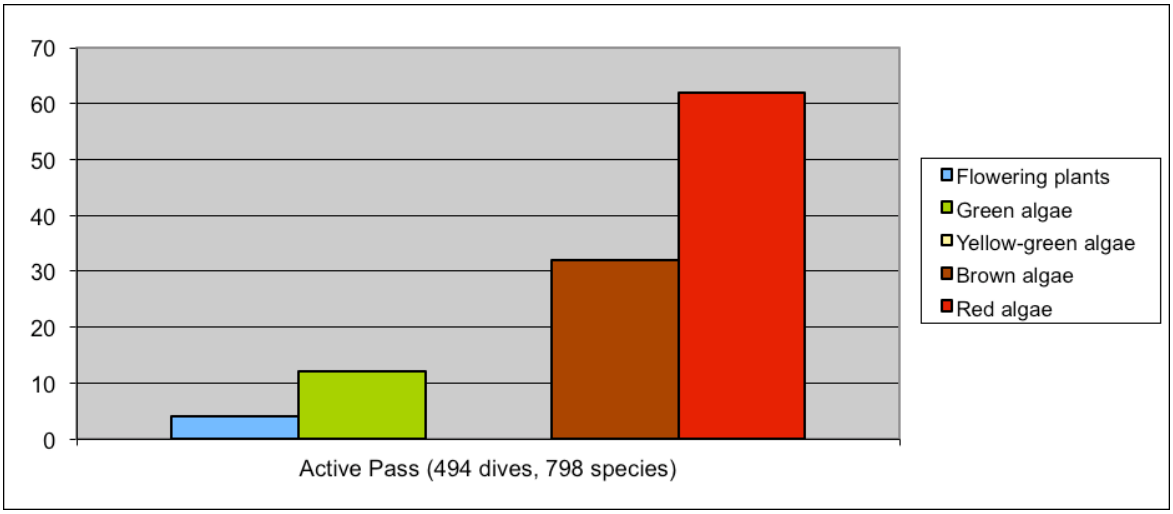



**FIGURE 7d - Gabriola Pass**

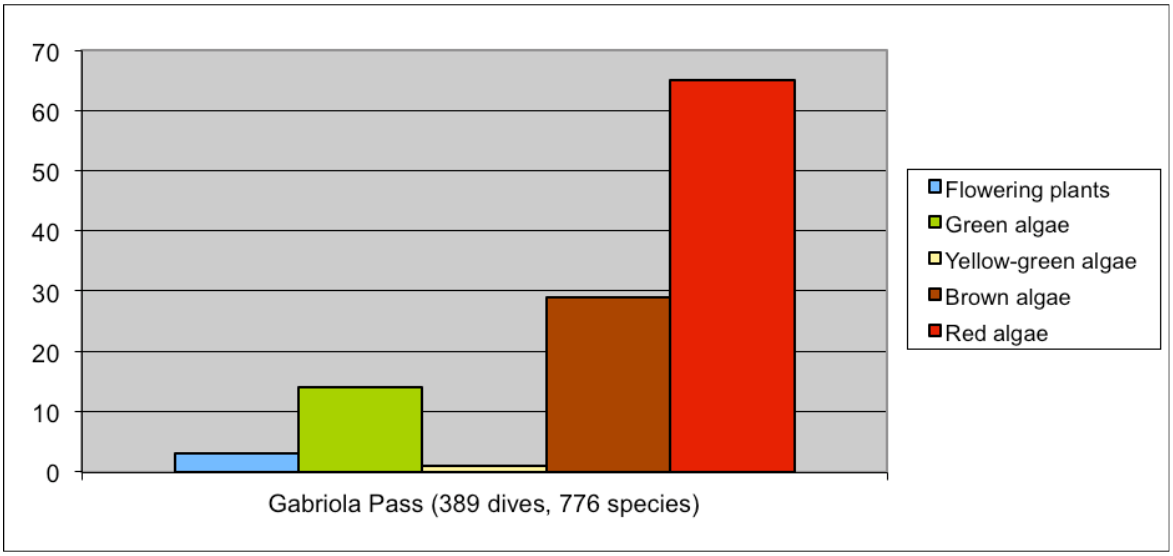


**FIGURE 7e - Lambert Channel / Nanoose Bay**

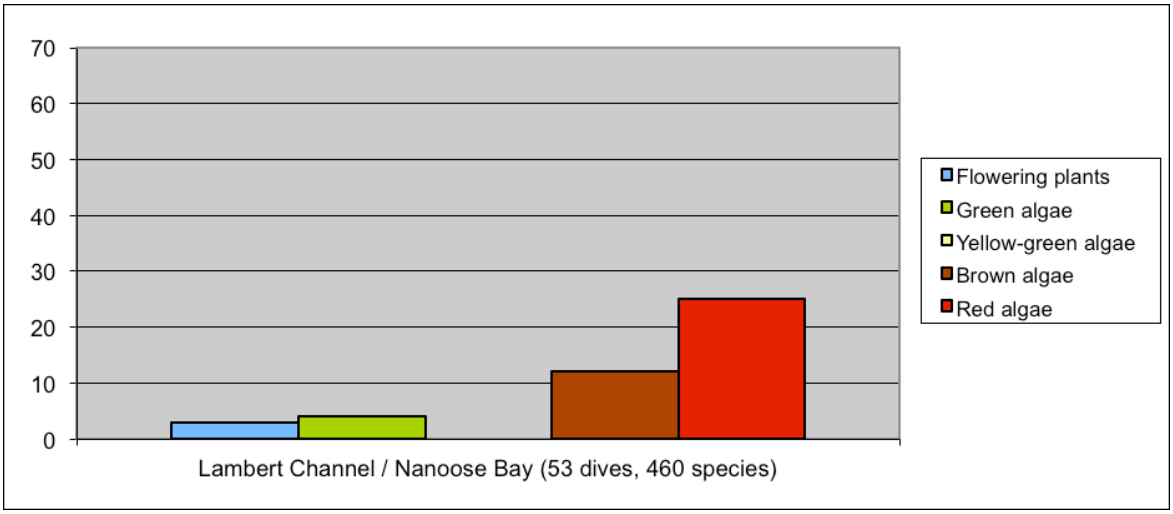



**FIGURE 7f - Discovery Passage / Campbell River**

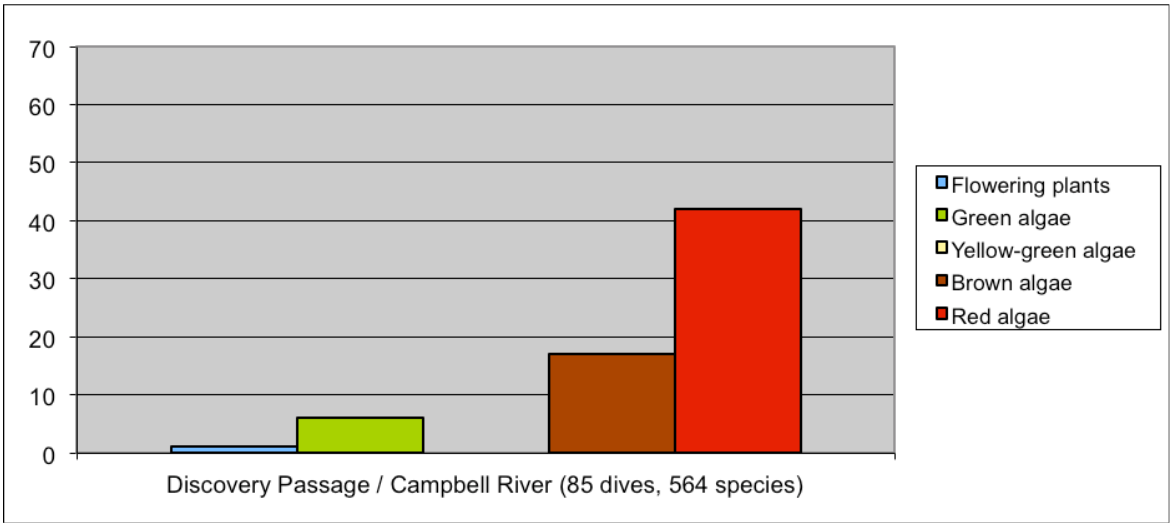


**FIGURE 7g - Texada**

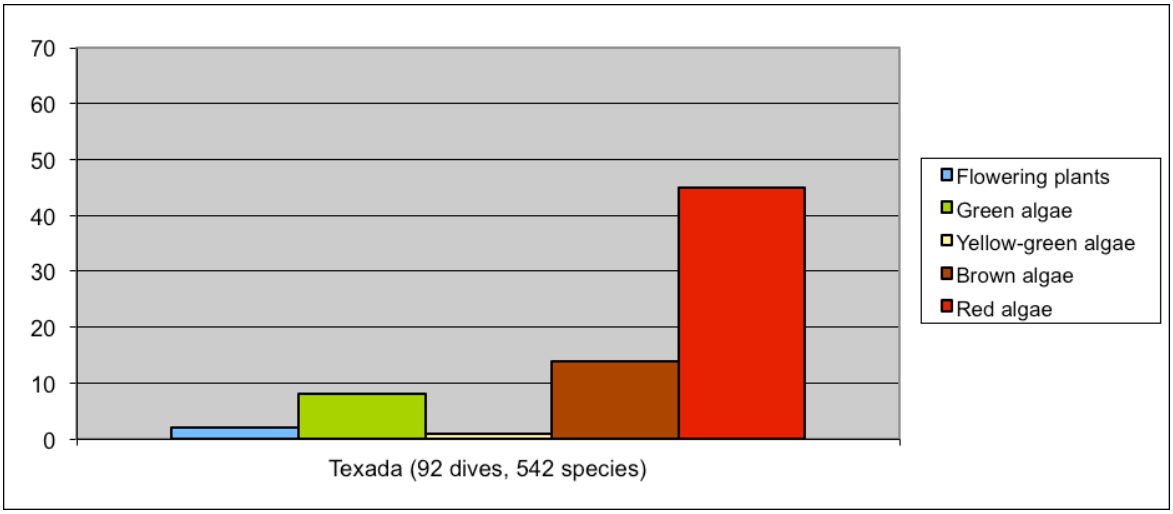



**FIGURE 7h - Jervis Inlet**

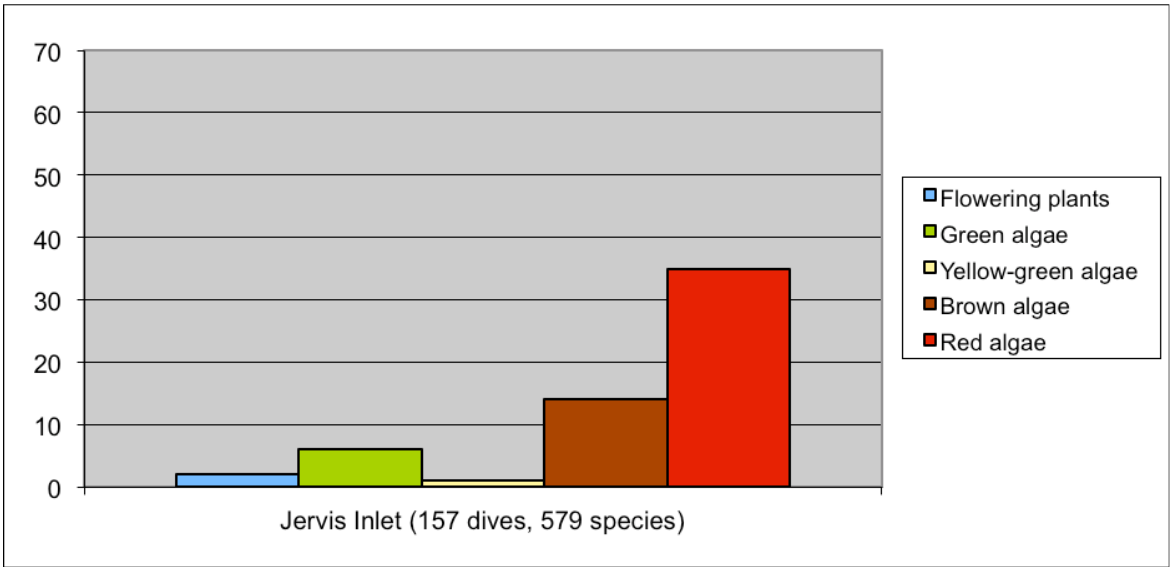


**FIGURE 7i - Sunshine Coast**

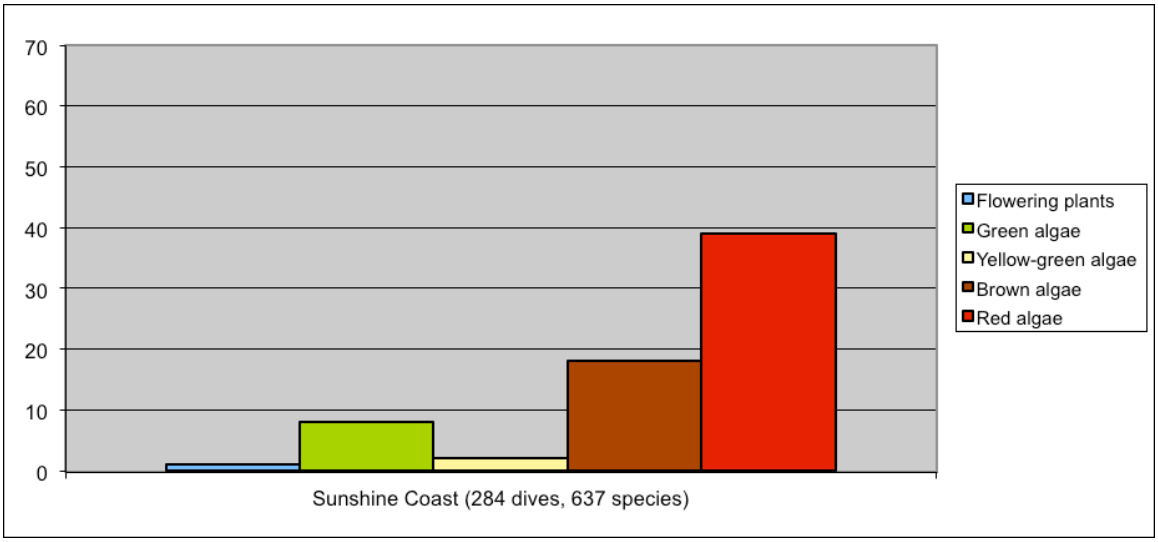



**FIGURE 7j - Howe Sound**

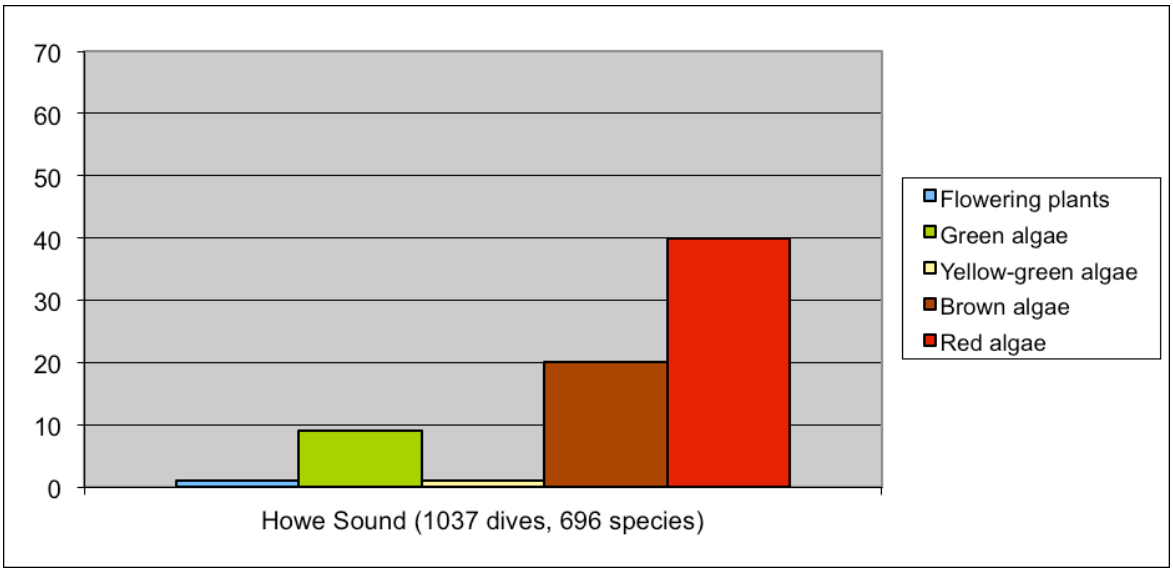
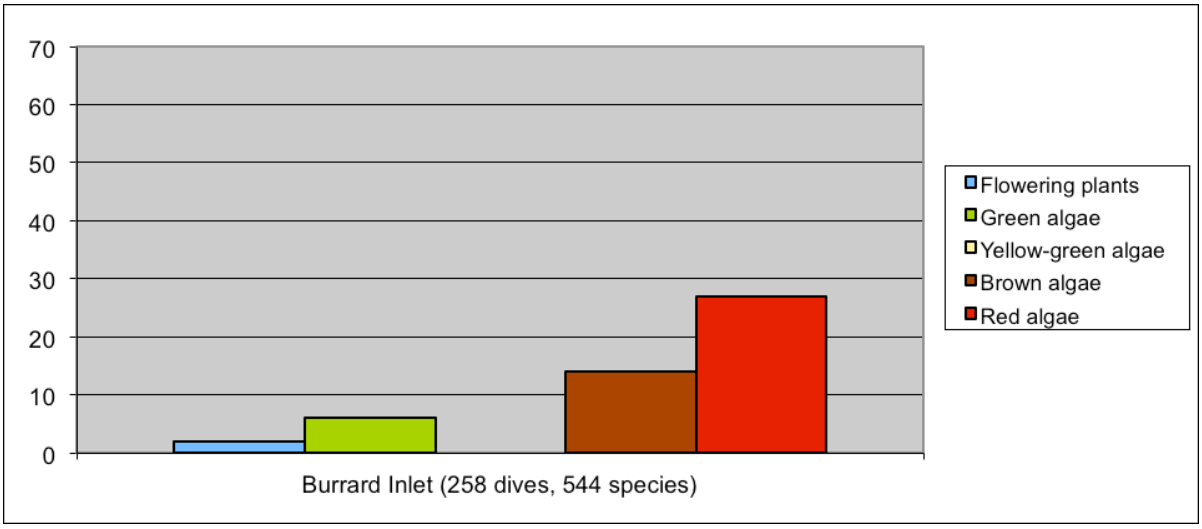


**FIGURE 7k - Burrard Inlet**




The occurrence of El Niño and La Niña events affecting the greater Georgia Strait could be a factor with respect to *Nereocystis* abundance. During the period of study for this report, three of these events occurred, in the years 1989, 1999 and 2010. The histograms for the regions (Figure 2) and selected sites within those regions (Figure 6) were examined for trends during these three events. Unfortunately, due to visitation gaps reflected in the data sets in these histograms, a complete assessment is impossible. Out of 71 potential data points available from the figures mentioned above, only 43 (60%) have entries, which means that 28 have no data. No correlations were evident, overall.

**TABLE 2 – Seaweeds exclusive to particular regions**

| | | N. Wash / Whidbey | San Juans | Active Pass | Gabriola Pass | Lambert / Nanoose | Campbell | Texada | Jervis Inlet | Sunshine Coast | Howe Sound | Burrard Inlet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Anthophyta | | | | | | | | | | | | |
| Sarcocornia perennis | | | | | | | | | | | | * |
| Chlorophyta | | | | | | | | | | | | |
| Ulva linza | | | | | * | | | | | | | |
| Ochrophyta | | | | | | | | | | | | |
| Laminaria bongardiana | | | | | * | | | | | | | |
| Laminaria dentigera | | * | | | | | | | | | | |
| Cystoseira osmundacea | | | | * | | | | | | | | |
| Haplogloia andersonii | | | | | | | | | | * | | |
| Eisenia arborea | | * | | | | | | | | | | |
| Rhodophyta | | | | | | | | | | | | |
| Nemalion helminthoides | | | | | | | | | | | * | |
| Mazzaella oregona | | | | | | | | | | | * | |
| Rhodomela tenuissima | | | | * | | | | | | | | |
| Melobesia sp. / Mesophyllum sp. | | | | * | | | | | * | | | |
| Melobesia mediocris, Melobesia marginata | | | | * | | | | | | | | |
| rhodoliths including Phymatolithon calcareum and Lithothamnion glaciale | | | | | * | | | | | | | |
| Dilsea californica | | | | | * | | | | | | | |
| Farlowia mollis | | | | | | | | | | | * | |
| Palmaria mollis | | | | | * | | | | | | | |
| Gymnogongrus chiton | | | | | | | | | | * | | |
| Scinaia confusa | | | | | * | | | | | | | |
| Tokidadendron kurilensis | | | | | * | | | | | | | |
| Fauchea fryeana | | | | | * | | | | | | | |
| Stenogramma interrupta | | | | | * | | | | | | | |
| red sponge growth | | | | | * | | | | | | | |

# 5. DISCUSSION

The purpose of this report is to examine the historical presence of bull kelp *Nereocystis luetkeana* within an area of focus termed "Strait of Georgia" and previously defined in the methods section. Bull kelp, *Nereocystis luetkeana* (Mertens) Postels and Ruprecht, is an annual brown alga (Phylum Ochrophyta, Class Phaeophyceae) found along North America's Pacific coast from southern California to northern Alaska, on solid substrate to depths of 20 m (65 ft.) (Lamb and Hanby, 2005).

Often found in large aggregations known as "kelp beds," bull kelp *Nereocystis luetkeana* is a very significant species and as a consequence is presumed to be the foundation of a veritable ecosystem. "Kelp" is a popular term generally and most correctly used in reference to the species of large obvious brown algae Ochrophyta that comprise the Order Laminariales. Such kelp beds and their associated fauna are a vital component of the coastal environment. From an economic perspective, bull kelp is linked to many commercially important species including forage fish species like herring and sandlance as well as several salmon species, at various life cycle stages. Numerous species of tiny pelagic arthropods, largely unobserved or documented in the database utilized for this report, are known to associate with kelp beds and provide food for the aforementioned forage fish and juvenile salmon. The present study shows bull kelp to be continuously present around the north and south entrances to the Strait of Georgia and at high-energy tidal passages. Except for tidal passes, the middle latitudes of the Strait of Georgia are where bull kelp is now least abundant, especially in the last two decades (Figure 2).

One suggested reason for the lack of *Nereocystis* in some localities where it was historically present, is a recovery or recent appearances of pinnipeds. In some place (for example, the Popham Island site in the Howe Sound region), large numbers of harbour seals and their resulting excrement may have resulted in a loss of any previously existing attached organisms. Particularly near large cities such as Vancouver, Victoria and Nanaimo, such an effect may be further enhanced by human waste flow into the marine environment.

With respect to the dive log data provided in this report, the previous pinniped-oriented discussion must be framed. Almost all the observations that form pinniped entries in the database are recorded based upon underwater, during the dive sightings. This factor greatly reduces the value of any pinniped abundance conclusions drawn from this data as these mammals are common within the study area and often noticed pre- and post dive.

With respect to this immense literature, one of the more recent papers, Berry et al., 2005, in part looked at this relationship through a study area focused upon Washington State via an aerial photographic assessment of *Nereocystis* beds. It mentions several possible influences on *Nereocystis* abundance including climate change (El Niño – of which there is only the one 2010 event within the study's time frame).T heir study area abuts rather than overlaps ours, and it did provide context for our investigations.

Note: In 2002, the Department of Fisheries and Oceans established a number of Rockfish Conservation Areas coast-wide in British Columbia. In the Active region, the Georgina site falls within one of these RCAs while nearby Laura Point does not. Considering how recent this rather narrowly focused designation is, it is unlikely that trends related to this report would have as yet resulted.

Year-to-year fluctuations with respect to presence and absence of the species' as well as variable densities of such kelp beds are becoming more evident as more observational effort is undertaken. Such observations are prompting speculation and investigation into the potential causes for such

fluctuations. Psychology Louis Druehl potentially presented a significant factor in such temporal variations (Druehl, 2000) when he says, "*Nereocystis* has a logistic problem in completing its life cycle. The spores are produced on the blades at the ocean surface, often several metres above the ocean floor, but a critical concentration of spores is required near where the parent plant is successfully established to assure re-occupation of this optimal space once the annual plant is lost. So the sorus (spore patch) drops from the blade and delivers its concentrated spores to the bottom before releasing the spores. This is the only kelp to release spore patches." Louis Druehl's statements potentially explain the aforementioned fluctuations. Variable oceanographic and meteorological factors, such as current and wind, undoubtedly affect seasonal kelp spore distribution – and consequently, kelp bed variability.

Druehl's insight also highlights a primary feature of *Nereocystis* biology that obscures attempts to assess its existence in the field. As an annual, this species is very limited in its presence during the late autumn and winter. At these times, the vast majority of specimens have vanished, dislodging or disintegrating. Consequently, if the species is observed at all, it is usually via low numbers of remnant senescent individuals. It is not until spring, when new growth appears, that the species becomes obvious again. Consequently, this seasonal phenomenon produces a "period of obviousness" for *Nereocystis* that is reflected in the data and is difficult to assess. "Period of obviousness" exceptions do occur and the large *Nereocystis* bed along the Stanley Park shoreline of Burrard Inlet is an example of how much of it persists year round. Such persistence may be because of a lack of stormy weather events in the area to facilitate removal. The "periods of obviousness" factor must always be considered when consulting this report.

A couple of anecdotal examples follow. As a young boy in the 1950s, Andy Lamb routinely visited Caulfeild Cove, West Vancouver, during family picnic activities. At this time, a significant kelp bed formed along the adjacent shoreline. From 1994 to 2004, the authors of the PMLS made 38 dives there, in which *Nereocystis* was recorded on 13. Dives during which it was observed occurred throughout all seasons, but in consideration of the species' seasonal life history, its "viewability quotient" is higher during the summer. On the 8 dives where detailed information is available, *Nereocystis* was recorded as "few or one" on all but one dive. On that November, 1994 dive, it was recorded as "some" but as "old" (senescent). Over the same time period, a large, robust *Nereocystis* bed has been consistently present along the Stanley Park shoreline of Burrard Inlet from the mouth of Beaver Creek to the First Narrows Bridge. Caulfeild Cove is a site with little tidal current whereas very strong currents affect the Stanley Park shoreline kelp bed. In 1985, divers Ian and Julia Hass purchased waterfront property at Dinner Bay, Mayne Island (Active Pass region), a location that they have visited frequently and consistently ever since. A small rocky reef structure exists just in front of their property that reaches to within about 2 metres of the surface. Up until three years ago, the Hasses consistently noticed a few ("6 or so") *Nereocystis* individuals on this reef during the peak summer season. However, in 2007, they observed very many robust specimens on the reef. As divers they have also routinely visited the reef and report a small cluster of red sea urchins *Strongylocentrotus franciscanus* consistently there and always in the same rocky crevice.

Over many years and via numerous studies, investigators have linked *Nereocystyis* abundance with that of sea urchins (genus *Strongylocentrotus*). These sea urchins are well documented predators of *Nereocystis.* The extreme manifestation of this relationship is often referred to under the terminology "urchin barrens", whereby predation is so severe that entire areas are devoid of *Nereocystis* and associated organisms save for encrusting coralline algae and meagre numbers of few other species.

Bull kelp is highly visible from the sea surface and is considered a navigation hazard, so that most people typically have a good awareness of its presence, even if they cannot identify it. Over time, some kelp beds disappear in particular locations, and that too is usually noticeable. Although people have commonly presumed a key ecological link between presence of bull kelp and seabed biodiversity, this exhaustive presentation demonstrates that the loss of bull kelp does not indicate any collapse of the entire community. Instead, the seabed biodiversity of the Strait of Georgia is remarkably stable and extensive throughout the region, regardless of bull kelp presence. This does not mean that massive beds of bull kelp may not serve important ecological services, as for the refuge and feeding opportunities of young fish, including salmon.

# 6. CONCLUSIONS

The present report represents the results of major searches and manipulations of the PMLS taxonomic database of over 4,500 Pacific Northwest dives. With respect to bull kelp Nereocystis luetkeana, these data compilations were used to examine relations of bull kelp to the overall biodiversity of the shallow seabed ecosystems of the greater Strait of Georgia. The presence or absence of bull kelp does not correspond to any significant shifts in ecosystem biodiversity. The entire Strait of Georgia area has very predictable shallow seabed biodiversity for the various major taxonomic groupings of species. The north and south entrances of this area always have bull kelp present, whereas the middle latitudes have the least bull kelp. Howe Sound and the central east coast of Vancouver Island from Lambert Channel to Nanoose Bay have the least bull kelp, as well as a tendency for urchin barrens to occur where no seaweeds are present. The complex relations of human population density, seal and sea lion population density, oceanographic currents, and possible effects of climate change are all possible factors affecting bull kelp that will make it difficult to prove cause and effect. Sea urchins are often singled out as a cause for lack of bull kelp, but sea urchins occur in abundance throughout this greater Strait of Georgia area, and fine-scale studies of urchin barrens cannot be extracted from the present data compilation.

# 7. APPENDICES

## 7.1 Species Abundance Data

| | whidbey | sanjuan | active | gabriola | nanoose | campbell | powell | jervis | sunshine | howe | burrard |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Flowering plants (Anthophyta)** | | | | | | | | | | | |
| Salicornia depressa | . | . | * | * | . | . | . | . | . | . | . |
| Sarcocornia perennis | . | . | . | . | . | . | . | . | . | . | * |
| Zostera marina | 5 | 4 | 7 | 3 | 10 | 2 | 5 | 7 | 1 | 2 | 10 |
| Zostera japonica | * | . | * | * | * | . | * | * | . | . | . |
| Phyllospadix spp. | 2 | 2 | * | . | 1 | . | . | . | . | . | . |
| **Green algae (including Chlorella, Symbiodinium) (Chlorophyta)** | | | | | | | | | | | |
| Prasiola meridionalis | * | . | 1 | * | . | * | * | . | * | * | * |
| Blidingia spp., including Blidingia minima var. vexata | . | . | * | * | . | . | . | . | . | . | . |
| Urospora penicilliformis | * | . | * | * | . | . | * | . | . | * | * |
| Cladophora sp. | * | . | * | * | . | * | 1 | * | . | * | * |
| Chaetomorpha sp., including Chaetomorpha linum | . | . | * | * | . | . | * | . | . | . | * |
| Ulva intestinalis | 4 | * | 2 | 3 | 3 | * | 3 | 1 | 2 | 2 | 3 |
| Ulva linza | . | . | . | * | . | . | . | . | . | . | . |
| Ulva spp., including Ulva lactuca | 18 | 8 | 20 | 23 | 13 | 15 | 28 | 13 | 8 | 6 | 11 |
| Acrosiphonia coalita | . | . | * | * | . | . | . | . | . | * | . |
| Bryopsis sp., probably Bryopsis corticulans | * | . | * | * | . | . | . | . | * | * | . |
| Codium fragile | . | * | * | * | 1 | 2 | . | * | * | . | . |
| Codium setchellii | 6 | 4 | * | 3 | 1 | 9 | 1 | 15 | * | * | . |
| Kornmania leptoderma | 1 | . | * | * | . | . | . | . | . | . | . |
| Derbesia marina / Halicytis ovalis | . | . | . | . | . | . | . | * | * | . | . |
| undetermined | . | . | . | * | . | . | * | . | * | * | . |
| **Yellow-green algae (Xanthophyta)** | | | | | | | | | | | |
| Vaucheria spp. | . | * | . | . | . | . | . | . | * | . | . |
| Vaucheria spp. and others | . | . | . | * | . | . | 1 | * | * | * | . |

| Brown algae (Phaeophyta) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ectocarpus, Feldmannia, Hincksia, Pilayella | . | * | * | 1 | . | . | . | . | . | * | * |
| Fucus sp.? | . | . | . | * | * | . | . | . | . | . | . |
| Fucus gardneri | 7 | 1 | 15 | 12 | 6 | 5 | 28 | 11 | 6 | 6 | 11 |
| Pelvetiopsis limitata | * | * | . | . | . | . | . | . | . | . | . |
| Leathesia difformis | . | * | 1 | * | . | . | * | . | * | . | . |
| Colpomenia peregrina | . | . | * | 1 | . | . | 2 | . | * | . | . |
| Colpomenia bullosa | . | . | . | * | . | . | . | . | . | * | . |
| Analipus japonicus | . | * | * | . | . | . | . | . | * | . | . |
| Scytosiphon lomentaria | . | * | * | * | * | . | * | . | . | * | . |
| Postelsia palmaeformis | . | . | * | . | . | . | . | . | . | * | . |
| Hedophyllum sessile | . | * | * | . | . | * | . | . | . | . | . |
| Egregia menziesii | 2 | 1 | * | . | . | . | . | . | . | . | . |
| Alaria nana | * | . | * | * | . | 1 | . | * | . | * | . |
| Alaria fistulosa | . | . | . | . | . | . | . | . | . | * | . |
| Alaria marginata | 4 | 1 | 3 | 9 | . | 4 | 8 | 3 | * | * | * |
| Costaria costata | 9 | 2 | 3 | 4 | 2 | 5 | 2 | 3 | 1 | 3 | * |
| Cymathere triplicata | 5 | * | * | * | . | * | . | . | . | . | . |
| Laminaria bongardiana | . | . | . | * | . | . | . | . | . | . | . |
| Laminaria saccharina | 13 | 14 | 15 | 16 | 10 | 14 | 20 | 18 | 17 | 6 | 13 |
| Laminaria setchellii | . | 4 | * | * | . | * | * | * | * | * | * |
| Laminaria dentigera | . | * | . | . | . | . | . | . | . | . | . |
| Pleurophycus gardneri | * | * | * | * | . | . | . | . | * | . | . |
| Lessoniopsis littoralis | 3 | * | 3 | * | . | 2 | . | . | . | . | . |
| Cystoseira geminata | . | * | 1 | 1 | . | . | . | . | . | . | * |
| Cystoseira osmundacea | . | . | * | . | . | . | . | . | . | . | . |
| Sargassum muticum | 3 | 1 | 14 | 24 | 13 | 1 | 17 | 13 | 15 | 7 | 5 |
| Haplogloia andersonii | . | . | . | . | . | . | . | . | * | . | . |
| Desmarestia aculeata, Desmarestia latifrons | . | . | * | 3 | . | * | . | . | . | . | . |
| Desmarestia viridis | 6 | * | 1 | 1 | 2 | * | 2 | 2 | * | * | * |
| Desmarestia ligulata, Desmarestia munda | 8 | 6 | 3 | 6 | * | 9 | * | 2 | * | * | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pterygophora californica | 6 | 8 | 17 | 8 | . | 7 | . | * | . | . | . |
| Eisenia arborea | . | * | . | . | . | . | . | . | . | . | . |
| Macrocystis integrifolia | . | . | * | * | . | . | . | . | * | . | . |
| Macrocystis pyrifera | * | . | * | . | . | . | . | . | . | . | . |
| Nereocystis luetkeana | 23 | 18 | 13 | 17 | * | 15 | 12 | 20 | 1 | * | 1 |
| Dictyota binghamiae | . | * | * | * | . | . | . | . | . | * | . |
| Agarum clathratum | . | . | * | * | . | . | . | . | . | * | * |
| Agarum fimbriatum | 8 | 13 | 20 | 26 | 16 | 10 | 32 | 38 | 31 | 14 | 4 |
| undetermined | 1 | * | * | * | 1 | . | . | 1 | * | * | . |
| undetermined | 4 | * | 2 | 6 | 5 | 8 | 10 | 1 | 4 | 2 | 1 |
| **Red algae (Rhodophyta)** | | | | | | | | | | | |
| Bangia spp. | 1 | * | * | . | . | . | . | . | * | * | * |
| Porphyra spp. | 1 | * | 3 | 2 | 1 | 3 | 3 | 2 | 2 | 1 | 1 |
| Endocladia muricata | . | . | * | 1 | . | . | * | . | * | . | . |
| Cumagloia andersonii | . | . | . | * | . | . | * | . | . | . | . |
| Nemalion helminthoides | . | . | . | . | . | . | . | . | . | * | . |
| Hildenbrandia spp. | 9 | 2 | 9 | 29 | 14 | 12 | 23 | 34 | 22 | 7 | 3 |
| Mastocarpus jardinii | . | . | * | * | . | . | . | . | . | * | . |
| Mastocarpus papillatus | * | . | 1 | * | . | . | * | * | . | * | * |
| Mazzaella oregona | . | . | . | . | . | . | . | . | . | * | . |
| Rhodomela tenuissima | . | . | * | . | . | . | . | . | . | . | . |
| Neorhodomela larix | . | . | 3 | * | . | . | * | . | * | . | . |
| Cryptosiphonia woodii | . | . | * | * | . | . | * | . | . | . | . |
| Microcladia borealis | . | * | 2 | 2 | . | * | * | . | . | * | . |
| Halosaccion glandiforme | . | * | * | * | . | . | . | . | . | * | . |
| various | * | * | 6 | 24 | * | 6 | 4 | 1 | 1 | * | * |
| Callithamnion pikeanum | . | . | * | * | . | 1 | . | . | . | . | . |
| Grateloupia lanceolata | * | . | * | . | . | . | . | . | * | * | . |
| Prionitis lyallii | 1 | * | * | * | * | * | 1 | . | * | * | . |
| Plocamium cartilageneum pacificum | . | * | * | * | 1 | * | . | . | . | . | . |
| Clathromorphum, Lithothamniun, Melobesia, Mesophyllum | 22 | 15 | 22 | 34 | 19 | 22 | 32 | 23 | 14 | 10 | 8 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Melobesia sp. / Mesophyllum sp. | . | . | * | . | . | . | . | * | . | . | . |
| Melobesia mediocris, Melobesia marginata | . | . | * | . | . | . | . | . | . | . | . |
| including Phymatolithon calcareum and Lithothamnion glaciale | . | . | . | * | . | . | . | . | . | . | . |
| Bossiella, Calliarthron, Corallina, Serraticardia | 3 | 10 | 3 | 3 | 3 | 6 | 11 | 5 | 2 | . | . |
| Corallina officinalis var. chilensis | . | . | * | * | . | . | . | . | . | . | . |
| Corallina vancouveriensis | . | * | * | * | 1 | * | 2 | * | 1 | . | . |
| Bossiella spp., Calliarthron spp. | * | * | * | 2 | * | 3 | * | * | * | * | . |
| undetermined | . | . | 2 | 11 | 1 | . | * | 1 | * | * | * |
| Dilsea californica | . | . | . | * | . | . | . | . | . | . | . |
| Farlowia mollis | . | . | . | . | . | . | . | . | . | * | . |
| Ahnfeltia fastigiata | * | . | * | . | . | . | . | . | . | . | . |
| Palmaria callophylloides | . | * | 1 | 5 | . | . | * | * | * | * | . |
| Palmaria mollis | . | . | . | * | . | . | . | . | . | . | . |
| Ceramium pacificum | . | . | 1 | 1 | . | * | 2 | . | . | . | . |
| Ceramium codicola | * | . | * | . | * | * | . | 1 | . | * | . |
| Callophyllis spp. | 5 | * | 6 | 15 | 1 | 2 | 7 | 2 | 5 | 2 | 1 |
| Chondracanthus exasperatus | 9 | 1 | 7 | 9 | 10 | 1 | 10 | 1 | 1 | 2 | 1 |
| Mazzaella splendens | 9 | 2 | 5 | 3 | * | * | 4 | * | * | 1 | * |
| Microcladia coulteri | . | * | * | 1 | . | . | * | . | * | . | . |
| Cryptopleura ruprechtiana, Botryoglossum farlowianium | 1 | * | 3 | 4 | . | * | * | * | * | . | . |
| Cryptopleura lobulifera | * | . | 3 | 9 | . | 1 | 1 | * | * | * | . |
| Hymenena spp. | . | . | 1 | 3 | . | 1 | . | . | . | * | * |
| Erythrophyllum delesseroides | . | . | * | . | . | 1 | * | . | . | . | * |
| Gracilaria / Gracilariopsis | . | * | 2 | 2 | * | * | * | 1 | * | * | * |
| Odonthalia floccosa | . | . | 1 | * | . | . | . | . | * | . | . |
| Odonthalia washingtoniensis | . | . | . | . | . | * | . | . | . | . | * |
| Laurencia spectabilis | * | . | 1 | * | . | * | 1 | * | * | . | . |
| Sarcodiotheca gaudichaudii | 6 | 1 | 3 | 4 | 4 | * | 3 | 1 | 1 | * | 2 |
| Rhodymenia californica | . | . | * | * | . | . | . | . | . | * | * |
| Rhodymenia pacifica | . | . | * | * | . | * | * | . | * | . | . |
| Pterochondria woodii | . | * | 1 | 2 | . | * | * | * | * | . | . |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Schizymenia pacifica | . | * | * | 1 | . | * | * | * | * | * | . |
| Smithora naiadum | * | 1 | * | 1 | * | 1 | . | * | * | * | * |
| Porphyra gardneri | . | . | * | 1 | . | . | . | * | . | . | . |
| Polyneura latissima | . | * | 1 | * | * | 3 | . | . | . | * | . |
| Sparlingia pertusa | 1 | * | 1 | 2 | 2 | * | * | 1 | 1 | 3 | * |
| Constantinea subulifera | . | . | * | * | . | * | * | * | 1 | * | * |
| Constantinea simplex | . | * | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 1 | * |
| Delesseria decipiens | . | . | 1 | 3 | . | 3 | * | . | . | * | . |
| Membranoptera platyphylla | . | . | 2 | 2 | . | 1 | . | . | . | * | * |
| Porphyra nereocystis | . | * | * | 2 | . | * | . | * | . | . | . |
| Gymnogongrus chiton | . | . | . | . | . | . | . | . | * | . | . |
| Scinaia confusa | . | . | . | * | . | . | . | . | . | . | . |
| Tokidadendron kurilensis | . | . | . | * | . | . | . | . | . | . | . |
| Bonnemaisonia nootkana | * | * | 1 | 1 | . | 1 | * | * | * | . | * |
| Rhodoptilum plumosum | . | . | * | 1 | . | . | * | . | . | . | . |
| Fauchea lacinata | 4 | 2 | 2 | 2 | 1 | 6 | * | * | * | * | * |
| Fauchea fryeana | . | . | . | * | . | . | . | . | . | . | . |
| Fryeella gardneri | . | . | . | * | . | . | * | . | . | . | . |
| Botryocladia pseudodichotoma | . | * | * | 1 | 1 | 1 | * | * | * | 5 | * |
| Opuntiella californica | 1 | 7 | 3 | 3 | * | 5 | 2 | 5 | * | * | . |
| Sarcodiotheca furcata | . | . | . | * | . | . | * | . | . | . | . |
| Stenogramma interrupta | . | . | . | * | . | . | . | . | . | . | . |
| undetermined | . | . | . | * | . | . | . | . | . | . | . |
| C, orange-coloured red alga Griffithsia pacifica? | . | . | * | 2 | . | . | * | . | * | . | . |
| undetermined | 3 | 3 | 6 | 1 | 5 | 4 | 3 | 6 | 4 | 1 | 2 |
| undetermined | 4 | 12 | 12 | 2 | 9 | 5 | 7 | 8 | 5 | 2 | 4 |
| undetermined | 2 | 1 | 3 | * | . | 3 | 1 | 2 | . | * | * |
| **Sponges (Porifera)** | | | | | | | | | | | |
| Sycon spp. | * | 1 | 3 | 2 | 5 | 2 | 2 | 2 | 2 | * | * |
| Leucilla nuttingi | . | 2 | 7 | 4 | 3 | 5 | 2 | 2 | 5 | * | * |
| Leucandra heathi | . | * | * | * | 1 | 7 | 1 | 1 | 3 | * | . |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Leucandra sp. | . | . | . | . | . | . | . | . | * | . | . |
| Leucosolenia eleanor | . | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 6 | * | . |
| Leucosolenia nautilia | . | * | * | 1 | . | 1 | * | . | * | * | . |
| Rhabdocalyptus dawsoni | . | . | . | * | 6 | 1 | 31 | 11 | 23 | 10 | * |
| Staurocalyptus dowlingi | . | . | . | . | . | * | 4 | * | 2 | * | . |
| Aphrocallistes vastus | . | * | . | * | 2 | 7 | 35 | 4 | 11 | 10 | * |
| Heterochone calyx | . | . | . | . | . | . | 2 | * | * | * | . |
| Craniella villosa | . | 5 | 21 | 4 | 2 | 17 | 5 | 5 | * | * | . |
| Craniella spinosa | . | . | * | * | . | * | * | * | * | * | . |
| Stelletta clarella | . | . | . | . | . | * | * | * | . | . | . |
| Geodia mesotriaena | . | . | . | . | . | . | . | . | . | * | . |
| Polymastia pachymastia | * | 2 | 12 | 1 | * | 12 | * | 1 | * | * | * |
| Polymastia pacifica | . | . | . | . | . | . | . | . | . | . | * |
| Weberella sp. | . | * | . | * | . | . | . | . | . | . | . |
| Cliona californiana | 14 | 9 | 17 | 27 | 20 | 19 | 26 | 12 | 20 | 13 | 3 |
| Suberites domuncula forma latus | . | * | 1 | * | * | * | 2 | . | * | * | . |
| Suberites montiniger | 2 | 2 | 2 | * | * | 11 | 4 | * | * | * | . |
| Tethya californiana | . | * | * | * | 4 | 4 | 10 | * | * | * | . |
| Sceptrella sp. nov. | . | . | . | . | . | * | * | * | * | . | . |
| Stylissa stipitata | . | 4 | 4 | 1 | 2 | 12 | 2 | 5 | 2 | 2 | * |
| Phakellia sp. | . | . | * | * | * | . | * | . | . | * | . |
| Syringella amphispicula | 1 | 4 | 1 | 1 | * | * | 2 | 2 | 1 | 2 | 5 |
| Neoesperiopsis rigida | . | * | * | 1 | 4 | 3 | 12 | 7 | 12 | 5 | 1 |
| Neoesperiopsis digitata | * | 3 | 5 | . | * | 7 | * | 1 | * | * | . |
| Iophon chelifer var. californiana | . | * | 1 | * | . | 1 | 1 | 9 | * | * | * |
| Pachychalina spp. | 4 | 5 | 12 | 1 | . | 9 | . | . | * | * | . |
| Reniera sp. nov. | . | * | * | * | . | . | . | . | . | . | . |
| Xestospongia hispida, Xestospongia trindanea | . | 2 | 6 | 1 | * | 3 | . | * | . | * | . |
| Myxilla lacunosa | 6 | 7 | 4 | 5 | * | 23 | * | . | . | . | . |
| Halichondria bowerbankia | 4 | 3 | 2 | 2 | * | 6 | 3 | 2 | 1 | * | 1 |
| Halichondria panicea | 1 | * | * | * | * | 1 | * | * | * | * | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mycale cf. toporoki | . | . | * | . | . | * | 1 | * | * | * | . |
| Stylinos sp. nov. | . | . | * | . | . | . | * | * | * | * | * |
| Laxosuberites sp. nov., Suberites sp. | . | . | . | * | . | . | . | . | . | . | . |
| Adocia sp.? similar to Reniera formaminosa | . | 2 | 6 | 2 | . | 5 | 2 | 2 | * | * | * |
| Haliclona? permollis | 3 | * | * | * | * | . | * | . | . | . | . |
| Hamigera sp. | . | * | 9 | 1 | 2 | 3 | 4 | 3 | 4 | 5 | * |
| Aplysilla sp. nov. | * | 4 | 2 | 2 | * | 14 | 1 | * | * | * | . |
| Chelonaplysilla polyraphis | . | . | * | * | . | . | . | . | . | . | . |
| Pleuraplysilla sp. nov. | . | . | * | * | . | . | . | . | . | * | . |
| Acarnus erithacus | . | . | * | * | . | . | . | . | . | . | . |
| Anthoarcuata graceae | . | . | * | * | . | . | . | . | . | . | . |
| Plocamia karykina | 1 | 2 | 9 | 1 | * | 4 | * | * | * | * | . |
| Ophlitaspongia pennata | 5 | 11 | 24 | 22 | 4 | 18 | 10 | 6 | 7 | 6 | 1 |
| Asbestopluma occidentalis | . | . | . | * | 1 | * | 4 | 2 | 5 | 1 | * |
| Myxilla incrustans | 2 | 3 | 6 | 4 | 2 | 6 | * | 1 | * | * | 1 |
| Mycale adhaerens | * | * | 4 | 3 | 1 | 6 | 1 | * | * | * | * |
| Penares cortius | 1 | 1 | * | * | 1 | 3 | 11 | . | . | * | * |
| Hymenamphiasta cyanocrypta | . | . | . | . | . | . | * | . | * | . | . |
| Phloeodictyon sp. nov. | . | . | . | * | . | . | . | . | . | . | . |
| Eumastia sitiens | . | . | . | * | . | . | . | . | . | . | . |
| Hexadella sp. | . | . | . | . | . | . | * | . | * | * | . |
| A | . | * | . | * | . | . | . | . | . | . | . |
| D | . | * | * | * | . | . | . | . | . | . | . |
| E | . | * | * | * | . | . | . | . | . | . | . |
| F | . | * | * | * | . | . | * | . | * | . | . |
| G | . | . | . | * | . | . | . | . | . | . | . |
| J | . | . | * | * | . | . | . | . | . | . | . |
| K | . | . | * | * | . | . | * | . | . | . | . |
| L | . | . | . | * | . | . | . | . | . | . | . |
| M | . | . | . | * | . | . | . | . | . | . | . |
| N | . | . | * | . | . | . | . | . | . | . | . |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| O | . | . | . | * | . | . | . | . | * | . | . |
| P | . | * | . | * | . | . | . | . | . | . | . |
| Q | . | . | * | * | . | . | . | . | . | . | . |
| T | . | . | . | * | . | . | . | . | . | . | . |
| U | . | . | * | * | . | . | . | . | . | . | . |
| W | . | * | * | * | . | . | * | . | . | . | . |
| undetermined | . | . | . | * | . | . | . | . | . | * | . |
| undetermined | 5 | 6 | 10 | 5 | 2 | 7 | 7 | 5 | 3 | 1 | 3 |
| **Cnidarians (Cnidaria)** | | | | | | | | | | | |
| Metridium senile | 14 | 29 | 19 | 6 | 12 | 23 | 10 | 9 | 8 | 1 | 4 |
| Metridium farcimen | 22 | 5 | 19 | 52 | 13 | 12 | 18 | 12 | 14 | 22 | 25 |
| Cribrinopsis fernaldi | 3 | 13 | 7 | 4 | 8 | 11 | 14 | 6 | 20 | 8 | * |
| undetermined | . | . | . | . | . | . | . | . | * | . | . |
| Urticina crassicornis | 21 | 22 | 13 | 11 | 9 | 21 | 4 | 5 | 7 | 5 | 9 |
| Urticina lofotensis | . | * | * | . | . | . | . | . | . | . | . |
| Urticina piscivora | . | 2 | 1 | . | . | . | . | . | . | . | . |
| Urticina coriacea | 4 | 3 | 4 | 3 | 12 | 3 | 2 | * | * | 3 | 12 |
| Urticina columbiana | . | 1 | * | . | . | . | . | * | . | * | * |
| Stomphia didemon | 1 | 1 | 2 | 4 | 9 | 2 | 20 | 5 | 12 | 13 | 5 |
| Stomphia coccinea | . | * | * | * | 1 | 1 | 1 | * | * | 2 | 2 |
| Anthopleura xanthogrammica | . | * | * | . | . | . | . | * | . | . | * |
| Anthopleura elegantissima | 4 | * | * | 2 | 6 | * | 1 | . | * | * | . |
| Anthopleura artemisia | 1 | . | * | * | * | * | * | 1 | * | * | 4 |
| Corynactis californica | . | * | * | . | . | 26 | . | . | * | . | . |
| Epiactis prolifera | 2 | 9 | 4 | 1 | . | 6 | . | . | . | . | * |
| Epiactis lisbethae | . | * | * | * | . | 6 | . | . | . | . | . |
| Epiactis ritteri | . | * | * | . | . | . | . | . | . | . | . |
| Aulactinia incubans | . | * | * | . | . | * | . | . | . | . | . |
| undetermined | . | * | . | . | . | . | . | . | . | . | . |
| Halcampa decemtentaculata | 4 | * | 1 | * | * | 3 | . | * | * | . | 2 |
| Edwardsia spp. | * | . | * | . | . | . | . | . | . | . | . |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Peachia quinquecapitata | . | . | . | 1 | * | . | 1 | * | . | * | * |
| Pachycerianthus fimbriatus | * | * | 12 | 30 | 34 | 13 | 31 | 18 | 22 | 17 | 5 |
| Epizoanthus scotinus | 4 | 15 | 10 | 10 | 14 | 10 | 4 | 9 | 10 | 7 | 2 |
| undetermined | . | . | * | . | . | . | . | * | * | . | . |
| Balanophyllia elegans | 8 | 21 | 44 | 41 | 13 | 28 | 26 | 23 | 19 | 5 | 2 |
| Paracyathus stearnsi | . | . | . | * | . | . | . | * | * | * | . |
| Caryophyllia alaskensis | . | . | * | * | * | . | 1 | 1 | 1 | 7 | 1 |
| Clavularia sp. | . | * | * | * | . | 2 | . | . | . | * | . |
| Clavularia sp. | . | 3 | * | * | . | 7 | . | . | . | . | . |
| Gersemia rubiformis | * | . | * | * | . | 8 | . | . | . | . | . |
| Alcyonium sp. | . | . | 1 | 6 | . | . | . | . | . | . | . |
| Ptilosarcus gurneyi | 2 | 3 | 10 | 13 | 15 | 5 | 12 | 10 | 12 | 9 | 13 |
| Virgularia sp. | . | . | * | * | 9 | * | 1 | * | 1 | * | 1 |
| Stylatula spp., Acanthoptilum gracile | . | . | * | . | . | . | . | . | . | . | . |
| Halipteris willeomoesi | . | . | * | . | . | . | . | * | . | * | . |
| Halipterus californica | . | . | . | * | . | . | . | . | . | . | . |
| Swiftia torreyi | . | . | . | . | . | . | . | . | 3 | . | . |
| Calcigorgia spiculifera | . | . | . | . | . | . | . | . | * | . | . |
| Paragorgia pacifica | . | . | . | . | . | . | . | . | 1 | . | . |
| Anthothela pacifica | . | . | . | . | . | . | . | . | * | . | . |
| undetermined | . | . | . | . | . | . | . | . | * | . | . |
| Stylantheca spp. | 4 | 15 | 15 | 9 | . | 13 | . | 12 | . | * | 1 |
| Stylaster norvigicus | . | * | * | . | * | 1 | . | 5 | 1 | . | * |
| Stylaster campylecus | . | . | . | . | . | . | . | . | * | . | . |
| Aglaophenia spp. | 6 | 12 | 8 | 4 | . | 7 | . | 1 | * | * | * |
| Abietinaria spp. | 22 | 26 | 23 | 9 | 7 | 23 | 4 | 8 | 7 | 5 | 9 |
| Thuiaria spp. | . | * | 1 | 4 | * | . | . | . | * | . | . |
| Sertularella spp. / Sertularia spp. | . | 3 | 1 | * | * | 3 | * | 1 | 2 | * | * |
| Selaginopsis sp. | 7 | 5 | 11 | 4 | * | 11 | * | 5 | 1 | * | 1 |
| Rhizocaulus verticillatus | . | . | * | 1 | . | . | . | . | . | . | . |
| Plumularia setacea | 1 | 6 | 8 | 6 | * | 10 | 1 | 1 | 1 | * | . |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Plumularia sp. | * | 3 | 2 | 3 | 1 | 3 | 1 | 2 | 2 | * | * |
| Abietinaria greenei | 9 | 9 | 5 | * | . | 1 | * | * | * | . | * |
| Obelia spp. | 1 | 4 | 6 | 10 | 5 | 4 | 10 | 10 | 8 | 2 | 7 |
| Eudendrium californicum | . | * | . | . | . | . | . | . | . | . | . |
| Garveia annulata | 8 | 11 | 7 | 4 | . | 17 | * | 1 | . | * | * |
| Garveia groenlandica | . | . | . | . | * | . | . | . | . | . | . |
| Clavactinia milleri | 4 | 3 | 5 | 3 | . | 7 | . | . | * | * | . |
| Hydractinia sp. (perhaps Hydractinia aggregata) | 1 | 2 | 1 | 1 | 2 | 2 | * | * | * | * | * |
| Hydractinia sp. (probably Hydractinia laevispina) | . | . | * | * | . | . | . | . | . | . | . |
| Sarsia tubulosa | 1 | * | * | * | * | 2 | . | * | * | * | * |
| Ectopleura crocea | 4 | 7 | 10 | 9 | 1 | 15 | 2 | 6 | 2 | * | 3 |
| Ectopleura marina | * | 1 | 6 | 2 | 5 | 8 | 1 | 8 | 2 | 3 | 3 |
| Tubularia indivisa | 3 | * | 1 | 1 | * | 2 | * | * | * | . | * |
| Clava sp. | 1 | 4 | 10 | 9 | 2 | 17 | 5 | 23 | 6 | 3 | * |
| Orthopyxis sp. | 1 | 2 | 4 | 3 | . | 8 | . | 1 | * | * | * |
| Corymorpha sp. | . | . | . | * | . | . | . | . | . | . | . |
| Thuiaria thuja | . | * | 4 | * | . | * | . | . | . | * | . |
| Hydrallmania distans | . | . | * | 2 | . | . | . | . | . | . | . |
| Lafoea dumosa | . | 4 | 6 | 8 | 1 | 4 | 4 | 3 | 2 | 1 | 2 |
| Grammaria spp. | . | * | . | * | . | . | . | . | . | . | . |
| Bythotiara huntsmani | . | . | . | . | . | * | * | 3 | * | . | . |
| Halecium beani | . | * | * | * | . | * | . | . | . | . | . |
| Halecium densum | . | 3 | 1 | 1 | . | * | . | . | * | * | 1 |
| A | . | . | . | * | . | . | . | . | . | . | . |
| B | . | . | . | * | . | . | . | . | . | . | . |
| undetermined | 2 | 1 | 1 | * | . | * | 1 | * | * | * | * |
| Cyanea capillata | * | 1 | 1 | 2 | 2 | * | 4 | 2 | 2 | 1 | 6 |
| Phacellophora camtschatica | . | * | * | 1 | * | . | . | * | * | * | . |
| Chrysaora fuscescens | . | . | . | . | . | . | . | . | * | * | * |
| Aurelia labiata | . | * | 1 | 10 | 2 | 4 | 1 | 9 | 5 | 1 | 6 |
| Mitrocoma cellularia | 1 | 7 | 1 | 6 | 2 | * | * | 1 | * | * | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Solmissus spp. | 1 | 2 | * | * | . | * | . | . | . | * | . |
| Aglantha digitale | . | . | * | . | . | . | * | . | * | . | . |
| Bougainvillia sp. | . | . | . | 1 | . | * | * | * | * | * | * |
| Aequorea spp. | 2 | 17 | 6 | 27 | 11 | 1 | 4 | 16 | 5 | 2 | 6 |
| Polyorchis penicillatus | * | * | * | * | 1 | * | * | * | * | * | * |
| Eperetmus typus | . | . | * | * | . | . | . | . | * | . | . |
| Gonionemus vertens | . | * | . | . | * | * | * | * | * | . | . |
| Clytia gregarium | * | 8 | 5 | 3 | 4 | 3 | 8 | 4 | 3 | * | 10 |
| Eutonina indicans | . | . | 1 | 2 | 1 | * | 2 | 2 | 2 | * | 1 |
| Sarsia spp. | . | * | * | * | * | . | * | 1 | * | . | * |
| Neoturris breviconis | . | . | * | * | 2 | . | * | * | . | * | . |
| Leuckartiara spp. | . | . | * | * | . | . | . | 1 | * | . | * |
| Euphysa spp. | . | . | * | * | . | * | . | * | * | . | . |
| Aegina citrea | * | . | * | * | . | 1 | * | * | * | * | . |
| Stomotoca atra | . | . | . | * | . | . | . | * | . | . | . |
| Melicertum octocostatum | . | . | . | * | . | . | . | . | . | . | . |
| Nanomia bijuga | * | . | 1 | 1 | 2 | 2 | 3 | 5 | 3 | 1 | * |
| Muggiaea sp. | . | . | * | * | . | . | * | * | * | * | . |
| undetermined | . | * | . | * | 1 | * | * | . | * | * | . |
| Haliclystus salpinx | * | . | * | . | . | . | . | * | . | . | . |
| **Ctenophores (Ctenophora)** | | | | | | | | | | | |
| Pleurobrachia bachei | 1 | 2 | 3 | 5 | 3 | 4 | 8 | 11 | 9 | 2 | 9 |
| Euplokamis dunlapae | . | . | * | * | . | . | 1 | 1 | * | * | . |
| Bolinopsis infundibulum | 1 | * | 2 | 6 | 4 | 3 | 5 | 6 | 5 | 1 | 1 |
| Leucothea pulchra | . | . | . | . | * | * | 1 | . | . | . | . |
| Beroe spp. | . | * | * | 1 | . | 2 | 2 | 3 | 3 | * | * |
| **Flatworms (Platyhelminthes)** | | | | | | | | | | | |
| Eurylepta leoparda | . | * | * | * | * | 2 | * | 2 | 1 | 1 | * |
| Kaburakia excelsa | . | . | . | * | . | . | . | * | * | * | * |
| Notocomplana spp. | . | . | . | . | . | . | . | . | . | . | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Stylochus californiensis | . | . | . | . | . | . | . | * | . | . | . |
| Phylloplana viridis | . | . | * | . | . | . | * | * | . | . | . |
| Kronborgia pugetensis | * | . | * | . | . | . | . | . | . | . | . |
| undetermined | . | . | * | . | . | . | . | * | . | . | . |
| **Ribbon worms (Nemertea)** | | | | | | | | | | | |
| Emplectonema gracile | . | . | * | . | . | . | . | . | . | * | . |
| Emplectonema purpuratum | . | . | . | . | . | . | . | . | . | * | . |
| Emplectonema burgeri | . | . | . | . | . | . | . | * | . | . | . |
| Micrura verrilli | . | . | . | * | . | . | . | . | * | . | . |
| Amphiporus bimaculatus | . | . | . | . | . | * | . | . | . | * | . |
| Amphiporus imparispinosus | . | . | . | . | . | * | . | . | . | . | . |
| Amphiporus formidibalis | . | . | . | . | . | . | . | * | . | . | . |
| Tubulanus sexlineatus | 1 | * | * | * | . | 3 | 1 | 1 | 2 | * | * |
| Tubulanus polymorphus | . | 1 | * | * | 2 | 1 | 1 | 3 | 1 | * | * |
| Tubulanus albocinctus | * | . | * | * | * | * | * | 1 | * | * | * |
| Tetrastemma nigrifrons | . | . | * | . | . | . | * | 1 | * | * | . |
| Cerebratulus californiensis | . | * | * | . | . | * | . | * | * | * | * |
| Cerebratulus montgomeri | . | . | . | . | . | * | . | . | * | * | * |
| undetermined | . | . | . | . | . | . | . | * | . | . | . |
| undetermined | . | . | . | . | . | . | . | * | . | . | . |
| undetermined | . | . | . | . | . | . | . | . | . | * | . |
| **Arrow worms (Chaetognatha)** | | | | | | | | | | | |
| Sagitta elegans | 4 | * | 2 | * | 1 | 3 | 1 | 3 | 1 | * | * |
| **Peanut worms (Sipuncula)** | | | | | | | | | | | |
| Phascolosoma agassizii | . | * | * | . | . | . | . | . | . | . | * |
| Golfingia vulgaris | * | * | * | * | 1 | . | * | * | * | * | * |
| undetermined | . | . | * | . | . | . | . | . | . | . | . |

**Segmented worms (Annelida)**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| various | . | * | * | * | . | . | * | 1 | * | * | * |
| Abarenicola pacifica | . | . | * | . | . | . | . | . | . | . | . |
| Glycera americana | . | . | . | * | . | . | . | . | . | . | . |
| Eunice valens | . | . | * | . | . | . | . | . | . | . | * |
| Trypanosyllis ingens | . | . | * | . | . | * | . | . | * | . | . |
| Amblyosyllis sp. | . | . | . | . | . | . | * | * | * | . | . |
| Pionosyllis gigantea | . | . | . | . | . | . | . | . | * | . | . |
| undetermined | . | . | . | . | . | * | . | * | * | . | . |
| Autolytus magnus | . | . | . | * | . | . | . | . | . | . | . |
| Phyllodoce spp. | . | . | . | . | . | * | . | . | . | * | . |
| Tomopteris pacifica | . | . | * | * | * | 4 | * | * | * | * | . |
| Tomopteris septentrionalis | . | . | . | . | * | . | 1 | 1 | * | * | . |
| Euphrosine multibranchiata | . | . | * | . | . | . | . | * | * | . | * |
| Ophiodromus pugettensis | . | . | . | * | . | . | . | 1 | . | . | * |
| Diopatra ornata | 3 | * | 1 | * | * | * | . | * | * | * | 1 |
| Halosydna brevisetosa | * | 1 | * | * | . | * | . | * | * | * | * |
| Harmothoe imbricata | . | . | * | . | . | * | . | * | * | . | * |
| Harmothoe extenuata | . | . | . | * | . | . | * | . | * | * | * |
| Arctonoe fragilis | * | . | * | 1 | 1 | * | * | * | * | * | * |
| Arctonoe vittata | * | * | * | * | * | * | * | 1 | * | * | 1 |
| Arctonoe rubra | . | . | * | 1 | * | . | . | * | * | * | * |
| Hololepida magna | . | . | * | * | * | * | * | * | * | * | * |
| Lepidasthenia longicirrata | . | . | . | . | . | . | . | . | . | . | * |
| Eunoe senta | . | . | . | . | . | . | * | . | * | * | . |
| Aphrodita negligens | . | . | . | . | . | . | . | . | * | . | . |
| Nephtys spp. | . | * | * | * | . | 1 | * | * | * | * | * |
| Nereis vexillosa | * | . | * | * | . | * | . | . | . | * | . |
| Nereis procera | . | . | . | * | . | . | . | . | * | . | . |
| Cheilonereis cyclurus | * | . | . | . | . | . | . | . | . | . | . |
| Flabelligera infundibularis | . | . | * | * | . | . | . | . | . | . | . |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Apomatus geniculata and Apomatus timsii | . | * | 1 | * | 3 | * | 2 | 1 | 2 | 2 | 2 |
| Protula pacifica | * | 2 | * | 6 | 8 | 2 | 15 | 3 | 8 | 9 | 3 |
| Serpula columbiana (Serpula vermicularis) | 26 | 22 | 26 | 28 | 13 | 23 | 19 | 12 | 9 | 13 | 15 |
| Salmacina tribranchiata | . | . | * | * | . | . | . | . | . | . | . |
| Pseudochitinopoma occidentalis | * | . | * | 5 | . | . | . | . | * | . | . |
| Crucigera zygophora | . | . | . | * | * | . | . | . | * | * | * |
| Crucigera irregularis | . | . | . | . | . | . | . | . | . | * | . |
| Crucigera spp. | . | . | * | 6 | 2 | 1 | 2 | * | 1 | 3 | 6 |
| Pileolaria spp. (spirorbids) | 10 | 1 | 2 | 6 | 4 | 8 | 3 | 5 | 1 | * | 1 |
| Dodecaceria concharum | * | 1 | 1 | * | 1 | 6 | * | . | . | . | . |
| Dodecaceria fewkesi | 8 | 15 | 33 | 29 | 4 | 10 | 1 | 4 | * | * | . |
| Cirratulus sp. | . | . | . | . | * | . | . | . | . | . | . |
| Chone minuta / Chone ecaudata (in part) | . | . | . | * | . | . | . | . | . | . | . |
| Chone aurantiaca | 4 | 2 | 2 | 1 | 3 | 1 | 1 | * | * | * | * |
| Demonax medius | * | * | * | 1 | . | 5 | 1 | 1 | * | * | . |
| Eudistylia polymorpha | . | . | * | * | . | . | . | . | . | . | . |
| Eudistylia vancouveri | 5 | 1 | 3 | 5 | . | 13 | . | * | . | * | 3 |
| Schizobranchia insignis | 3 | 1 | 1 | 1 | 1 | 2 | * | * | * | * | 3 |
| Myxicola infundibulum | 13 | 10 | 8 | 15 | 14 | 13 | 15 | 6 | 7 | 3 | 4 |
| Myxicola aesthetica | . | . | . | * | . | . | . | . | . | . | . |
| Bispira sp. (as Sabella crassicornis) | 4 | 4 | 2 | 2 | 7 | 8 | 5 | 4 | 3 | 2 | 3 |
| undetermined | . | . | . | * | . | . | . | . | . | . | . |
| Pectinaria granulata | . | * | * | * | * | * | . | * | . | * | . |
| Neosabellaria cementarium | 18 | 3 | 1 | * | . | * | * | * | * | * | * |
| Idanthyrsus saxicavus | . | * | * | . | . | * | . | * | . | . | . |
| Pista elongata | 4 | 3 | 3 | 5 | . | 9 | * | 4 | * | * | * |
| Pista pacifica | * | . | * | . | . | . | . | . | . | . | . |
| Thelepus crispus | 8 | 6 | 3 | 6 | 10 | 13 | 9 | 6 | 5 | 2 | 4 |
| (including Polycirrus sp. IV) | . | . | . | . | . | . | . | . | * | . | . |
| undetermined | . | . | . | * | . | . | . | . | . | . | . |
| Spiochaeopterus costarum | 2 | 2 | 2 | 3 | 7 | 3 | 7 | 4 | 4 | 4 | 8 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Phyllochaeopterus prolifica | . | . | * | 1 | * | . | . | . | . | * | . |
| Phyllochaeopterus claparedii | . | . | . | 1 | . | . | . | . | . | * | . |
| Chaeopterus species complex | . | . | * | * | * | . | . | * | . | * | . |
| Mesochaeopterus taylori | . | . | * | * | . | . | . | . | . | . | . |
| **Spoon worms (Echiura)** | | | | | | | | | | | |
| **Phoronids (Phoronida)** | | | | | | | | | | | |
| Phoronis ijimai | * | . | * | * | 2 | 2 | 2 | 3 | 1 | * | * |
| Phoronopsis harmeri | . | . | . | * | . | * | * | * | * | . | . |
| **Bryozoans (Bryozoa)** | | | | | | | | | | | |
| Membranipora serrilamella | 11 | 13 | 13 | 10 | 1 | 11 | 11 | 8 | 5 | 5 | 6 |
| Lichenopora spp. | . | * | * | * | . | . | * | 1 | 2 | * | * |
| Celleporella hyalina | . | . | * | * | . | . | . | . | . | . | . |
| Disporella separata | * | 1 | 4 | * | . | * | * | . | . | . | . |
| Rhynchozoon rostratum (Rhynchozoon tumulosum) | * | . | * | . | . | . | . | . | . | . | . |
| Eurystomella bilabiata | . | * | * | 1 | . | * | . | . | * | . | * |
| Schizoporella unicornis | 8 | 12 | 10 | 14 | 9 | 8 | 9 | 6 | 7 | 5 | 4 |
| Watersipora cucullata | . | . | . | * | . | . | . | . | . | . | . |
| Bowerbankia sp. | . | . | * | * | . | 1 | . | . | . | . | . |
| Bugula californica | 4 | 5 | 3 | 4 | 3 | 4 | 6 | 1 | 2 | 1 | 2 |
| Caulibugula californica | * | . | * | * | * | * | * | 2 | 1 | * | 2 |
| Dendrobeania murrayana | * | 1 | 2 | 8 | 5 | 3 | 5 | 7 | 12 | 7 | 4 |
| Dendrobeania lichenoides | 4 | 8 | 3 | 3 | . | * | 1 | * | * | * | . |
| Crisia spp. | 19 | 7 | 15 | 12 | 9 | 15 | 8 | 5 | 7 | 1 | 2 |
| Flustrellidra corniculata | . | . | * | . | . | . | . | . | . | . | * |
| Alcyonidium pedunculatum | . | . | . | * | . | . | . | . | . | * | * |
| Cellaria diffusa | . | * | * | 1 | 1 | 1 | 6 | 2 | 7 | 7 | 2 |
| Microporina borealis | . | . | * | * | . | 4 | * | * | * | * | . |
| Phidolopora pacifica | 3 | 1 | 2 | 2 | 2 | * | * | * | 5 | 1 | . |
| Heteropora pacifica | 14 | 20 | 19 | 6 | 1 | 14 | 3 | * | * | * | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Heteropora alaskensis | . | * | 1 | * | 2 | 3 | * | . | * | . | . |
| Diaperoecia californica | 10 | 13 | 25 | 14 | 1 | 7 | * | * | * | * | * |
| Costazia ventricosa | 2 | 1 | 3 | . | . | * | . | . | . | . | . |
| Hippodiplosia insculpta | . | 1 | 3 | 2 | * | 2 | * | 1 | * | * | . |
| A | . | . | * | * | . | . | . | . | . | . | . |
| B | . | . | * | * | . | . | . | . | . | . | . |
| A | . | . | * | * | . | . | . | . | . | . | . |
| B | . | . | . | * | . | . | . | . | . | . | . |
| E | . | . | . | * | . | . | . | . | . | . | . |
| H | . | . | . | * | . | . | . | . | . | . | . |
| I | . | . | * | * | 1 | . | . | . | . | . | . |
| M | . | . | . | * | . | . | . | . | . | . | . |
| N | . | . | . | * | . | . | . | . | . | . | . |
| undetermined | . | . | . | * | . | . | . | * | . | . | . |
| **Entoprocts (Entoprocta)** | | | | | | | | | | | |
| Barentsia sp. | . | * | * | * | . | 2 | . | * | . | * | . |
| **Brachiopods (Brachiopoda)** | | | | | | | | | | | |
| Terebratalia transversa | 17 | 22 | 17 | 2 | 1 | 12 | 1 | 5 | 3 | 5 | 4 |
| Laqueus californicus | * | * | * | * | . | * | . | 1 | * | * | * |
| Terebratulina unguicula | . | * | . | . | . | . | * | 4 | * | 4 | 2 |
| **Molluscs (Mollusca)** | | | | | | | | | | | |
| Tonicella lineata | 21 | 21 | 20 | 26 | 15 | 22 | 18 | 23 | 14 | 8 | 7 |
| Tonicella undocaerulea | 1 | * | * | . | . | 2 | * | . | . | . | . |
| Tonicella venusta | . | . | . | * | . | . | . | . | . | . | . |
| Tonicella insignis | 1 | 4 | 7 | 8 | 8 | 14 | 13 | 16 | 7 | 6 | 6 |
| Mopalia lignosa | 3 | * | * | 2 | . | . | * | 1 | * | * | 1 |
| Mopalia muscosa | 1 | * | * | * | . | 1 | . | * | * | * | * |
| Mopalia kennerlyi | 3 | * | * | * | . | 1 | * | * | * | * | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mopalia ciliata | . | . | . | * | . | . | . | . | . | . | . |
| Mopalia swani | * | * | * | 1 | * | 1 | 1 | * | 1 | * | . |
| Mopalia hindsii | 1 | . | * | 1 | . | 1 | . | * | * | * | * |
| Mopalia spectabilis | 4 | * | 2 | 1 | . | 5 | 1 | * | * | * | * |
| Mopalia vespertina | . | . | * | 1 | . | . | . | * | . | * | 1 |
| Mopalia egretta | . | . | . | * | . | . | * | * | * | * | * |
| Mopalia sinuata | . | . | * | . | . | . | . | . | . | . | . |
| Mopalia sp. | 17 | 12 | 11 | 4 | 6 | 11 | 3 | 7 | 5 | 5 | 13 |
| Lepidozona mertensi | 5 | 1 | 6 | 9 | 2 | 6 | 4 | 8 | 2 | 1 | 1 |
| Lepidozona cooperi | 1 | * | * | * | . | * | * | . | * | . | . |
| Lepidozona interstinctus | . | . | * | * | * | . | 1 | . | * | * | * |
| Lepidozona trifida | . | * | * | 4 | * | * | * | * | 1 | * | 3 |
| Dendrochiton flectens | . | . | * | . | * | . | * | . | * | * | * |
| Placiphorella velata | . | * | . | * | . | . | . | * | * | * | . |
| Placiphorella rufa | * | * | * | * | * | 1 | * | 9 | * | * | . |
| Lepidochitona dentiens | . | . | * | . | . | . | . | . | . | . | . |
| Katharina tunicata | 12 | 3 | 3 | * | . | 1 | * | . | . | * | . |
| Cryptochiton stelleri | 21 | 24 | 13 | 6 | 7 | 22 | 7 | 10 | 3 | 3 | * |
| undetermined | . | . | . | . | . | . | . | . | * | . | . |
| Mytilus trossulus | 6 | 1 | 11 | 5 | 5 | 5 | 5 | 7 | 7 | 8 | 18 |
| Mytilus galloprovincialis | . | . | . | * | . | . | . | . | . | . | . |
| Mytilus edulis | . | . | * | * | . | . | . | . | . | * | . |
| Mytilus californianus | 2 | 1 | * | . | * | * | * | . | . | * | * |
| Modiolus modiolus | * | . | * | * | * | * | * | * | * | * | . |
| Modiolus rectus | 2 | . | * | . | * | . | . | * | . | . | . |
| Musculus discors | . | . | . | . | . | . | . | * | . | . | . |
| Chlamys hastata | . | * | 3 | 11 | 2 | . | * | * | * | * | * |
| Chlamys rubida | . | . | * | * | . | * | * | * | * | * | * |
| Chlamys sp. | 24 | 23 | 21 | 4 | 11 | 21 | 8 | 7 | 8 | 6 | 5 |
| Patinopecten caurinus | . | . | . | . | . | * | . | . | . | . | * |
| Crassadoma gigantea | 15 | 17 | 21 | 21 | 10 | 20 | 10 | 10 | 7 | 2 | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Crassostrea gigas | 1 | . | 1 | * | * | * | 3 | 1 | 1 | * | * |
| Ostrea conchaphila | . | * | . | . | . | . | * | . | . | * | . |
| Pododesmus macrochisma | 15 | 7 | 14 | 28 | 9 | 10 | 9 | 6 | 9 | 10 | 19 |
| Diplodonta impolita | . | . | * | * | . | * | * | . | * | . | . |
| Glans carpenteri | . | * | . | * | . | . | . | . | . | . | . |
| Kellia suborbicularis | * | * | * | 1 | 1 | 1 | * | 2 | * | * | * |
| Glycymeris septentrionalis | . | . | * | * | . | * | . | . | . | . | . |
| Astarte elliptica | . | . | . | . | . | . | . | . | . | * | 1 |
| Clinocardium nuttalli | 2 | * | 1 | 1 | 2 | . | 1 | * | 1 | 1 | 4 |
| Clinocardium ciliatum | . | . | . | * | . | . | . | . | * | * | . |
| Clinocardium californiense | . | . | . | * | . | . | . | . | . | . | . |
| Tresus capax | 14 | 3 | 3 | 1 | 7 | * | 3 | 1 | 1 | 3 | 8 |
| Tresus nuttallii | 1 | . | * | 1 | . | * | * | * | * | * | * |
| Tresus sp. | * | * | 1 | 4 | * | . | . | * | * | * | * |
| Panopea abrupta | 8 | 3 | 2 | 1 | 6 | * | 1 | * | * | * | 3 |
| Solen sicarius | . | . | * | . | . | . | 1 | * | . | * | * |
| Tellina modesta | . | . | . | . | . | * | . | . | . | . | . |
| Macoma nasuta | . | . | * | * | 1 | . | . | * | . | * | * |
| Macoma balthica | . | . | . | * | . | . | . | . | . | . | . |
| Macoma sp. | . | . | . | . | . | . | . | . | . | . | * |
| Nuttallia obscurata | . | . | * | . | . | . | * | * | . | . | . |
| Gari californica | * | * | 1 | 3 | * | * | 2 | 2 | * | * | . |
| Semele rubropicta | . | . | * | * | . | . | * | * | . | . | * |
| Saxidomus gigantea | 1 | * | 1 | 1 | . | * | . | . | * | * | * |
| Protothaca staminea | * | * | * | * | . | 1 | * | * | * | * | * |
| Venerupis philippinarum | . | . | * | * | . | . | . | . | . | * | . |
| Humilaria kennerleyi | 1 | 3 | 2 | 2 | 1 | 3 | 2 | 1 | 1 | * | * |
| Petricola carditoides | . | . | . | * | . | . | . | . | . | . | . |
| Mya arenaria | . | . | * | * | . | . | . | . | . | . | . |
| Mya truncata | * | . | * | * | * | . | * | . | * | * | 1 |
| Hiatella arctica | . | . | * | * | . | . | . | . | . | . | * |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Platyodon cancellatus | . | . | * | . | . | . | . | . | . | . | . |
| Penitella penita | 3 | . | * | * | * | . | . | . | . | . | * |
| Zirfaea pilsbryi | . | . | * | * | . | . | . | . | . | . | * |
| Bankia setacea (gribble Limnoria lignorum) | . | * | * | * | 1 | . | . | 1 | 1 | * | 1 |
| Mytilimeria nuttalli | 8 | 6 | 6 | 2 | . | 1 | * | * | * | . | . |
| Entodesma navicula | 9 | 10 | 6 | 6 | * | 7 | 1 | 6 | 1 | * | . |
| undetermined | . | * | . | . | . | . | . | . | . | . | . |
| Tectura persona | * | . | * | * | . | * | * | . | * | * | * |
| Tectura scutum | 6 | * | 3 | * | 1 | 2 | 2 | 1 | * | * | * |
| Tectura sp. | 3 | 1 | 2 | * | 3 | 6 | * | 1 | * | * | * |
| Lottia pelta | . | . | * | . | . | . | * | * | * | . | . |
| Lottia digitalis | . | . | * | . | . | . | . | . | . | . | . |
| Tectura fenestrata | . | * | * | * | * | 1 | . | * | * | * | . |
| Acmaea mitra | 21 | 17 | 9 | 6 | 7 | 22 | 10 | 8 | 3 | * | * |
| Lottia instabilis | * | 1 | * | * | . | * | . | * | . | . | . |
| Discurria insessa | . | * | * | . | . | . | . | . | . | . | . |
| Lottia limatula | . | . | . | * | . | . | . | . | . | . | . |
| Tectura paleacea | . | . | * | . | . | . | . | . | . | . | . |
| Lottia alveus paralella | . | * | . | . | * | . | . | . | . | . | . |
| Niveotectura funiculata | 1 | . | . | * | 1 | . | * | * | * | * | * |
| Cryptobranchia concentrica | . | . | . | * | . | . | * | . | . | . | . |
| Lepeta caeca | . | . | . | * | . | . | . | . | . | . | . |
| Diodora aspera | 14 | 10 | 8 | 6 | 5 | 18 | 10 | 7 | 4 | * | * |
| Cranopsis cucullata | . | * | 2 | 1 | 6 | 4 | 4 | 7 | 5 | 4 | 2 |
| Cranopsis multistriata | . | . | . | . | . | . | * | . | . | * | . |
| Puncturella galeata | . | . | . | . | . | . | . | . | . | * | . |
| Crepipatella dorsata | * | . | * | . | . | . | * | . | . | * | . |
| Calyptraea fastigiata | * | * | . | * | . | . | . | . | . | . | . |
| Crepidula nummaria | 2 | * | * | * | * | * | . | . | . | * | . |
| Credidula adunca | 12 | 4 | 2 | * | . | . | . | . | * | * | . |
| Haliotis kamtschatkana | 3 | 10 | 2 | 2 | 6 | 10 | 1 | * | * | * | * |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Nucella lamellosa | 23 | 4 | 14 | 20 | 4 | 10 | 1 | 8 | 13 | 3 | 5 |
| Nucella ostrina | 2 | * | * | * | . | * | . | * | . | . | . |
| Nucella canaliculata | * | . | . | 1 | . | * | . | . | . | . | . |
| Nucella lima | 1 | 1 | * | * | . | 3 | . | . | . | . | . |
| Ceratostoma foliatum | 24 | 15 | 18 | 19 | 10 | 14 | 7 | 16 | 12 | 5 | 3 |
| Ceratostoma inornatum | . | . | . | * | . | . | . | . | * | . | . |
| Lirabuccinum dirum | 2 | 2 | 3 | 1 | * | 3 | * | 4 | 1 | * | * |
| Amphissa columbiana | 15 | 19 | 6 | 4 | 6 | 14 | 2 | 6 | 2 | 2 | 1 |
| Amphissa versicolor | 1 | . | * | * | . | * | . | . | * | * | . |
| Ocinebrina interfossa | . | * | * | * | * | * | * | . | * | . | . |
| Ocinebrina lurida | 1 | 2 | 8 | 5 | 4 | 4 | 2 | * | * | * | . |
| Ocenebra sclera | . | . | . | * | . | . | . | . | . | . | . |
| Scabrotrophon maltzani | . | * | * | 1 | * | * | * | 1 | 2 | 1 | * |
| Boreotrophon stuarti | . | . | * | . | . | . | . | . | . | * | * |
| Boreotrophon multicostatus | . | . | * | . | . | . | . | . | * | . | . |
| Littorina sitkana | . | * | * | * | . | * | . | . | * | * | . |
| Littorina scutulata | . | * | 1 | * | . | . | . | . | * | . | * |
| undetermined | 1 | . | * | * | 1 | * | * | * | * | * | * |
| Lacuna variegata | 2 | 3 | * | * | 2 | 2 | . | * | * | * | * |
| Lacuna vincta | . | * | * | * | . | * | . | * | * | * | * |
| Alia carinata | 1 | * | * | * | 5 | * | . | 3 | 1 | . | * |
| Astyris gausapata | . | . | * | . | . | . | . | . | . | . | * |
| Kurtziella crebricostata | . | . | * | . | . | . | . | . | . | . | . |
| Nassarius mendicus | * | * | * | * | 5 | 1 | 2 | 3 | 3 | * | 2 |
| Nassarius fraterculus | . | . | . | . | . | . | . | * | . | . | . |
| Nassarius fossatus | . | . | * | . | . | . | . | . | . | . | . |
| Ilyanassa obsoleta | . | . | * | . | . | . | . | . | . | . | . |
| Bittium eschrichtii | . | 1 | * | * | 2 | . | 1 | 1 | * | . | . |
| Bittium attenuatum | . | * | * | * | 1 | * | * | * | . | * | . |
| Batillaria cumingi | . | . | . | * | . | . | . | . | . | . | . |
| Epitonium indianorum | . | . | * | * | 3 | 1 | * | * | * | * | * |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Opalia borealis | . | . | * | . | . | . | . | . | . | * | . |
| Balcis micans | . | . | . | . | . | . | . | . | . | * | * |
| Lirularia lirulata | . | . | . | . | . | . | * | * | . | . | . |
| Calliostoma ligatum | 24 | 22 | 21 | 11 | 5 | 19 | 6 | 14 | 4 | 2 | * |
| Calliostoma annulatum | 2 | 7 | 1 | * | * | . | . | * | * | * | . |
| Calliostoma variegatum | . | . | . | . | . | * | 1 | 1 | 2 | * | * |
| Calliostoma canaliculatum | . | . | . | . | . | . | . | * | * | * | . |
| Margarites pupillus | 4 | 8 | 2 | * | 1 | 2 | . | 3 | 1 | * | 2 |
| Margarites helicinus | . | . | . | . | . | * | . | . | . | . | . |
| Tegula funebralis | * | * | * | . | . | . | . | * | . | . | . |
| Tegula pulligo | . | * | * | . | . | . | . | * | . | . | * |
| Euspira lewisii | 4 | * | 2 | 2 | 8 | 2 | 3 | 4 | 5 | 1 | 2 |
| Euspira draconis | . | . | . | . | . | . | . | . | . | . | * |
| Euspira pallida | * | . | * | * | 1 | * | * | 1 | * | 1 | 1 |
| undetermined | . | . | . | * | . | . | . | . | . | . | . |
| Cryptonatica aleutica | . | . | . | * | . | . | . | . | * | * | . |
| Olivella biplicata | * | . | . | . | . | . | . | . | . | * | . |
| Olivella baetica | * | . | . | . | 1 | . | * | . | . | . | . |
| Janthina janthina | . | . | . | . | * | . | . | . | . | . | . |
| Neptunea phoenicia | . | . | * | . | . | . | . | . | . | * | . |
| Neptunea lyrata | * | * | . | . | . | . | . | . | . | . | . |
| Fusitriton oregonensis | 10 | 15 | 2 | 1 | 2 | * | 3 | 1 | 2 | 2 | * |
| Trichotropsis cancellata | 10 | 15 | 5 | 1 | 2 | 4 | 1 | 2 | 4 | 3 | 3 |
| Vermetus compactus | * | 2 | 2 | 1 | 5 | 1 | 2 | * | * | . | . |
| Onchidella borealis | * | . | . | . | . | . | . | . | . | . | . |
| Velutina prolongata | . | * | * | . | . | 1 | . | * | . | . | . |
| Velutina velutina | . | . | . | * | . | * | . | * | * | * | * |
| Velutina rubra | . | . | . | . | . | . | . | * | . | . | . |
| Marsenina stearnsi | 3 | * | * | * | . | * | . | . | * | * | . |
| Marsenina rhombica | . | * | * | . | . | . | . | . | . | . | . |
| Odostomia columbiana | . | . | . | . | . | . | . | . | . | . | * |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Rictaxis punctocaelatus | . | . | . | . | 5 | * | . | . | . | . | . |
| Haminoea vesicula | . | * | * | * | 8 | * | * | 2 | 1 | * | * |
| Melanochlamys diomedea | . | * | * | * | * | . | . | * | * | . | * |
| Aglaja ocelligera | * | . | * | * | 9 | 1 | 1 | * | * | * | * |
| Gastropteron pacificum | . | . | * | * | 2 | . | 1 | 1 | 1 | * | * |
| Phyllaplysia taylori | . | * | * | * | . | . | * | 2 | * | * | * |
| Anidolyta spongotheras | . | . | . | . | . | . | . | * | . | . | . |
| Berthella californica | * | * | 1 | * | * | 4 | 2 | 9 | 4 | * | * |
| Berthella strongi | . | . | . | * | . | . | . | . | . | . | . |
| Limacina helicina | . | . | * | * | . | * | * | * | * | . | . |
| Clione limacina | * | * | * | . | * | 6 | 3 | 5 | 1 | * | . |
| Cliopsis krohni | . | . | * | . | . | . | . | . | . | . | . |
| Elysia hedgpethi | . | . | . | . | . | * | . | 2 | . | . | . |
| Peltodoris nobilis | 2 | 8 | 13 | 6 | 9 | 12 | 9 | 5 | 6 | 3 | 1 |
| Anisodoris lentiginosa | * | . | * | 1 | * | * | 2 | * | * | * | * |
| Doris montereyensis | 2 | 8 | 8 | 4 | 4 | 13 | 6 | 5 | 5 | 1 | 2 |
| Doris odhneri | * | 5 | 5 | 4 | 3 | 8 | 10 | 4 | 4 | 5 | 1 |
| Aldisa tara | . | * | * | . | . | * | * | * | * | * | . |
| Geitodoris heathi | 3 | 6 | 2 | 1 | . | 8 | 1 | 1 | * | * | * |
| Diaulula sandiegensis | 10 | 5 | 4 | 3 | 3 | 11 | 5 | 3 | 2 | 1 | 2 |
| Cadlina luteomarginata | 6 | 13 | 17 | 15 | 14 | 15 | 16 | 15 | 10 | 9 | 7 |
| Aldisa albomarginata | . | . | . | * | . | . | . | * | * | * | . |
| Cadlina modesta | . | . | * | * | * | 1 | * | * | 1 | * | * |
| Cadlina flavomaculata | . | . | . | * | . | . | . | . | . | . | . |
| Acanthodoris hudsoni | 4 | 1 | 3 | 2 | 2 | 2 | 1 | 3 | 1 | * | * |
| Acanthodoris nanaimoensis | 8 | 2 | 8 | 3 | * | * | * | 1 | 1 | 2 | 4 |
| Acanthodoris pilosa | . | * | * | * | * | . | . | . | * | * | * |
| Acanthodoris lutea | . | . | . | * | . | . | . | * | . | * | * |
| Adalaria proxima | . | . | . | . | . | . | . | * | . | * | . |
| Adalaria jannae | . | . | . | * | . | . | . | . | . | * | . |
| Adalaria spp. | 2 | 1 | * | * | * | * | 2 | 2 | * | * | 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Diaphorodoris lirulatocauda | . | . | . | * | . | . | . | . | . | . | . |
| Onchidoris bilamellata | 1 | * | 1 | 4 | 1 | * | . | 2 | 2 | * | 2 |
| Onchidoris muricata | . | . | . | . | . | . | . | . | * | * | . |
| Corambe pacifica | . | * | . | * | . | * | . | . | . | . | . |
| Doridella steinbergi | * | * | . | . | . | * | . | * | . | . | . |
| Rostanga pulchra | . | 1 | * | * | . | 3 | * | * | * | * | 1 |
| Aldisa cooperi | * | * | 5 | 1 | . | 2 | * | . | * | * | * |
| Aldisa sanguinea | . | . | . | * | . | . | . | . | . | . | . |
| Okenia vancouverensis | . | . | . | . | . | . | . | * | . | . | . |
| Triopha catalinae | 8 | 10 | 4 | 1 | 1 | * | * | . | . | * | 2 |
| Triopha maculata | . | . | . | * | . | . | . | . | . | . | . |
| Limacia cockerelli | 6 | 1 | 1 | 1 | 1 | 1 | . | * | * | * | 1 |
| Aegires albopunctatus | . | . | * | * | * | 1 | 1 | 2 | 2 | * | * |
| Palio dubia | . | * | . | . | . | * | . | * | . | * | * |
| Ancula gibbosa | . | . | . | . | . | . | . | * | . | . | * |
| Tritonia festiva | * | 8 | * | 1 | * | * | . | * | * | * | . |
| undetermined | . | . | . | . | . | . | . | . | . | * | . |
| Tritonia diomedea | . | . | * | * | . | . | . | . | . | * | . |
| Tochuina tetraquetra | . | * | * | * | * | 4 | * | . | * | * | . |
| Dendronotus iris | * | * | 2 | 6 | 13 | 4 | 4 | 4 | 4 | 2 | * |
| Dendronotus rufus | . | . | 1 | 3 | * | 1 | * | * | * | * | * |
| Dendronotus dalli | . | 1 | * | * | . | * | * | 1 | . | * | * |
| Dendronotus diversicolor | 3 | 13 | 7 | 1 | * | 5 | 2 | 4 | 2 | * | 1 |
| Dendronotus albus | . | * | * | * | * | * | . | * | * | . | * |
| Dendronotus frondosus | . | * | * | . | . | . | . | 1 | * | * | 1 |
| Dendronotus subramosus | . | * | * | . | . | . | . | . | . | . | . |
| Dendronotus sp. | . | * | * | * | . | . | . | * | * | * | * |
| undetermined | . | . | * | . | . | * | . | * | * | * | * |
| Melibe leonina | * | . | 1 | * | * | 1 | * | 1 | 2 | * | 4 |
| Doto columbiana | . | 1 | * | . | . | 1 | . | * | * | . | * |
| Doto kya | . | . | * | . | . | . | . | . | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Armina californica | . | * | * | * | . | * | 1 | * | * | * | 1 |
| Dirona albolineata | 8 | 6 | 7 | 10 | 7 | 8 | 6 | 8 | 6 | 3 | 11 |
| Dirona pellucida | . | * | * | 2 | . | * | 2 | 1 | * | * | * |
| Janolus fuscus | 1 | * | 3 | 1 | 2 | 2 | 3 | 3 | 4 | 1 | 3 |
| Janolus sp. nov. | . | . | * | . | . | * | * | 1 | * | * | * |
| Hermissenda crassicornis | 5 | 10 | 6 | 8 | 8 | 11 | 6 | 10 | 4 | 1 | 5 |
| Flabellina triophina | 2 | 3 | 6 | 3 | 6 | 10 | 14 | 11 | 11 | 2 | 3 |
| Flabellina verrucosa | . | 1 | 5 | 4 | . | 3 | 1 | 3 | 1 | * | 1 |
| Flabellina trilineata | 4 | 5 | 7 | 5 | * | 9 | 1 | 4 | * | * | 1 |
| Flabellina japonica | . | . | . | * | * | * | . | 5 | 1 | * | . |
| Flabellina pricei | . | . | . | * | . | . | . | . | . | . | . |
| Flabellina sp. | * | . | * | * | 1 | * | . | . | * | * | * |
| Eubranchus rustyus | . | . | . | * | . | . | . | . | . | . | . |
| Eubranchus sanjuanensis | . | * | . | . | . | * | . | * | * | * | . |
| Catriona columbiana | . | . | . | . | . | . | . | . | . | * | . |
| undetermined | . | . | . | * | . | . | . | . | . | . | . |
| Aeolidia papillosa | * | * | * | * | 1 | . | * | * | * | * | * |
| Antalis pretiosum | . | . | . | . | . | . | . | * | . | . | . |
| Enteroctopus dofleini | 9 | 3 | 3 | 3 | 6 | 5 | 6 | 3 | 2 | 4 | 1 |
| Octopus rubescens | . | * | * | * | . | * | . | * | * | * | * |
| Benthoctopus leioderma | . | . | * | * | . | . | . | . | . | . | . |
| Rossia pacifica | . | * | * | * | . | * | * | * | * | 1 | 1 |
| Loligo opalescens | * | . | * | * | 1 | . | * | * | * | * | * |
| Ommastrephes bartrami | . | . | * | . | . | . | . | . | . | . | . |
| **Arthropods (Arthropoda)** | | | | | | | | | | | |
| Chromopleustes oculatus | 4 | 2 | 1 | 1 | 4 | 1 | * | 6 | 3 | * | 1 |
| Traskorchestia traskiana | . | . | . | * | . | . | . | . | . | . | . |
| Peramphithoe humeralis | . | . | * | . | . | . | . | . | . | . | . |
| Ampithoe lacertosa | . | . | . | * | . | . | . | . | . | . | . |
| Podoceras cristatus | . | 1 | * | * | . | * | . | . | . | . | . |
| Erichthonius rubricornis | 2 | * | * | . | . | 2 | . | * | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| undetermined | * | . | 1 | 1 | 1 | 3 | * | 4 | 1 | 1 | * |
| Caprella alaskana | * | 1 | * | 3 | 2 | 3 | * | 1 | * | * | * |
| undetermined | 1 | * | * | * | 1 | 1 | * | * | * | * | * |
| Bopyroides hippolytes | . | . | . | * | . | . | . | . | . | * | * |
| Munidon parvum / Pseudione galacanthae | . | . | . | . | . | . | . | . | . | * | . |
| Rocinela propodialis | 4 | * | * | . | . | . | 1 | . | * | * | . |
| Cirolana harfordi | . | . | . | . | . | . | * | . | * | * | . |
| Gnorimosphaeroma oregonensis | * | . | . | . | . | . | . | . | . | * | . |
| Idotea resecata | . | * | * | * | . | . | . | * | * | * | * |
| Idotea wosnesenskii | . | . | . | . | . | . | . | . | * | . | . |
| Idotea montereyensis | . | * | . | . | . | . | . | . | . | . | . |
| Idotea stenops | . | . | . | . | . | . | . | . | . | * | . |
| undetermined | . | . | . | * | . | . | 1 | * | . | . | . |
| undetermined | 2 | 4 | 1 | 6 | 14 | 2 | 3 | 1 | 6 | 4 | 3 |
| undetermined | 1 | 1 | * | * | . | . | 2 | * | * | * | * |
| undetermined | * | * | * | * | * | . | * | . | * | * | . |
| undetermined | . | . | . | . | . | . | . | . | . | * | . |
| Lepeophtherius sp. A | . | . | . | . | . | . | . | . | * | . | . |
| Lepeophtherius sp. B | . | . | . | * | . | . | . | . | . | . | . |
| undetermined | . | * | * | . | * | * | 1 | 1 | 1 | * | . |
| undetermined | . | . | * | . | * | * | 2 | * | * | * | . |
| Euphausia spp. | . | * | 1 | * | 2 | 1 | 1 | 4 | * | 1 | 1 |
| Argulus pugettensis | . | . | * | * | . | . | * | . | . | . | . |
| Argulus borealis | . | . | . | . | . | * | . | . | . | . | * |
| Crangon nigricauda | . | . | * | . | . | . | . | . | . | . | . |
| Crangon alaskensis | . | . | * | . | . | * | . | . | * | * | * |
| Crangon sp. | 1 | 2 | 1 | * | 1 | * | . | * | * | * | 2 |
| Paracrangon echinata | . | * | . | . | . | . | . | . | . | * | * |
| Metacrangon munita | . | * | . | . | . | . | . | . | * | * | * |
| Mesocrangon munitella | . | . | * | . | . | . | . | . | . | . | . |
| Rhynocrangon alata | . | . | * | . | . | . | . | . | . | * | * |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Pasiphaea pacifica | . | . | . | . | . | . | * | * | . | . | . |
| Eualus suckleyi | . | . | * | * | . | * | . | . | * | * | * |
| Eualus sp. nov. | . | * | * | * | . | * | 2 | * | 2 | 1 | * |
| Eualus pusiolus | . | . | . | * | . | . | * | . | . | * | . |
| Eualus lineatus | . | . | . | . | . | . | . | . | * | * | . |
| Eualus subtilis | . | . | . | * | . | . | * | * | * | . | . |
| Heptacarpus brevirostris | * | * | * | * | . | . | . | * | . | * | * |
| Heptacarpus stimpsoni | . | . | * | * | . | . | . | . | . | . | * |
| Heptacarpus kincaidi | 2 | 4 | 1 | 1 | 2 | 3 | 2 | 1 | 5 | 1 | 1 |
| Heptacarpus tridens | 2 | * | * | * | . | * | * | * | * | * | 1 |
| Heptacarpus tenuissimus | * | * | * | * | . | . | . | * | * | * | * |
| Heptacarpus decorus | . | . | . | . | . | . | . | . | . | * | . |
| Heptacarpus stylus | 3 | * | 1 | * | * | * | 1 | * | * | * | * |
| Heptacarpus pugettensis | . | . | . | * | . | . | . | * | . | . | . |
| Heptacarpus sitchensis | . | * | * | . | . | . | . | . | * | . | . |
| Hippolyte clarki | 1 | 3 | 1 | * | * | 1 | . | * | * | * | * |
| Lebbeus grandimanus | 1 | 2 | * | * | * | 2 | 1 | * | 1 | * | * |
| Lebbeus sp. 1 | . | . | * | * | . | * | 1 | * | * | 1 | * |
| Lebbeus sp. 2 | . | . | . | * | . | . | . | . | . | * | * |
| Lebbeus groenlandicus | . | . | * | . | . | . | . | . | * | * | . |
| Spirontocaris prionota | . | . | * | * | . | 1 | * | . | * | * | * |
| Spirontocaris lamellicornis | * | * | * | * | * | . | * | . | * | * | 1 |
| Spirontocaris snyderi | . | . | . | . | . | * | * | * | * | * | * |
| Spirontocaris holmesi | . | . | . | . | . | . | . | . | . | * | . |
| Spirontocaris sica | . | . | . | * | . | . | . | . | . | . | . |
| Pandalus danae | 14 | 24 | 19 | 26 | 12 | 7 | 13 | 6 | 6 | 13 | 27 |
| Pandalus stenolepis | * | 3 | 2 | 5 | 4 | 1 | 6 | 1 | 5 | 7 | 2 |
| Pandalus hypsinotus | . | * | . | . | . | . | . | . | . | * | * |
| Pandalus tridens | . | . | . | . | . | . | . | . | * | * | . |
| Pandalus eous | . | * | * | . | * | . | . | . | * | 2 | * |
| Pandalus goniurus | . | * | . | . | . | . | . | . | * | * | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Pandalus platyceros | * | 1 | * | 5 | 1 | * | 6 | 1 | 1 | 5 | 1 |
| Pandalopsis dispar | . | . | * | * | . | . | * | . | . | . | . |
| Pandalopsis lucidirimicola | . | * | * | * | . | * | . | . | * | * | . |
| undetermined | 5 | 4 | 3 | * | 3 | 1 | 1 | * | 2 | 1 | 5 |
| Neotrypaea californiensis | . | . | * | * | . | . | . | . | . | * | * |
| Upogebia pugettensis | . | . | . | * | . | . | . | . | . | * | . |
| Hemigrapsus oregonensis | * | * | * | * | * | * | 4 | * | * | * | 1 |
| Hemigrapsus nudus | 1 | * | * | * | * | * | * | . | * | * | * |
| Lophopanopeus bellus | 3 | * | * | * | . | * | . | * | * | * | * |
| Cancer oregonensis | 16 | 12 | 8 | 7 | 2 | 11 | 2 | 2 | 2 | 1 | 6 |
| Cancer productus | 7 | 9 | 9 | 9 | 6 | 4 | 6 | 3 | 2 | 6 | 24 |
| Cancer antennarius | . | . | . | . | . | . | . | . | . | . | * |
| Cancer magister | 2 | 3 | 1 | * | 2 | * | * | * | * | 4 | 22 |
| Cancer gracilis | . | 3 | * | 1 | 2 | * | . | * | * | * | 1 |
| Chionoecetes bairdi | . | * | * | * | . | . | . | . | . | * | 1 |
| Telmessus cheiragonus | 3 | 2 | * | 1 | 1 | . | * | . | * | . | * |
| Pugettia producta | 5 | 1 | 3 | 6 | 7 | 2 | 6 | 1 | 1 | * | . |
| Pugettia gracilis | 14 | 7 | 5 | 3 | 3 | 7 | 1 | 1 | * | * | 3 |
| Pugettia richii | 1 | . | . | . | . | . | . | . | . | . | . |
| Mimulus foliatus | . | * | * | . | * | * | . | * | * | * | . |
| Hyas lyratus | . | 1 | * | * | . | . | * | . | . | * | . |
| Scyra acutifrons | 22 | 20 | 20 | 19 | 4 | 21 | 3 | * | * | 1 | * |
| Oregonia gracilis | 14 | 13 | 7 | 6 | 5 | 7 | 4 | 5 | 4 | 4 | 14 |
| Oregonia bifurcata | . | . | * | * | . | . | . | . | . | . | . |
| Chorilia longipes | . | . | * | 2 | 1 | * | 9 | 3 | 6 | 4 | 11 |
| Pinnixa faba | . | . | * | . | . | . | . | . | . | . | . |
| Pinnixa littoralis | . | . | . | . | * | . | . | . | . | . | . |
| Petrolisthes eriomerus | 4 | 1 | 1 | 1 | * | 1 | * | . | * | * | * |
| Petrolisthes cinctipes | 2 | 1 | . | * | * | . | . | * | . | . | . |
| Pachycheles rudis | . | * | * | * | . | . | . | . | . | . | . |
| Pachycheles pubescens | 2 | * | * | . | . | . | . | . | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Petrolisthes sp. | 1 | * | 1 | * | * | 1 | * | . | * | . | * |
| Munida quadrispina | . | . | * | * | 1 | 2 | 11 | 1 | 5 | 6 | * |
| Oedignathus inermis | . | * | * | 1 | . | 3 | . | * | . | . | . |
| Hapalogaster mertensii | 3 | 1 | 1 | 1 | 1 | 3 | * | 2 | * | * | * |
| Acantholithodes hispidus | . | * | * | 2 | 2 | 2 | 5 | 4 | 3 | 3 | 2 |
| Rhinolithodes wosnessenskii | . | * | 1 | 3 | 2 | 1 | 2 | 1 | 2 | 3 | * |
| Phyllolithodes papillosus | 14 | 4 | 3 | 3 | 1 | 4 | 1 | * | * | * | * |
| Lopholithodes mandtii | * | 5 | 4 | 4 | 2 | 12 | 2 | 3 | 1 | 1 | * |
| Lopholithodes foraminatus | . | . | * | . | . | . | . | . | * | * | . |
| Placetron wosnessenskii | 1 | 1 | * | * | . | 2 | * | . | * | * | . |
| Cryptolithodes typicus | 13 | 9 | 4 | 2 | 2 | 3 | * | 3 | 2 | 2 | * |
| Cryptolithodes sitchensis | * | 1 | * | * | . | * | * | * | . | . | . |
| Pagurus granosimanus | 1 | * | 1 | * | * | 1 | * | * | 1 | * | 1 |
| Pagurus samuelis | * | . | * | * | . | * | . | . | * | * | * |
| Pagurus caurinus | . | * | * | 3 | 1 | * | . | * | * | * | * |
| Pagurus hirsutiusculus | 3 | 5 | * | * | * | * | * | 1 | * | * | * |
| Pagurus quaylei | . | . | . | * | . | . | . | * | . | . | . |
| Pagurus dalli | . | . | * | . | . | . | . | * | . | . | . |
| Pagurus beringanus | 22 | 13 | 16 | 22 | 7 | 18 | 4 | 12 | 9 | 3 | 6 |
| Pagurus kennerlyi | . | * | * | * | * | * | * | * | * | * | . |
| Paguristes turgidus | . | * | * | . | * | . | * | . | . | * | 1 |
| Paguristes ulreyi | . | . | * | . | . | . | . | . | . | . | . |
| Elassochirus gilli | 2 | 10 | * | * | . | 3 | 1 | * | 1 | * | . |
| Elassochirus tenuimanus | 11 | 7 | 4 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 |
| Pagurus stevensae | . | . | * | * | * | * | 2 | * | * | * | . |
| Pagurus armatus | 1 | 4 | 1 | * | 11 | 4 | 5 | * | * | 4 | 9 |
| Pagurus ochotensis | 6 | 3 | * | * | . | * | . | * | * | * | 1 |
| Labidochirus splendescens | . | * | . | . | . | . | . | . | . | * | . |
| Parapagurodes hartae | . | * | . | . | . | . | . | . | * | . | . |
| Discorsopagurus schmitti | 3 | 2 | * | * | 1 | 3 | * | * | * | * | * |
| Orthopagurus minimus | . | * | * | * | . | * | . | . | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| undetermined | . | * | * | . | 1 | * | * | * | * | * | * |
| Chthamalus dalli | * | . | . | * | . | * | * | . | . | * | . |
| Balanus glandula | 14 | 4 | 21 | 29 | 8 | 4 | 14 | 14 | 13 | 12 | 31 |
| Balanus crenatus | . | . | * | . | . | . | . | . | . | . | * |
| Balanus rostratus | . | . | * | * | * | * | * | * | 1 | 1 | * |
| Balanus rostratus apertus | . | . | . | . | . | . | * | . | . | . | . |
| Solidobalanus engbergi | * | . | * | . | . | . | . | . | . | * | . |
| Balanus nubilus | 30 | 23 | 30 | 26 | 3 | 27 | 2 | 12 | 5 | 8 | 6 |
| Semibalanus cariosus | 16 | 3 | 3 | * | 1 | 3 | . | * | * | * | * |
| Semibalanus balanoides | . | . | * | . | . | . | . | . | . | . | . |
| Pollicipes polymerus | . | * | * | * | * | . | . | . | . | . | . |
| undetermined | . | . | . | . | 1 | * | . | * | * | * | * |
| Tanystylum anthomasti | . | . | . | * | . | . | . | . | . | . | . |
| Nymphon pixellae | . | . | . | * | 1 | * | * | 2 | 3 | * | * |
| **Echinoderms (Echinodermata)** | | | | | | | | | | | |
| Pisaster ochraceus | 3 | 5 | 19 | 12 | 11 | 20 | 20 | 12 | 12 | 13 | 19 |
| Pisaster giganteus | . | . | * | * | . | . | . | . | * | * | . |
| Pisaster brevispinus | 2 | 1 | 17 | 17 | 13 | 4 | 14 | 16 | 13 | 14 | 19 |
| Evasterias troschelii | 17 | 12 | 19 | 24 | 8 | 14 | 10 | 9 | 13 | 10 | 23 |
| Orthasterias koehleri | 1 | 13 | 12 | 22 | 19 | 17 | 21 | 19 | 18 | 12 | * |
| Lethasterias nanimensis | . | . | . | . | . | . | . | . | . | * | . |
| Stylasterias forreri | . | * | * | 2 | 4 | 1 | 9 | 2 | 5 | 6 | * |
| Dermasterias imbricata | 6 | 14 | 22 | 25 | 18 | 22 | 19 | 20 | 12 | 10 | 19 |
| Asterina miniata | * | * | * | . | . | . | . | . | * | * | . |
| Mediaster aequalis | 1 | * | 9 | 22 | 17 | 6 | 22 | 16 | 16 | 12 | 1 |
| Gephyreaster swifti | . | . | * | . | . | . | * | . | * | * | . |
| Ceramaster patagonicus | . | . | . | * | 2 | 1 | 6 | 1 | 4 | * | . |
| Ceramaster arcticus | . | . | . | . | . | . | * | . | * | . | . |
| Hippasteria spinosa | . | . | * | * | 1 | * | * | 6 | 3 | * | . |
| Poraniopsis inflatus inflatus | . | . | . | . | . | . | . | . | * | * | . |
| Lophaster furcilliger vexator | . | . | . | . | . | . | . | 1 | 1 | * | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Pteraster tesselatus | 5 | 9 | 10 | 4 | 12 | 8 | 15 | 13 | 14 | 8 | 1 |
| Pteraster militaris | . | * | * | * | 1 | * | 2 | 2 | 2 | * | . |
| Henricia leviuscula leviuscula | 2 | 4 | 4 | 6 | 5 | 3 | 7 | 7 | 3 | 4 | 1 |
| Henricia sanguinolenta | . | * | * | * | * | 1 | 2 | * | * | * | . |
| Henricia aspera aspera | 16 | 17 | 18 | 5 | 10 | 19 | 14 | 7 | 8 | 9 | 4 |
| Henricia sp. nov. | . | * | . | . | . | . | . | . | . | . | . |
| Leptychaster pacificus | . | . | . | . | . | . | . | . | . | * | . |
| Luidia foliolata | . | * | 1 | 1 | 7 | * | * | 3 | * | * | 1 |
| Leptasterias hexactis species complex | 1 | * | * | . | . | . | . | . | . | . | . |
| Leptasterias aequalis species complex | 12 | 7 | 1 | . | . | . | . | * | * | . | . |
| Pycnopodia helianthoides | 20 | 22 | 28 | 36 | 22 | 26 | 25 | 26 | 21 | 21 | 31 |
| Crossaster papposus | * | * | 3 | 11 | 11 | 4 | 10 | 18 | 11 | 6 | 3 |
| Solaster dawsoni | 8 | 9 | 12 | 12 | 9 | 6 | 15 | 17 | 12 | 10 | 6 |
| Solaster paxillatus | . | . | . | * | . | . | . | . | * | * | . |
| Solaster stimpsoni | 18 | 19 | 14 | 10 | 11 | 10 | 11 | 13 | 7 | 3 | 3 |
| Solaster endeca | . | * | * | * | * | * | * | 2 | 1 | * | * |
| Ophiopholis aculeata | 4 | 15 | 12 | 12 | 10 | 22 | 10 | 24 | 6 | 7 | 2 |
| Amphiodia occidentalis | . | . | * | . | . | . | . | . | . | . | . |
| Amphipholis squamata | . | * | . | * | . | * | * | . | . | * | * |
| Amphipholis pugetana | . | . | . | . | . | . | . | * | . | . | * |
| Ophiura sarsii | . | * | * | 1 | 2 | * | 3 | 1 | 2 | 5 | 1 |
| Ophiura lutkeni | . | * | 8 | 33 | 9 | 4 | 8 | 11 | 10 | 10 | 4 |
| Amphiodia periercta | . | . | * | * | . | * | . | * | . | . | . |
| undetermined | . | . | . | . | . | . | * | * | * | . | . |
| Gorgonocephalus eucnemis | . | 1 | 2 | 2 | * | 2 | . | . | * | * | * |
| Florometra serratissima | . | * | 2 | 28 | 8 | 1 | 6 | 25 | 10 | 12 | 2 |
| Strongylocentrotus franciscanus | 10 | 28 | 41 | 31 | 17 | 35 | 24 | 13 | 7 | 6 | 1 |
| Strongylocentrotus purpuratus | 5 | 4 | * | . | . | . | . | . | . | . | . |
| Strongylocentrotus droebachiensis | 30 | 19 | 17 | 25 | 13 | 22 | 18 | 25 | 17 | 14 | 6 |
| Strongylocentrotus pallidus | 1 | 1 | * | * | . | 1 | . | * | . | * | . |
| Brisaster latifrons | . | . | . | . | . | . | . | . | . | * | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Dendraster excentricus | . | . | * | . | 2 | . | * | . | * | . | . |
| Parastichopus californicus | 19 | 19 | 27 | 34 | 24 | 17 | 30 | 29 | 23 | 19 | 22 |
| Parastichopus leukothele | . | * | * | * | . | . | . | . | . | * | * |
| Cucumaria miniata | 25 | 27 | 21 | 18 | 8 | 13 | 7 | 6 | 2 | 7 | 12 |
| Cucumaria pallida | . | * | 1 | 6 | 1 | * | 4 | 1 | * | * | * |
| Eupentacta quinquesemita | 21 | 21 | 13 | 12 | 8 | 20 | 7 | 7 | 6 | 5 | 3 |
| Eupentacta pseudoquinquesemita | * | * | * | * | 1 | 1 | 1 | * | * | * | . |
| Leptosynapta clarki | . | . | * | . | . | . | * | . | . | * | * |
| Thyone benti | . | * | . | . | . | . | . | . | . | . | . |
| Cucumaria piperata | 6 | 7 | 1 | 2 | 4 | 1 | 1 | 2 | 1 | * | * |
| Pseudocnus curatus | 8 | 12 | . | . | . | . | . | . | . | . | . |
| Cucumaria pseudocurata | . | * | . | . | . | . | . | . | . | . | . |
| Cucumaria vegae | . | * | . | . | . | . | . | . | . | . | . |
| Thyonidium kurilensis | . | * | . | . | . | . | . | . | . | . | . |
| Chiridota albatrossii | . | * | . | * | . | * | . | . | . | . | * |
| Psolus chitonoides | 26 | 25 | 17 | 17 | 10 | 20 | 14 | 14 | 11 | 9 | 13 |
| Psolidium bidiscum | 1 | * | * | * | . | * | * | 5 | 1 | * | 2 |
| Psolus squamatus | . | . | . | * | . | . | . | * | * | * | . |
| undetermined sea cucumber | . | . | . | . | . | . | . | . | . | . | * |
| **Urochordates (Urochordata)** | | | | | | | | | | | |
| Corella willmeriana | 4 | 7 | 14 | 20 | 10 | 22 | 20 | 14 | 13 | 10 | 13 |
| Corella inflata | . | * | * | * | . | . | * | * | 1 | * | * |
| Ciona savignyi | * | * | * | 5 | 5 | 4 | 2 | 13 | 7 | 4 | 1 |
| Ascidia paratropa | 3 | 12 | 5 | 2 | 6 | 8 | 6 | 6 | 10 | 4 | 2 |
| Ascidia columbiana / Ascidia callosa | * | * | * | * | * | 3 | * | 2 | 2 | 2 | 4 |
| Ascidia ceratodes | . | . | . | * | . | . | . | . | . | * | . |
| Bathypera feminalba | . | . | . | * | . | . | . | 1 | * | * | . |
| Cnemidocarpa finmarkiensis | 15 | 12 | 18 | 25 | 11 | 7 | 9 | 14 | 9 | 12 | 8 |
| Halocynthia aurantium | . | * | 2 | 3 | 5 | 6 | 15 | 13 | 14 | 13 | 2 |
| Halocynthia igaboja | 2 | 9 | 5 | 3 | 8 | 5 | 15 | 14 | 18 | 12 | 1 |
| Pyura haustor | 13 | 16 | 9 | 6 | 13 | 15 | 10 | 14 | 7 | 6 | * |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Pyura mirabilis | . | * | * | * | * | . | * | * | * | * | * |
| Styela gibbsii | 6 | 6 | 7 | 9 | 4 | 15 | 4 | 12 | 9 | 5 | 2 |
| Styela clava | * | . | * | 1 | . | . | . | . | * | . | . |
| Styela montereyensis | 1 | * | * | . | * | . | . | * | * | . | * |
| Boltenia villosa | 11 | 12 | 11 | 15 | 12 | 18 | 14 | 25 | 21 | 11 | 5 |
| Boltenia echinata | . | . | * | * | . | . | . | . | . | . | . |
| Chelyosoma productum | 9 | 6 | 5 | 5 | 3 | 11 | * | 5 | 4 | 6 | * |
| Chelyosoma columbianum | * | . | . | * | . | . | * | * | * | * | * |
| Molgula pacifica | . | * | 1 | * | . | . | . | . | . | . | * |
| Metandrocarpa taylori | 17 | 22 | 22 | 9 | 8 | 11 | 8 | 18 | 3 | * | . |
| Perophora annectens | 7 | 6 | 2 | 1 | 1 | 5 | * | * | * | * | . |
| Clavelina huntsmani | . | * | * | * | . | . | . | . | . | . | . |
| Pycnoclavella stanleyi | 3 | 7 | 13 | 2 | . | 1 | * | . | . | . | . |
| Cystodytes lobatus | 3 | 14 | 13 | 2 | . | 2 | * | . | * | * | . |
| Eudistoma purpuropunctatum | . | * | * | . | . | . | . | . | . | . | . |
| Distaplia occidentalis | 1 | 7 | 13 | 9 | 1 | 5 | 1 | * | 1 | * | * |
| Aplidiopsis pannosum | . | . | . | * | . | . | . | . | . | . | . |
| Distaplia smithi | . | * | * | * | * | . | . | . | . | . | . |
| Ritterella pulchra | . | . | . | . | . | 1 | . | . | . | . | . |
| Aplidium californicum | . | * | 4 | 1 | 2 | 1 | 4 | 2 | 1 | * | . |
| Aplidium solidum | 5 | 6 | 3 | 5 | 1 | 7 | 4 | 1 | 2 | 1 | * |
| Eudistoma sp. nov. | . | . | . | . | . | * | . | . | . | . | . |
| Eudistoma molle | . | 1 | * | * | * | * | . | . | . | . | . |
| Diplosoma listerianum | . | * | * | . | . | . | . | . | . | . | . |
| Didemnum carnulentum | 12 | 11 | 8 | 2 | * | 1 | * | * | * | * | * |
| Didemnum/Tridemnum complex | 2 | * | 3 | 12 | * | 1 | 1 | * | * | * | . |
| Didemnum sp. (Didemnum cf. lahillei) | . | . | . | * | . | . | . | . | * | * | . |
| Tridemnum alexi | 1 | * | 2 | * | . | 2 | 7 | 2 | * | * | . |
| Botryllus schlosseri | 1 | . | * | 1 | . | . | * | 1 | 2 | . | . |
| Botrylloides violaceus | 1 | . | . | * | 2 | * | . | 3 | 7 | . | . |
| Synoicum parfustis | . | . | * | * | . | . | . | . | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| undetermined | . | . | * | . | * | . | . | . | * | * | * |
| **Acorn worms (Hemichordata)** | | | | | | | | | | | |
| **Chordates (Chordata)** | | | | | | | | | | | |
| Hexanchus griseus | . | . | . | . | * | . | . | . | . | . | . |
| Squalus suckleyi | . | 2 | * | * | 1 | 2 | 1 | 1 | * | * | 1 |
| Raja rhina | . | * | * | * | 1 | . | * | . | * | * | * |
| Raja binoculata | . | * | * | . | 2 | . | * | . | . | * | * |
| Raja sp. | . | . | . | . | . | . | . | . | . | * | * |
| Hydrolagus colliei | 1 | 2 | * | * | 3 | * | 7 | * | 2 | 1 | * |
| Clupea pallasii | 4 | 11 | 6 | 2 | 3 | 2 | 10 | * | 3 | 2 | 1 |
| Engraulis mordax | . | . | . | * | . | . | . | . | * | * | * |
| Spirinchus thaleichthys | . | . | . | * | . | . | * | . | * | * | * |
| Hypomesus pretiosus | . | . | . | . | . | . | . | . | * | * | . |
| Oncorhynchus gorbuscha | . | * | * | * | * | . | * | . | . | * | * |
| Oncorhynchus keta | . | * | * | * | * | * | . | * | * | * | . |
| Oncorhynchus sp. | . | . | * | * | . | . | . | * | * | * | * |
| Oncorhynchus tshawytscha | . | * | * | . | . | * | . | . | * | * | . |
| Oncorhynchus kisutch | . | * | * | . | . | . | * | . | . | * | * |
| Oncorhynchus sp. | . | . | * | . | . | . | . | . | * | * | . |
| Oncorhynchus sp. | * | * | * | . | 1 | . | . | . | * | * | * |
| Gasterosteus aculeatus | . | 1 | * | * | . | . | . | * | 1 | 1 | 2 |
| Aulorhynchus flavidus | 7 | 4 | 5 | 3 | 8 | 3 | 6 | * | 4 | 4 | 6 |
| Syngnathus leptorhynchus | * | * | * | * | . | * | * | * | * | * | 1 |
| Trichodon trichodon | . | . | * | . | . | . | . | . | . | . | . |
| Ammodytes hexapterus | 4 | 7 | 1 | * | . | 1 | . | . | * | * | * |
| Gadus macrocephalus | 1 | 1 | * | * | * | * | * | . | * | * | * |
| Microgadus proximus | . | 1 | * | * | . | . | . | . | . | * | 1 |
| Theragra chalcogramma | . | 4 | * | * | . | * | * | * | * | 3 | 3 |
| Merluccius productus | . | . | . | . | * | . | . | . | . | * | . |
| Lycodes pacificus | . | 2 | * | . | * | . | . | . | . | 1 | 1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Brosmophycis marginata | . | . | . | * | * | * | * | * | * | * | * |
| Rhinogobiops nicholsii | 10 | 7 | 19 | 28 | 25 | 10 | 29 | 19 | 24 | 17 | 15 |
| Lepidogobius lepidus | . | * | * | * | 1 | * | . | * | 1 | * | 2 |
| Ronquilus jordani | . | 2 | 5 | 1 | 2 | 3 | 8 | 15 | 7 | 4 | 4 |
| Lumpenus sagitta | * | 6 | * | * | * | * | * | * | * | * | 5 |
| Xiphister mucosus | * | . | . | . | . | . | . | . | . | * | . |
| Xiphister atropurpureus | . | . | . | . | . | . | . | . | . | * | . |
| Anoplarchus purpurescens | * | * | * | * | . | . | . | * | . | * | 1 |
| Anoplarchus insignis | . | * | * | . | . | . | . | . | . | * | * |
| Chirolophis nugator | 7 | 8 | 6 | 2 | 1 | 2 | * | * | * | * | * |
| Chirolophis decoratus | 4 | 1 | 1 | 1 | . | 1 | 1 | * | 2 | 1 | * |
| Anoplarchus sp. | * | * | * | * | . | . | . | * | . | * | * |
| Apodichthys fucorum | . | . | . | . | . | . | . | . | . | * | . |
| Apodichthys flavidus | 3 | 3 | 1 | * | * | * | 1 | . | . | * | * |
| Pholis laeta | 4 | 3 | 1 | * | * | * | * | * | * | * | 1 |
| Pholis ornata | 3 | * | * | * | 1 | . | * | * | . | * | 1 |
| Pholis clemensi | 4 | 8 | 4 | 1 | * | * | * | 1 | 1 | * | * |
| Pholis sp. | . | . | * | * | . | . | . | . | * | * | * |
| Ptilichthys goodei | . | . | . | * | . | . | . | . | . | * | * |
| Anarrhichthys ocellatus | 3 | 2 | 1 | 1 | 1 | 2 | * | 2 | * | * | * |
| Rhacochilus vacca | 10 | * | 13 | 13 | 8 | 4 | 23 | 16 | 9 | 7 | 4 |
| Embiotoca lateralis | 20 | 4 | 28 | 26 | 9 | 15 | 20 | 20 | 11 | 9 | 14 |
| Brachyistius frenatus | 5 | * | 9 | 12 | 2 | 1 | 12 | 16 | 5 | 2 | 5 |
| Cymatogaster aggregata | 7 | * | 11 | 7 | 3 | 1 | 29 | 9 | 11 | 11 | 10 |
| Sebastes caurinus | 19 | 23 | 28 | 38 | 24 | 26 | 30 | 24 | 19 | 18 | 15 |
| Sebastes maliger | 5 | 16 | 20 | 25 | 22 | 26 | 32 | 22 | 19 | 16 | 8 |
| Sebastes auriculatus | . | . | * | 8 | * | . | . | 2 | . | * | * |
| Sebastes nebulosus | . | * | * | * | . | . | . | * | . | * | . |
| Sebastes flavidus | 5 | 3 | 2 | 2 | . | . | * | . | . | 2 | . |
| Sebastes melanops | 13 | 8 | 7 | 1 | 1 | . | . | . | . | * | * |
| Sebastes mystinus | . | * | . | . | . | . | . | . | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Sebastes paucispinus | . | . | * | . | . | . | . | . | . | . | . |
| Sebastes brevispinus | . | * | * | . | . | . | . | . | . | * | . |
| Sebastes entomelas | . | . | * | . | . | . | . | . | . | . | . |
| Sebastes emphaeus | 10 | 22 | 20 | 8 | . | . | 1 | * | 2 | 4 | * |
| Sebastes pinniger | 1 | * | * | . | . | . | * | . | * | * | * |
| Sebastes miniatus | * | * | * | * | . | . | * | * | . | * | . |
| Sebastes nigrocinctus | * | 2 | 7 | 7 | 6 | 10 | 4 | 8 | 5 | 1 | * |
| Sebastes ruberrimus | . | * | * | 4 | 9 | 1 | 10 | 6 | 3 | 1 | * |
| Sebastes diploproa | . | . | . | . | . | . | * | . | . | * | . |
| Sebastes proriger | . | . | . | . | . | . | . | . | . | * | . |
| Sebastes elongatus | . | . | . | . | . | . | * | 1 | . | . | . |
| Sebastes sp. | . | * | . | . | * | * | . | . | * | * | * |
| Hexagrammos lagocephalus | . | . | * | . | . | . | . | . | * | . | . |
| Hexagrammos decagrammus | 24 | 22 | 27 | 26 | 22 | 26 | 27 | 18 | 17 | 14 | 6 |
| Hexagrammos stelleri | 2 | 2 | 2 | 1 | 3 | 1 | 5 | 1 | 1 | 5 | 7 |
| Ophiodon elongatus | 17 | 16 | 22 | 17 | 14 | 15 | 24 | 14 | 13 | 14 | 7 |
| Oxylebius pictus | 16 | 3 | 11 | 12 | 5 | 9 | 16 | 16 | 7 | 4 | 2 |
| Artedius fenestralis | 2 | 1 | 2 | 1 | * | . | * | * | * | * | 6 |
| Artedius lateralis | 2 | * | * | * | . | . | * | * | * | * | * |
| Artedius harringtoni | 25 | 19 | 20 | 14 | 6 | 19 | 8 | 10 | 4 | 5 | 9 |
| Oligocottus maculosus | 2 | * | 2 | * | 1 | * | 1 | * | * | * | 1 |
| Clinocottus embryum | . | . | . | . | . | . | . | . | . | * | . |
| Ascelichthys rhodorus | . | . | * | . | . | . | . | . | . | . | . |
| Synchirus gilli | . | * | 1 | * | * | * | * | * | * | * | * |
| Jordania zonope | 15 | 23 | 27 | 20 | 10 | 8 | 13 | 10 | 10 | 7 | 1 |
| Radulinus taylori | 9 | 5 | 3 | 1 | 2 | 1 | * | * | 1 | * | 2 |
| Icelinus borealis | * | 2 | * | * | . | * | . | . | * | * | * |
| Icelinus tenuis | . | * | * | * | . | . | 2 | * | * | 1 | . |
| Icelinus fimbriatus | . | . | . | * | . | . | . | * | . | * | . |
| Triglops pingelii | 1 | 1 | . | * | . | . | . | . | * | . | . |
| Triglops macellus | . | * | * | * | . | * | * | . | . | * | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Radulinus asprellus | . | . | * | . | . | . | . | . | . | * | . |
| Radulinus boleoides | . | . | . | . | . | . | . | . | . | * | . |
| Chitonotus pugetensis | . | * | * | 1 | 5 | 1 | 4 | 1 | 1 | 3 | 9 |
| Dasycottus setiger | . | . | . | . | . | . | . | . | . | * | * |
| Malacocottus kincaidi | * | . | . | . | . | . | . | . | . | . | * |
| Psychrolutes paradoxus | . | * | * | * | . | . | . | . | . | . | * |
| Psychrolutes sigalutes | . | . | * | . | . | . | . | . | . | * | . |
| Scorpaenichthys marmoratus | 4 | 2 | 7 | 3 | 2 | 6 | 4 | 3 | 2 | 1 | 1 |
| Myoxocephalus polyacanthocephalus | 2 | 3 | * | * | . | * | . | . | . | * | 2 |
| Enophrys bison | 16 | 6 | 1 | 1 | * | 5 | 1 | 1 | * | 2 | 3 |
| Hemilepidotus hemilepidotus | 4 | 7 | 2 | 1 | 4 | 13 | 2 | * | * | 3 | 2 |
| Leptocottus armatus | * | * | * | * | * | * | * | . | * | * | 5 |
| Artedius sp. | . | . | * | * | * | * | * | . | * | * | * |
| Rhamphocottus richardsonii | 6 | 4 | 3 | 3 | * | 2 | 1 | 3 | * | 2 | 3 |
| Blepsias cirrhosus | . | * | . | . | . | . | . | . | . | . | . |
| Nautichthys oculofasciatus | 2 | 1 | 1 | * | 1 | 2 | 1 | * | * | 3 | 2 |
| undetermined | . | . | . | . | * | . | . | . | * | * | . |
| Porichthys notatus | . | . | * | * | * | * | 3 | * | * | 1 | 1 |
| Gobiesox maeandricus | 4 | * | * | * | . | * | . | * | . | * | * |
| Liparis dennyi | . | . | * | . | . | . | . | . | . | . | . |
| Liparis pulchellus | . | * | * | . | . | . | . | . | . | * | * |
| Liparis sp. | * | * | * | . | . | . | * | . | * | * | . |
| Eumicrotremus orbis | . | * | * | . | . | 1 | . | . | . | * | * |
| Asterotheca infraspinata | . | * | . | . | . | . | . | . | . | * | * |
| Xeneretmus latifrons | . | . | . | . | . | . | . | . | . | . | * |
| Odontopyxis trispinosa | * | 1 | * | * | 1 | * | * | * | * | * | 3 |
| Pallasina barbata | . | * | * | . | * | . | . | . | * | * | * |
| Anoplagonus inermis | . | * | * | . | . | * | . | . | . | * | * |
| Agonopsis vulsa | . | * | * | * | . | * | * | * | * | 1 | 4 |
| Podothecus accipenserinus | * | 1 | * | . | . | . | . | . | . | * | * |
| Hypsagonus mozinoi | . | . | * | . | . | . | . | . | . | . | . |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| Bothragonus swanii | . | * | . | . | . | . | . | . | . | . | . |
| Citharichthys sordidus | . | * | * | . | * | . | . | * | * | * | * |
| Citharichthys stigmaeus | 2 | 4 | 2 | 2 | 8 | * | 6 | 2 | 1 | 6 | 12 |
| Atheresthes stomias | . | . | . | . | . | . | . | . | . | * | . |
| Hippoglossoides elassodon | . | . | . | . | . | . | . | . | . | * | * |
| Lyopsetta exilis | . | . | . | * | . | . | . | . | . | * | * |
| Lepidopsetta bilineata | * | 3 | 1 | 1 | 5 | * | 2 | * | 1 | 5 | 12 |
| Parophrys vetulus | * | 2 | * | * | 5 | * | . | * | * | 3 | 6 |
| Microstomus pacificus | . | * | * | . | . | . | . | . | . | 1 | * |
| Glyptocephalus zachirus | . | * | * | . | . | . | . | . | . | * | * |
| Psettichthys melanostictus | . | . | . | . | . | . | . | . | . | * | . |
| Platichthys stellatus | * | * | * | * | * | 1 | . | * | * | * | 6 |
| Pleuronichthys coenosus | * | 1 | * | * | 2 | * | 1 | 1 | * | 3 | 7 |
| Thamnophis elegans | . | . | * | . | . | . | . | . | . | . | . |
| Phalacrocorax sp. | . | . | * | . | . | . | . | . | * | . | * |
| Bucephala clangula | . | . | * | . | . | . | . | . | * | * | . |
| Mergus merganser | . | . | * | . | . | . | . | . | . | . | . |
| Phoca vitulina | . | * | 1 | * | * | 2 | * | * | 1 | 1 | * |
| Eumetopias jubata | . | * | 1 | * | 2 | * | . | * | * | * | * |
| Zalophus californicus | . | . | * | . | * | . | . | . | * | * | * |
| Orcinus orca | . | * | . | . | . | . | . | . | . | . | . |
| Eschirichtius glaucus | . | * | * | . | . | . | * | . | * | . | . |
| Lutra canadensis | . | . | * | . | . | . | . | . | . | * | . |

## 7.2 List of all species used in this report

| COMMON NAME | SCIENTIFIC NAME | AUTHOR |
|---|---|---|
| **Flowering plants** | **Anthophyta** | |
| annual sea asparagus | *Salicornia depressa* | Standl. -- not accepted |
| perennial sea asparagus | *Sarcocornia perennis* | (P. Mill.) A.J. Scott |
| eelgrass | *Zostera marina* | L. |
| dwarf eelgrass | *Zostera japonica* | Aschers. & Graebn |
| surfgrasses | *Phyllospadix spp.* | Hook. |
| **Green algae** | **Chlorophyta** | |
| short sea lettuce | *Prasiola meridionalis* | J. G. Agardh |
| tiny-tube sea lettuces | *Blidingia spp., including Blidingia minima var. vexata* | H. Kylin, 1947 |
| green hair | *Urospora penicilliformis* | none |
| sea moss | *Cladophora sp.* | Kützing, 1843 |
| green excelsior | *Chaetomorpha sp., including Chaetomorpha linum* | Kuetzing, 1845 |
| cornrow sea lettuce | *Ulva intestinalis* | none |
| flat-tube sea lettuce | *Ulva linza* | none |
| sea lettuces | *Ulva spp., including Ulva lactuca* | none |
| green rope | *Acrosiphonia coalita* | J. Agardh, 1846 |
| sea fern | *Bryopsis sp., probably Bryopsis corticulans* | J. V. F. Lamouroux, 1809 |
| sea staghorn | *Codium fragile* | (Suringar) Hariot |
| spongy cushion | *Codium setchellii* | Gardner, 1919 |
| epiphytic sea lettuce | *Kornmania leptoderma* | none |
| sea pearls | *Derbesia marina / Halicytis ovalis* | (Lyngbye) Kjellman |
| undetermined green algae | *undetermined* | none |
| **Yellow-green algae** | **Xanthophyta** | |
| black felt mat | *Vaucheria spp.* | De Candolle, 1801 |
| Black felt mat / green scum | *Vaucheria spp. and others* | none |
| **Brown algae** | **Phaeophyta** | |
| brown tuft | *Ectocarpus, Feldmannia, Hincksia, Pilayella* | none |
| skinny rockweed | *Fucus sp.?* | none |
| rockweed | *Fucus gardneri* | none |
| little rockweed | *Pelvetiopsis limitata* | (Setchell) Gardner |
| sea cauliflower | *Leathesia difformis* | L. |
| round brown bag | *Colpomenia peregrina* | Sauv. |
| oyster thief | *Colpomenia bullosa* | Saund. |
| fir needle | *Analipus japonicus* | none |
| whip tube | *Scytosiphon lomentaria* | (Lyngbye) Link |
| sea palm | *Postelsia palmaeformis* | Ruprecht |
| sea cabbage | *Hedophyllum sessile* | C. Ag. |
| feather boa kelp | *Egregia menziesii* | (Turner) Areschoug |
| narrow-winged kelp | *Alaria nana* | none |
| float-bearing winged kelp | *Alaria fistulosa* | none |
| broad-winged kelp | *Alaria marginata* | Postals and Ruprecht |
| seersucker kelp | *Costaria costata* | C. Ag. |
| three-ribbed kelp | *Cymathere triplicata* | none |
| dark-brown wrack kelp | *Laminaria bongardiana* | none |
| sugar wrack kelp | *Laminaria saccharina* | none |
| split kelp | *Laminaria setchellii* | none |
| northern split kelp | *Laminaria dentigera* | Kjellm. |

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|---|---|---|
| broad-rib kelp | *Pleurophycus gardneri* | Setchell and Gardner Ex Tilden |
| strap kelp | *Lessoniopsis littoralis* | (Forlow and Setch. Ex Tild.) Reinke |
| northern bladder chain | *Cystoseira geminata* | none |
| bladder chain | *Cystoseira osmundacea* | Turn. |
| wireweed | *Sargassum muticum* | Yendo |
| hairy brown seaweed | *Haplogloia andersonii* | (Farlow) Levring |
| wiry acid weed | *Desmarestia aculeata, Desmarestia latifrons* | none |
| stringy acid weed | *Desmarestia viridis* | Mull. |
| broad acid weed | *Desmarestia ligulata, Desmarestia munda* | none |
| old growth kelp | *Pterygophora californica* | Ruprecht, 1852 |
| palm kelp | *Eisenia arborea* | Areschoug, 1876 |
| small giant kelp | *Macrocystis integrifolia* | Bory |
| giant kelp | *Macrocystis pyrifera* | (Linnaeus) Agardh |
| bull kelp | *Nereocystis luetkeana* | (Mertens) Postels and Ruprecht |
| mermaid's gloves | *Dictyota binghamiae* | none |
| sea colander kelp | *Agarum clathratum* | none |
| fringed sea colander kelp | *Agarum fimbriatum* | Harv. |
| undetermined brown algae | *undetermined* | none |
| undetermined diatom | *undetermined* | none |
| **Red algae** | **Rhodophyta** | |
| bald sea hair | *Bangia spp.* | Lyngbye, 1819 |
| nori | *Porphyra spp.* | C. A. Agardh |
| nail brush seaweed | *Endocladia muricata* | none |
| hairy seaweed | *Cumagloia andersonii* | (Farlow) Setchell and Gardner |
| rubber threads | *Nemalion helminthoides* | (Velley) Batters |
| red rock crust | *Hildenbrandia spp.* | Nardo, 1834 |
| bushy Turkish washcloth | *Mastocarpus jardinii* | none |
| Turkish washcloth / tar spot seaweed | *Mastocarpus papillatus* | none |
| mottled Turkish washcloth | *Mazzaella oregona* | none |
| very slender rhodomela | *Rhodomela tenuissima* | none |
| black pine | *Neorhodomela larix* | none |
| dark branching-tube seaweed | *Cryptosiphonia woodii* | (J. Agardh) J. Agardh |
| coarse sea lace | *Microcladia borealis* | none |
| sea sacs | *Halosaccion glandiforme* | none |
| filamentous red seaweed | *various* | none |
| beauty bush | *Callithamnion pikeanum* | none |
| narrow iodine seaweed | *Grateloupia lanceolata* | none |
| broad iodine seaweed | *Prionitis lyallii* | none |
| sea braid | *Plocamium cartilageneum pacificum* | none |
| crustose corallines | *Clathromorphum, Lithothamniun, Melobesia, Mesophyllum* | none |
| button coralline | *Melobesia sp. / Mesophyllum sp.* | none |
| surfgrass coralline seaweed | *Melobesia mediocris, Melobesia marginata* | none |
| rhodoliths | *including Phymatolithon calcareum and Lithothamnion glaciale* | none |
| articulated coralline algae | *Bossiella, Calliarthron, Corallina, Serraticardia* | none |
| pink feather coralline | *Corallina officinalis var. chilensis* | none |
| graceful coralline | *Corallina vancouveriensis* | none |
| leaf coral seaweed | *Bossiella spp., Calliarthron spp.* | none |
| bladed red algae | *undetermined* | none |
| leathery strap seaweed | *Dilsea californica* | J. Ag. |
| tattered red seaweed | *Farlowia mollis* | Harv. and Bail. |
| wiry forked seaweed | *Ahnfeltia fastigiata* | none |
| Callophyllis-like dulse | *Palmaria callophylloides* | none |

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|---|---|---|
| thin dulse | *Palmaria mollis* | none |
| hairy pottery seaweed | *Ceramium pacificum* | none |
| staghorn felt | *Ceramium codicola* | none |
| beautiful leaf seaweed | *Callophyllis spp.* | Kuetzing, 1843 |
| Turkish towel | *Chondracanthus exasperatus* | none |
| iridescent seaweed | *Mazzaella splendens* | none |
| delicate sea lace | *Microcladia coulteri* | none |
| ruffled red seaweed | *Cryptopleura ruprechtiana, Botryoglossum farlowianum* | none |
| hidden-ribbed red seaweed | *Cryptopleura lobulifera* | none |
| black-lined red seaweed | *Hymenena spp.* | none |
| red sea leaf | *Erythrophyllum delesseroides* | none |
| red spaghetti | *Gracilaria / Gracilariopsis* | none |
| sea brush | *Odonthalia floccosa* | none |
| toothed-twig seaweed | *Odonthalia washingtoniensis* | none |
| sea laurel | *Laurencia spectabilis* | none |
| succulent seaweed | *Sarcodiotheca gaudichaudii* | none |
| California rose seaweed | *Rhodymenia californica* | none |
| Pacific rose seaweed | *Rhodymenia pacifica* | none |
| cartilage-wing seaweed | *Pterochondria woodii* | none |
| slimy leaf | *Schizymenia pacifica* | none |
| red fringe | *Smithora naiadum* | (Anderson) Hollenberg |
| kelp-fringing nori | *Porphyra gardneri* | none |
| network red seaweed | *Polyneura latissima* | none |
| red eyelet silk | *Sparlingia pertusa* | none |
| giant cup and saucer seaweed | *Constantinea subulifera* | none |
| cup and saucer seaweed | *Constantinea simplex* | Setchell, 1901 |
| winged rib | *Delesseria decipiens* | none |
| feather-veined red seaweed | *Membranoptera platyphylla* | none |
| bull-kelp nori | *Porphyra nereocystis* | Anders. |
| thin forked seaweed | *Gymnogongrus chiton* | (Howe) Silva and De Cew |
| fleshy bush seaweed | *Scinaia confusa* | none |
| Japanese tree seaweed | *Tokidadendron kurilensis* | none |
| delicately-branched red seaweed | *Bonnemaisonia nootkana* | Esp. |
| plumose red braid | *Rhodoptilum plumosum* | none |
| blue branching seaweed | *Fauchea lacinata* | none |
| margined blue branching seaweed | *Fauchea fryeana* | none |
| arched red seaweed | *Fryeella gardneri* | none |
| sea grapes | *Botryocladia pseudodichotoma* | none |
| prickly pear seaweed | *Opuntiella californica* | none |
| furcated fleshy red seaweed | *Sarcodiotheca furcata* | none |
| midrib seaweed | *Stenogramma interrupta* | none |
| red sponge growth | *undetermined* | none |
| undetermined seaweed | *C, orange-coloured red alga Griffithsia pacifica?* | none |
| undetermined blade red seaweed | *undetermined* | none |
| undetermined branching red seaweed | *undetermined* | none |
| undetermined epiphytic red algae | *undetermined* | none |
| **Sponges** | **Porifera** | |
| tiny vase sponge | *Sycon spp.* | Risso, 1826 |
| stalked vase sponge | *Leucilla nuttingi* | (Urban, 1902) |
| bristly vase sponge | *Leucandra heathi* | Urban, 1905 |
| tubular vase sponge | *Leucandra sp.* | Haeckel, 1872 |
| lacy ball sponge | *Leucosolenia eleanor* | Urban, 1905 |

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|---|---|---|
| spaghetti sponge | *Leucosolenia nautilia* | de Laubenfels, 1930 |
| sharp lipped boot sponge | *Rhabdocalyptus dawsoni* | (Lambe, 1892) |
| round lipped boot sponge | *Staurocalyptus dowlingi* | none |
| cloud sponge | *Aphrocallistes vastus* | Schulze, 1887 |
| fingered goblet sponge | *Heterochone calyx* | none |
| tennis ball sponge | *Craniella villosa* | Lambe, 1894 |
| spiny tennis ball sponge | *Craniella spinosa* | Lambe, 1894 |
| thick white prickly sponge | *Stelletta clarella* | de Laubenfels, 1930 |
| armoured ball sponge | *Geodia mesotriaena* | de Laubenfels, 1910 |
| aggregated nipple sponge | *Polymastia pachymastia* | none |
| aggregated vase sponge | *Polymastia pacifica* | Lambe, 1894 |
| retractable nipple sponge | *Weberella sp.* | Vosmaer, 1885 |
| yellow boring sponge | *Cliona californiana* | Grant, 1826 |
| hermit crab sponge | *Suberites domuncula forma latus* | (Johnson, 1842) |
| peach ball sponge | *Suberites montiniger* | Carter, 1880 |
| orange rough ball sponge | *Tethya californiana* | Pallas, 1766 |
| chocolate puffball sponge | *Sceptrella sp. nov.* | none |
| stalked trumpet sponge | *Stylissa stipitata* | de Laubenfels, 1961 |
| funnel sponge | *Phakellia sp.* | Bowerbank, 1862 |
| tough yellow branching sponge | *Syringella amphispicula* | de Laubenfels, 1961 |
| orange finger sponge | *Neoesperiopsis rigida* | (Lambe, 1893) |
| glove sponge | *Neoesperiopsis digitata* | (Miklucho-maclay, 1870) |
| white reticulated sponge | *Iophon chelifer var. californiana* | none |
| thick strap sponge | *Pachychalina spp.* | Schmidt, 1868 |
| gnarled finger sponge | *Reniera sp. nov.* | none |
| hard gnarled clump sponge | *Xestospongia hispida, Xestospongia trindanea* | (Ridley and Dendy, 1886) |
| sulphur sponge | *Myxilla lacunosa* | Lambe, 1893 |
| Bowerbank's crumb of bread sponge | *Halichondria bowerbankia* | none |
| yellow-green encrusting sponge | *Halichondria panicea* | (Pallas, 1766) |
| bristly yellow clump sponge | *Mycale cf. toporoki* | Kolton, 1958 |
| flaccid sponge | *Stylinos sp. nov.* | none |
| papilla sponge | *Laxosuberites sp. nov., Suberites sp.* | none |
| pale orange carpet sponge | *Adocia sp.? similar to Reniera formaminosa* | none |
| purple intertidal sponge | *Haliclona? permollis* | Lambe, 1893 |
| orange cratered encrusting sponge | *Hamigera sp.* | Gray, 1867 |
| slippery rose sponge | *Aplysilla sp. nov.* | (Marejkowsky, 1878) |
| slippery purple sponge | *Chelonaplysilla polyraphis* | none |
| slippery white sponge | *Pleuraplysilla sp. nov.* | none |
| thick encrusting scarlet sponge | *Acarnus erithacus* | de Laubenfels, 1927 |
| red-brown encrusting sponge | *Anthoarcuata graceae* | Bakus, 1966 |
| bright red sponge | *Plocamia karykina* | (de Laubenfels, 1927) |
| velvety red sponge | *Ophlitaspongia pennata* | (Lambe, 1895) |
| pipecleaner sponge | *Asbestopluma occidentalis* | (Lambe, 1893) |
| rough scallop sponge | *Myxilla incrustans* | (Esper, 1805) |
| smooth scallop sponge | *Mycale adhaerens* | (Lambe, 1844) |
| spotted gray sponge | *Penares cortius* | de Laubenfels, 1930 |
| deep blue sponge | *Hymenamphiasta cyanocrypta* | de Laubenfels, 1930 |
| turquoise-tinged sponge | *Phloeodictyon sp. nov.* | none |
| breast sponge | *Eumastia sitiens* | none |
| yellow spicule-less sponge | *Hexadella sp.* | Topsent, 1905 |
| undetermined sponge | *A* | none |
| undetermined sponge | *D* | none |

| | | |
|---|---|---|
| undetermined sponge | *E* | none |
| undetermined sponge | *F* | none |
| undetermined sponge | *G* | none |
| undetermined sponge | *J* | none |
| undetermined sponge | *K* | none |
| undetermined sponge | *L* | none |
| undetermined sponge | *M* | none |
| undetermined sponge | *N* | none |
| undetermined sponge | *O* | none |
| undetermined sponge | *P* | none |
| undetermined sponge | *Q* | none |
| undetermined sponge | *T* | none |
| undetermined sponge | *U* | none |
| undetermined sponge | *W* | none |
| aquarium resident sponge | *undetermined* | none |
| undetermined demo sponge | *undetermined* | none |
| **Cnidarians** | **Cnidaria** | |
| short plumose anemone | *Metridium senile* | (Linnaeus, 1761) |
| giant plumose anemone | *Metridium farcimen* | (Tilesius, 1809) |
| crimson anemone | *Cribrinopsis fernaldi* | Siebert and Spaulding, 1976 |
| white anemone | *undetermined* | none |
| painted anemone | *Urticina crassicornis* | (Müller, 1776) |
| white-spotted rose anemone | *Urticina lofotensis* | none |
| rose anemone | *Urticina piscivora* | (Sebens and Laakso, 1978) |
| stubby rose anemone | *Urticina coriacea* | none |
| sand-rose anemone | *Urticina columbiana* | Verrill, 1922 |
| swimming anemone | *Stomphia didemon* | Siebert, 1973 |
| spotted swimming anemone | *Stomphia coccinea* | (Müller, 1776) |
| green surf anemone | *Anthopleura xanthogrammica* | (Brandt, 1835) |
| pink-tipped anemone | *Anthopleura elegantissima* | (Brandt, 1835) |
| burrowing anemone | *Anthopleura artemisia* | (Pickering in Dana, 1846) |
| strawberry anemone | *Corynactis californica* | Carlgren, 1936 |
| proliferating anemone | *Epiactis prolifera* | Verrill, 1869 |
| brooding anemone | *Epiactis lisbethae* | Fautin and Chia, 1986 |
| sand-accumulating brooding anemone | *Epiactis ritteri* | Torrey, 1902 |
| warty-columned anemone | *Aulactinia incubans* | none |
| tiny orange anemone | *undetermined* | none |
| ten-tentacled burrowing anemone | *Halcampa decemtentaculata* | Hand, 1955 |
| white-crowned burrowing anemones | *Edwardsia spp.* | de Quatrefages, 1842 |
| jelly-dwelling anemone | *Peachia quinquecapitata* | McMurrich, 1913 |
| tube-dwelling anemone | *Pachycerianthus fimbriatus* | McMurrich, 1910 |
| orange zoanthid | *Epizoanthus scotinus* | Wood, 1958 |
| pink zoanthid | *undetermined* | none |
| orange cup coral | *Balanophyllia elegans* | Verrill, 1864 |
| brown cup coral | *Paracyathus stearnsi* | Verrill, 1869 |
| tan cup coral | *Caryophyllia alaskensis* | Vaughan, 1941 |
| pale soft coral | *Clavularia sp.* | de Blainville, 1830 |
| white soft coral | *Clavularia sp.* | de Blainville, 1830 |
| red soft coral | *Gersemia rubiformis* | (Ehrenberg, 1834) |
| orange soft coral | *Alcyonium sp.* | Linnaeus, 1758 |
| orange sea pen | *Ptilosarcus gurneyi* | (Gray, 1860) |
| white sea pen | *Virgularia sp.* | Lamarck, 1816 |

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|---|---|---|
| other white sea pens | *Stylatula spp., Acanthoptilum gracile* | none |
| sea whip | *Halipteris willeomoesi* | Kölliker, 1870 |
| short sea whip | *Halipterus californica* | (Moroff, 1902) |
| dwarf red gorgonian | *Swiftia torreyi* | none |
| pink gorgonian | *Calcigorgia spiculifera* | Broch, 1935 |
| pink candelabrum gorgonian | *Paragorgia pacifica* | Verrill, 1922 |
| dwarf white gorgonian | *Anthothela pacifica* | none |
| undetermined gorgonian | *undetermined* | none |
| encrusting hydrocoral | *Stylantheca spp.* | Fisher, 1931 |
| pink branching hydrocoral | *Stylaster norvigicus* | (Gunnerus, 1768) |
| white branching hydrocoral | *Stylaster campylecus* | (Fisher, 1938) |
| ostrich-plume hydroid | *Aglaophenia spp.* | Lamouroux, 1812 |
| coarse sea fir hydroid | *Abietinaria spp.* | Kirchenpauer, 1884 |
| embedded sea fir hydroid | *Thuiaria spp.* | Fleming, 1828 |
| garland hydroid | *Sertularella spp. / Sertularia spp.* | none |
| fish-bone hydroid | *Selaginopsis sp.* | Allman, 1876 |
| horse-tail hydroid | *Rhizocaulus verticillatus* | (Linnaeus, 1758) |
| glassy plume hydroid | *Plumularia setacea* | (Linnaeus, 1758) |
| delicate plume hydroid | *Plumularia sp.* | Lamarck, 1816 |
| fibre-optic hydroid | *Abietinaria greenei* | (Murray, 1860) |
| wine-glass hydroid | *Obelia spp.* | Péron and Lesueur, 1810 |
| brown bushy hydroid | *Eudendrium californicum* | Torrey, 1902 |
| orange hydroid | *Garveia annulata* | Nutting, 1901 |
| creeping orange hydroid | *Garveia groenlandica* | Levinsen, 1893 |
| hedge-hog hydroid | *Clavactinia milleri* | none |
| snail fur hydroid | *Hydractinia sp. (perhaps Hydractinia aggregata)* | none |
| barnacle fur hydroid | *Hydractinia sp. (probably Hydractinia laevispina)* | none |
| clapper hydroid | *Sarsia tubulosa* | (M. Sars, 1835) |
| bushy pink-mouth hydroid | *Ectopleura crocea* | (L. Agassiz, 1862) |
| solitary pink-mouth hydroid | *Ectopleura marina* | (Torrey, 1902) |
| giant pink-mouth hydroid | *Tubularia indivisa* | Linnaeus, 1758 |
| white hydroid | *Clava sp.* | Gmelin, 1791 |
| spider web hydroid | *Orthopyxis sp.* | L. Agassiz, 1862 |
| raspberry hydroid | *Corymorpha sp.* | M. Sars, 1835 |
| bottlebrush hydroid | *Thuiaria thuja* | (Linnaeus, 1758) |
| loose spiral hydroid | *Hydrallmania distans* | Nutting, 1899 |
| muff hydroid | *Lafoea dumosa* | (Fleming, 1820) |
| spindly embedded hydroid | *Grammaria spp.* | Stimpson, 1853 |
| tunicate siphon hydroid | *Bythotiara huntsmani* | (Fraser, 1911) |
| candalabrum hydroid | *Halecium beani* | (Johnston, 1838) |
| dense bushy hydroid | *Halecium densum* | Calkins, 1899 |
| undetermined hydroid | *A* | none |
| undetermined hydroid | *B* | none |
| undetermined hydroid | *undetermined* | none |
| lion's mane | *Cyanea capillata* | (Linnaeus, 1758) |
| fried egg jellyfish | *Phacellophora camtschatica* | Brandt, 1838 |
| sea nettle | *Chrysaora fuscescens* | Brandt, 1835 |
| moon jelly | *Aurelia labiata* | Chamisso and Eysenhardt, 1821 |
| cross jellyfish | *Mitrocoma cellularia* | (A. Agassiz, 1865) |
| scalloped jelly | *Solmissus spp.* | Haeckel, 1879 |
| pink helmet | *Aglantha digitale* | (O. F. Müller, 1776) |
| cluster-tentacled jelly | *Bougainvillia sp.* | Lesson, 1836 |

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|---|---|---|
| water jelly | *Aequorea spp.* | Péron and Lesueur, 1809 |
| red-eye medusa | *Polyorchis penicillatus* | (Eschscholtz, 1829) |
| curtained jelly | *Eperetmus typus* | H. B. Bigelow, 1915 |
| clinging jellyfish | *Gonionemus vertens* | L. Agassiz, 1862 |
| gregarious jellyfish | *Clytia gregarium* | none |
| aggregating jelly | *Eutonina indicans* | (Romanes, 1876) |
| thimble jellyfishes | *Sarsia spp.* | Lesson, 1843 |
| blob-top jelly | *Neoturris breviconis* | (Murbach and Shearer, 1902) |
| tall-top jelly | *Leuckartiara spp.* | Hartlaub, 1913 |
| tiny red sausage jelly | *Euphysa spp.* | Forbes, 1848 |
| four tentacled jelly | *Aegina citrea* | Eschscholtz, 1829 |
| hanging stomach jelly | *Stomotoca atra* | L. Agassiz, 1862 |
| eight-strand jelly | *Melicertum octocostatum* | (M. Sars, 1835) |
| tailed jelly | *Nanomia bijuga* | (delle Chiaje, 1841) |
| dwarf tailed jelly | *Muggiaea sp.* | Busch, 1851 |
| undetermined jelly | *undetermined* | none |
| trumpet stalked jellyfish | *Haliclystus salpinx* | Clark, 1863 |
| **Ctenophores** | **Ctenophora** | |
| sea gooseberry | *Pleurobrachia bachei* | A. Agassiz, 1860 |
| oval sea gooseberry | *Euplokamis dunlapae* | Mills, 1988 |
| lobed sea gooseberry | *Bolinopsis infundibulum* | (O. F. Müller, 1776) |
| orange-tipped sea gooseberry | *Leucothea pulchra* | Matsumoto, 1988 |
| transluscent comb jelly | *Beroe spp.* | Gronov, 1760 |
| **Flatworms** | **Platyhelminthes** | |
| spotted flatworm | *Eurylepta leoparda* | none |
| giant flatworm | *Kaburakia excelsa* | none |
| intertidal flatworm | *Notocomplana spp.* | none |
| California flatworm | *Stylochus californiensis* | none |
| green flatworm | *Phylloplana viridis* | none |
| pink parasitic flatworm | *Kronborgia pugetensis* | none |
| undetermined flatworm | *undetermined* | none |
| **Ribbon worms** | **Nemertea** | |
| green ribbon worm | *Emplectonema gracile* | none |
| leopard ribbon worm | *Emplectonema purpuratum* | none |
| mottled ribbon worm | *Emplectonema burgeri* | none |
| purple ribbon worm | *Micrura verrilli* | none |
| chevron ribbon worm | *Amphiporus bimaculatus* | none |
| pink-fronted ribbon worm | *Amphiporus imparispinosus* | Griffin, 1898 |
| white ribbon worm | *Amphiporus formidibalis* | none |
| six-lined ribbon worm | *Tubulanus sexlineatus* | (Griffin, 1898) |
| orange ribbon worm | *Tubulanus polymorphus* | Renier, 1804 |
| white-ringed ribbon worm | *Tubulanus albocinctus* | (Coe, 1904) |
| white-lined ribbon worm | *Tetrastemma nigrifrons* | none |
| light-edged ribbon worm | *Cerebratulus californiensis* | none |
| rose ribbon worm | *Cerebratulus montgomeri* | none |
| short orange ribbon worm | *undetermined* | none |
| subtidal white ribbon worm | *undetermined* | none |
| undetermined ribbon worm | *undetermined* | none |
| **Arrow worms** | **Chaetognatha** | |
| arrow worm | *Sagitta elegans* | Verrill, 1873 |
| **Peanut worms** | **Sipuncula** | |
| Agassiz's peanut worm | *Phascolosoma agassizii* | Keferstein, 1866 |

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|---|---|---|
| brown peanut worm | *Golfingia vulgaris* | (de Blainville, 1827) |
| undetermined peanut worm | *undetermined* | none |
| **Segmented worms** | **Annelida** | |
| fish leeches | *various* | none |
| Pacific Neopolitan lugworm | *Abarenicola pacifica* | none |
| American bloodworm | *Glycera americana* | Leidy |
| white-banded Bobbit worm | *Eunice valens* | none |
| purple-stub necklace-worm | *Trypanosyllis ingens* | none |
| obtuse sponge-dwelling necklace worm | *Amblyosyllis sp.* | Grube, 1857 |
| giant red necklace-worm | *Pionosyllis gigantea* | none |
| mystery necklace-worm | *undetermined* | none |
| noble necklace-worm | *Autolytus magnus* | none |
| leafy paddleworm | *Phyllodoce spp.* | Savigny, 1818 |
| tailed Pacific transparent-worm | *Tomopteris pacifica* | none |
| tail-less Pacific transparent-worm | *Tomopteris septentrionalis* | Steenstrup |
| multi-branched porcupine-worm | *Euphrosine multibranchiata* | none |
| bat star commensal worm | *Ophiodromus pugettensis* | (Johnson, 1901) |
| ornate tubeworm | *Diopatra ornata* | Moore, 1911 |
| eighteen-scaled worm | *Halosydna brevisetosa* | Kinberg, 1855 |
| fifteen-scaled worm | *Harmothoe imbricata* | (Linnaeus, 1769) |
| yellow and brown scaleworm | *Harmothoe extenuata* | none |
| fragile ruffled scaleworm | *Arctonoe fragilis* | (Baird, 1863) |
| red-banded commensal scaleworm | *Arctonoe vittata* | (Grube, 1855) |
| red commensal scaleworm | *Arctonoe rubra* | none |
| giant fleshy scaleworm | *Hololepida magna* | Moore, 1905 |
| snow-speckled scaleworm | *Lepidasthenia longicirrata* | Berkeley, 1923 |
| thorny scaleworm | *Eunoe senta* | (Moore, 1902) |
| dishevelled sea-mouse | *Aphrodita negligens* | Moore, 1905 |
| goddess-worm | *Nephtys spp.* | Cuvier, 1817 |
| banner sea-nymph | *Nereis vexillosa* | none |
| little pileworm sea-nymph | *Nereis procera* | none |
| red-and-white-banded sea-nymph | *Cheilonereis cyclurus* | (Harrington, 1897) |
| sheathed bristle-cage worm | *Flabelligera infundibularis* | none |
| pearl-topped calcareous worms | *Apomatus geniculata and Apomatus timsii* | none |
| white-crown calcareous tubeworm | *Protula pacifica* | none |
| red-trumpet calcareous tubeworm | *Serpula columbiana (Serpula vermicularis)* | none |
| three-branch calcareous tubeworm | *Salmacina tribranchiata* | (Moore, 1923) |
| western calcareous tubeworm | *Pseudochitinopoma occidentalis* | Bush, 1909 |
| yolk-bearer calcareous tubeworm | *Crucigera zygophora* | none |
| irregular calcareous tubeworm | *Crucigera irregularis* | none |
| pale calcareous tubeworm | *Crucigera spp.* | Benedict, 1887 |
| dwarf calcareous worm | *Pileolaria spp. (spirorbids)* | Claparede, 1870 |
| coralline-encased filament-worm | *Dodecaceria concharum* | Oersted |
| fringed filament-worm | *Dodecaceria fewkesi* | none |
| intertidal filament-worm | *Cirratulus sp.* | Lamarck, 1818 |
| minute feather-dusters | *Chone minuta / Chone ecaudata (in part)* | none |
| orange feather-duster | *Chone aurantiaca* | none |
| parasol feather-duster | *Demonax medius* | none |
| polymorph feather-duster | *Eudistylia polymorpha* | none |
| Vancouver feather-duster | *Eudistylia vancouveri* | none |
| split-branch feather-duster | *Schizobranchia insignis* | none |
| slime-tube feather-duster | *Myxicola infundibulum* | (Renier, 1804) |

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| petit slime-tube feather-duster | *Myxicola aesthetica* | none |
| twin-eyed feather duster | *Bispira sp. (as Sabella crassicornis)* | none |
| undetermined feather-duster worm | *undetermined* | none |
| tusk coneworm | *Pectinaria granulata* | none |
| cemented sandmason tubeworm | *Neosabellaria cementarium* | none |
| stone-cave sandmason tubeworm | *Idanthyrsus saxicavus* | none |
| basket-top spaghetti-worm | *Pista elongata* | none |
| fringed-hood spaghetti-worm | *Pista pacifica* | none |
| curly-head spaghetti-worm | *Thelepus crispus* | none |
| gill-less spaghetti-worm | *(including Polycirrus sp. IV)* | none |
| undetermined spagheti-worm | *undetermined* | none |
| jointed three-section tubeworm | *Spiochaeopterus costarum* | none |
| prolific three-section tubeworm | *Phyllochaeopterus prolifica* | none |
| tangled-straw three-section tubeworm | *Phyllochaeopterus claparedii* | none |
| U-shaped parchment tubeworm | *Chaeopterus species complex* | none |
| giant parchment tubeworm | *Mesochaeopterus taylori* | none |
| **Spoon worms** | **Echiura** | |
| **Phoronids** | **Phoronida** | |
| white colonial phoronid | *Phoronis ijimai* | Oka, 1897 |
| large green phoronid | *Phoronopsis harmeri* | Pixell, 1912 |
| **Bryozoans** | **Bryozoa** | |
| kelp-encrusting bryozoan | *Membranipora serrilamella* | none |
| coral bryozoans | *Lichenopora spp.* | Defrance, 1823 |
| glassy-white encrusting bryozoan | *Celleporella hyalina* | (Linnaeus, 1767) |
| purple encrusting bryozoan | *Disporella separata* | none |
| yellow encrusting bryozoan | *Rhynchozoon rostratum (Rhynchozoon tumulosum)* | none |
| derby hat bryozoan | *Eurystomella bilabiata* | (Hincks) |
| orange encrusting bryozoan | *Schizoporella unicornis* | (Johnston, 1874) |
| black and red encrusting bryozoan | *Watersipora cucullata* | none |
| tubeworm fuzz | *Bowerbankia sp.* | Farre, 1837 |
| spiral bryozoan | *Bugula californica* | Robertson, 1905 |
| parasol bryozoan | *Caulibugula californica* | (Robertson, 1905) |
| fan bryozoan | *Dendrobeania murrayana* | (Johnston, 1847) |
| leaf crust bryozoan | *Dendrobeania lichenoides* | none |
| white tuft bryozoans | *Crisia spp.* | Lamouroux, 1812 |
| spiny leather bryozoan | *Flustrellidra corniculata* | (Smitt, 1872) |
| smooth leather bryozoan | *Alcyonidium pedunculatum* | none |
| spindly rabbit-ear bryozoan | *Cellaria diffusa* | Robertson, 1905 |
| stick bryozoan | *Microporina borealis* | none |
| lattice-work bryozoan | *Phidolopora pacifica* | none |
| northern staghorn bryozoan | *Heteropora pacifica* | none |
| delicate staghorn bryozoan | *Heteropora alaskensis* | none |
| southern staghorn bryozoan | *Diaperoecia californica* | (D'orbigny, 1852) |
| rusty bryozoan | *Costazia ventricosa* | none |
| fluted bryozoan | *Hippodiplosia insculpta* | none |
| undetermined branching bryozoan | *A* | none |
| undetermined branching bryozoan | *B* | none |
| undetermined encrusting bryozoan | *A* | none |
| undetermined encrusting bryozoan | *B* | none |
| undetermined encrusting bryozoan | *E* | none |
| undetermined encrusting bryozoan | *H* | none |
| undetermined encrusting bryozoan | *I* | none |

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|---|---|---|
| undetermined encrusting bryozoan | *M* | none |
| undetermined encrusting bryozoan | *N* | none |
| undetermined encrusting bryozoan | *undetermined* | none |
| **Entoprocts** | **Entoprocta** | |
| nodding heads | *Barentsia sp.* | Hincks, 1880 |
| **Brachiopods** | **Brachiopoda** | |
| transverse lamp shell | *Terebratalia transversa* | (Sowerby, 1846) |
| California lamp shell | *Laqueus californicus* | (Koch in Chemnitz, 1848) |
| snake's head lamp shell | *Terebratulina unguicula* | (Carpenter, 1865) |
| **Molluscs** | **Mollusca** | |
| lined chiton | *Tonicella lineata* | (Wood, 1815) |
| blue-line chiton | *Tonicella undocaerulea* | none |
| lovely chiton | *Tonicella venusta* | none |
| white-line chiton | *Tonicella insignis* | (Reeve, 1847) |
| woody chiton | *Mopalia lignosa* | (Gould, 1846) |
| mossy chiton | *Mopalia muscosa* | (Gould, 1846) |
| northern hairy chiton | *Mopalia kennerlyi* | none |
| southern hairy chiton | *Mopalia ciliata* | (G. B. Sowerby II, 1840) |
| Swan's mopalia | *Mopalia swani* | Carpenter, 1864 |
| Hind's mopalia | *Mopalia hindsii* | (Reeve, 1874) |
| red-flecked mopalia | *Mopalia spectabilis* | G.I. Cowan and I. M. Cowan, 1977 |
| smooth mopalia | *Mopalia vespertina* | none |
| egret-plumed mopalia | *Mopalia egretta* | S.S. Berry, 1919 |
| dwarf hairy mopalia | *Mopalia sinuata* | Carpenter, 1864 |
| mossy or hairy chiton | *Mopalia sp.* | none |
| Merten's chiton | *Lepidozona mertensi* | (Middendorff, 1847) |
| Cooper's chiton | *Lepidozona cooperi* | (Dall, 1879) |
| smooth lepidozona | *Lepidozona interstinctus* | (Gould, 1846) |
| three-rib chiton | *Lepidozona trifida* | (Carpenter, 1864) |
| painted dendrochiton | *Dendrochiton flectens* | (Carpenter, 1864) |
| veiled-chiton | *Placiphorella velata* | Dall, 1879 |
| red veiled-chiton | *Placiphorella rufa* | S.S. Berry, 1917 |
| Gould's baby chiton | *Lepidochitona dentiens* | (Gould, 1846) |
| black leather chiton | *Katharina tunicata* | (W, Wood, 1815) |
| giant Pacific chiton | *Cryptochiton stelleri* | (Middendorff, 1847) |
| undetermined chiton | *undetermined* | none |
| Pacific blue mussel | *Mytilus trossulus* | Gould,1850 |
| Mediterranean blue mussel | *Mytilus galloprovincialis* | Lamark, 1819 |
| blue mussel | *Mytilus edulis* | Linnaeus, 1758 |
| California mussel | *Mytilus californianus* | Conrad, 1837 |
| northern horsemussel | *Modiolus modiolus* | (Linnaeus, 1758) |
| straight horsemussel | *Modiolus rectus* | Conrad, 1837 |
| discordant mussel | *Musculus discors* | (Linnaeus, 1867) |
| spiny pink scallop | *Chlamys hastata* | (G. B. Sowerby II, 1842) |
| smooth pink scallop | *Chlamys rubida* | (Hinds, 1845) |
| pink scallop | *Chlamys sp.* | Röding, 1798 |
| weathervane scallop | *Patinopecten caurinus* | (Gould, 1850) |
| giant rock scallop | *Crassadoma gigantea* | (J. E. Gray, 1825) |
| Pacific oyster | *Crassostrea gigas* | (Thunberg, 1793) |
| Olympia oyster | *Ostrea conchaphila* | (Carpenter, 1857) |
| green false-jingle | *Pododesmus macrochisma* | (Deshayes, 1839) |
| rough diplodon | *Diplodonta impolita* | S. S. Berry, 1953 |

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| little heart clam | *Glans carpenteri* | (Lamy, 1922) |
| suborbicular kellyclam | *Kellia suborbicularis* | (Montagu, 1803) |
| western bittersweet | *Glycymeris septentrionalis* | (Middendorff, 1849) |
| elliptical astarte | *Astarte elliptica* | (T. Brown, 1827) |
| Nuttall's cockle | *Clinocardium nuttalli* | (Conrad,1864) |
| hairy cockle | *Clinocardium ciliatum* | (Fabricus, 1780) |
| Aleutian cockle | *Clinocardium californiense* | Deshayes, 1839) |
| fat gaper | *Tresus capax* | (Gould, 1850) |
| Pacific gaper | *Tresus nuttallii* | (Conrad, 1837) |
| undetermined gaper | *Tresus sp.* | Gray, 1853 |
| Pacific geoduck | *Panopea abrupta* | (Gould, 1850) |
| sickle jackknife-clam | *Solen sicarius* | Gould, 1850 |
| plain tellin | *Tellina modesta* | Dall, 1900 |
| bent-nose macoma | *Macoma nasuta* | (Conrad, 1857) |
| Baltic macoma | *Macoma balthica* | (Linnaeus, 1758) |
| undetermined macoma | *Macoma sp.* | Leach, 1819 |
| purple mahogany-clam | *Nuttallia obscurata* | (Reeve, 1857) |
| California sunsetclam | *Gari californica* | (Conrad, 1849) |
| rose-painted clam | *Semele rubropicta* | Dall, 1871 |
| Washington butter clam | *Saxidomus gigantea* | (Deshayes, 1839) |
| Pacific littleneck clam | *Protothaca staminea* | (Conrad, 1837) |
| Japanese littleneck clam | *Venerupis philippinarum* | (A. Adams and Reeve, 1850) |
| Kennerley's venus | *Humilaria kennerleyi* | (Reeve, 1863) |
| hearty rock dweller | *Petricola carditoides* | (Conrad, 1837) |
| softshell-clam | *Mya arenaria* | Linnaeus, 1758 |
| truncated softshell-clam | *Mya truncata* | Linnaeus, 1758 |
| arctic nestler | *Hiatella arctica* | (Linnaeus, 1767) |
| boring softshell-clam | *Platyodon cancellatus* | (Conrad, 1837) |
| flat-tip piddock | *Penitella penita* | (Conrad, 1837) |
| rough piddock | *Zirfaea pilsbryi* | Lowe, 1931 |
| feathery shipworm | *Bankia setacea (gribble Limnoria lignorum)* | (Tryon,1863) |
| bladderclam | *Mytilimeria nuttalli* | Conrad, 1837 |
| rock entodesma | *Entodesma navicula* | (A. Adams and Reeve, 1850) |
| undetermined clam | *undetermined* | none |
| mask limpet | *Tectura persona* | (Rathke, 1833) |
| plate limpet | *Tectura scutum* | (Rathke, 1833) |
| limpet | *Tectura sp.* | Gray, 1847 |
| shield limpet | *Lottia pelta* | (Rathke, 1883) |
| ribbed limpet | *Lottia digitalis* | (Rathke, 1833 |
| fenestrate limpet | *Tectura fenestrata* | (Reeve,1855) |
| whitecap limpet | *Acmaea mitra* | Eschscholtz, 1833 |
| unstable limpet | *Lottia instabilis* | (Gould, 1846) |
| seaweed limpet | *Discurria insessa* | (Hinds, 1842) |
| file limpet | *Lottia limatula* | (Carpenter, 1864) |
| surfgrass limpet | *Tectura paleacea* | (Gould, 1853) |
| Pacific eelgrass limpet | *Lottia alveus paralella* | Dall, 1914 |
| corded white limpet | *Niveotectura funiculata* | (Carpenter, 1864) |
| ringed blind limpet | *Cryptobranchia concentrica* | (Middendorff, 1857) |
| pustulate blind limpet | *Lepeta caeca* | (Muller, 1776) |
| rough keyhole limpet | *Diodora aspera* | (Rathke, 1833) |
| hooded puncturella | *Cranopsis cucullata* | (Gould, 1846) |
| many-ribbed puncturella | *Cranopsis multistriata* | (Dall, 1914) |

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|---|---|---|
| helmet puncturella | *Puncturella galeata* | (Gould, 1846) |
| wrinkled slippersnail | *Crepipatella dorsata* | (Broderip, 1834) |
| cup-and-saucer snail | *Calyptraea fastigiata* | Gould, 1846 |
| northern white slippersnail | *Crepidula nummaria* | Gould, 1846 |
| hooked slippersnail | *Credidula adunca* | G. B. Sowerby I, 1825 |
| northern abalone | *Haliotis kamtschatkana* | Jonas, 1845 |
| wrinkled dogwinkle | *Nucella lamellosa* | (Gemlin, 1791) |
| northern striped dogwinkle | *Nucella ostrina* | none |
| channelled dogwinkle | *Nucella canaliculata* | (Duclos, 1832) |
| file dogwinkle | *Nucella lima* | (Gemlin, 1791) |
| leafy hornmouth | *Ceratostoma foliatum* | (Gemlin, 1791) |
| Japanese rocksnail | *Ceratostoma inornatum* | Dunker, 1860 |
| dire whelk | *Lirabuccinum dirum* | (Reeve, 1846) |
| wrinkled amphissa | *Amphissa columbiana* | Dall, 1916 |
| variegated amphissa | *Amphissa versicolor* | Dall, 1871 |
| sculptured rocksnail | *Ocinebrina interfossa* | (Carpenter, 1864) |
| lurid rocksnail | *Ocinebrina lurida* | (Middendorff, 1848) |
| sclera rocksnail | *Ocenebra sclera* | none |
| sandpaper trophon | *Scabrotrophon maltzani* | (Kobelt and Kuster, 1878) |
| winged trophon | *Boreotrophon stuarti* | (E.A. Smith, 1880) |
| ribbed trophon | *Boreotrophon multicostatus* | (Eschscholtz, 1829) |
| Sitka periwinkle | *Littorina sitkana* | Philippi, 1846 |
| checkered periwinkle | *Littorina scutulata* | Gould, 1849 |
| undetermined periwinkle | *undetermined* | none |
| variable lacuna | *Lacuna variegata* | Carpenter, 1864 |
| wide lacuna | *Lacuna vincta* | (Montagu, 1803) |
| carinate dovesnail | *Alia carinata* | (Hinds, 1844) |
| shaggy dovesnail | *Astyris gausapata* | (Gould, 1850) |
| violet-band mangelia | *Kurtziella crebricostata* | (Hinds, 1843) |
| western lean nassa | *Nassarius mendicus* | (Gould, 1850) |
| Japanese nassa | *Nassarius fraterculus* | (Dunker, 1860) |
| giant western nassa | *Nassarius fossatus* | (Gould, 1850) |
| black dog whelk | *Ilyanassa obsoleta* | (Say, 1822) |
| threaded bittium | *Bittium eschrichtii* | (Middendorf, 1849) |
| slender bittium | *Bittium attenuatum* | (Carpenter, 1864) |
| mudflat snail | *Batillaria cumingi* | (Bruguiere, 1792 |
| money wentletrap | *Epitonium indianorum* | (Carpenter, 1864) |
| boreal wentletrap | *Opalia borealis* | Keep, 1881 |
| shining balcis | *Balcis micans* | (Carpenter, 1864) |
| pearly topsnail | *Lirularia lirulata* | (Carpenter, 1864) |
| blue topsnail | *Calliostoma ligatum* | (Gould, 1844) |
| purple-ringed topsnail | *Calliostoma annulatum* | (Lightfoot, 1786) |
| variable topsnail | *Calliostoma variegatum* | Carpenter, 1864 |
| channelled topsnail | *Calliostoma canaliculatum* | (Lightfoot, 1786) |
| puppet margarite | *Margarites pupillus* | (Gould, 1849) |
| helicina margarite | *Margarites helicinus* | (Phipps, 1774) |
| black turban | *Tegula funebralis* | (A. Adams, 1855) |
| dusky turban | *Tegula pulligo* | (Gemlin, 1791) |
| Lewis's moonsnail | *Euspira lewisii* | (Conrad, 1847) |
| Drake's moonsnail | *Euspira draconis* | (Dall, 1903) |
| pale northern moonsnail | *Euspira pallida* | (Broderip and G. B. Sowerby I, 1829) |
| unidentified moonsnail egg collar | *undetermined* | none |

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|---|---|---|
| Aleutian moonsnail | *Cryptonatica aleutica* | Dall, 1919 |
| purple olive | *Olivella biplicata* | (G. B. Sowerby I, 1825) |
| baetic olive | *Olivella baetica* | Carpenter, 1864 |
| violet snail | *Janthina janthina* | Swainson, 1822 |
| Phoenician whelk | *Neptunea phoenicia* | (Dall, 1891) |
| ridged whelk | *Neptunea lyrata* | (Say, 1826) |
| Oregon triton | *Fusitriton oregonensis* | (Redfield, 1848) |
| checkered hairysnail | *Trichotropsis cancellata* | none |
| northern compact wormsnail | *Vermetus compactus* | none |
| leather limpet | *Onchidella borealis* | Dall, 1871 |
| smooth velvet snail | *Velutina prolongata* | Carpenter, 1864 |
| spiral velvet snail | *Velutina velutina* | (Muller, 1776) |
| red velvet snail | *Velutina rubra* | Willett, 1919 |
| Stearn's ear shell | *Marsenina stearnsi* | (Dall, 1871) |
| marbled lamellarid | *Marsenina rhombica* | (Dall, 1871) |
| small snail parasite | *Odostomia columbiana* | Dall and Bartsch, 1907 |
| striped barrel shell | *Rictaxis punctocaelatus* | Carpenter, 1864 |
| white bubble shell | *Haminoea vesicula* | (Gould, 1855) |
| Diomedes aglajid | *Melanochlamys diomedea* | (Bergh, 1894) |
| spotted aglajid | *Aglaja ocelligera* | (Bergh, 1893) |
| winged sea slug | *Gastropteron pacificum* | Bergh, 1893 |
| zebra leafslug | *Phyllaplysia taylori* | Dall, 1900 |
| capshell | *Anidolyta spongotheras* | (Bertsch, 1980) |
| California berthella | *Berthella californica* | (MacFarlane, 1966) |
| Strong's berthella | *Berthella strongi* | (Dall, 1900) |
| helicid pteropod | *Limacina helicina* | (Phipps, 1774) |
| sea angel | *Clione limacina* | (Phipps, 1774) |
| sea cherub | *Cliopsis krohni* | Troschel, 1854 |
| Hedgpeth's sea hare | *Elysia hedgpethi* | Er.Marcus, 1961 |
| noble sea lemon | *Peltodoris nobilis* | (MacFarlane, 1905) |
| freckled pale sea lemon | *Anisodoris lentiginosa* | none |
| Monterey sea lemon | *Doris montereyensis* | (J.G. Cooper, 1863) |
| white nudibranch | *Doris odhneri* | (MacFarlane, 1966) |
| Tara's dorid | *Aldisa tara* | Millen, 1984 |
| Heath's dorid | *Geitodoris heathi* | (MacFarlane, 1905) |
| leopard dorid | *Diaulula sandiegensis* | (J.G. Cooper, 1863) |
| yellow-rimmed nudibranch | *Cadlina luteomarginata* | MacFarlane, 1966 |
| white-rimmed nudibranch | *Aldisa albomarginata* | Millen, 1984 |
| modest cadlina | *Cadlina modesta* | MacFarlane, 1966 |
| yellow spotted cadlina | *Cadlina flavomaculata* | MacFarlane, 1966 |
| Hudson's dorid | *Acanthodoris hudsoni* | MacFarlane, 1905 |
| Nanaimo nudibranch | *Acanthodoris nanaimoensis* | O'Donoghue, 1921 |
| pilose doris | *Acanthodoris pilosa* | (Abildgaard, 1789) |
| sandalwood dorid | *Acanthodoris lutea* | MacFarlane, 1925 |
| white adalaria | *Adalaria proxima* | (Alder and Hancock, 1854) |
| Janna's adalaria | *Adalaria jannae* | Millen, 1987 |
| tiny white dorids | *Adalaria spp.* | Bergh, 1879 |
| porcupine dorid | *Diaphorodoris lirulatocauda* | Millen, 1985 |
| barnacle-eating nudibranch | *Onchidoris bilamellata* | (Linnaeus, 1767) |
| fuzzy onchidoris | *Onchidoris muricata* | (Muller, 1776) |
| frost spot nudibranch | *Corambe pacifica* | Macfarland and O'donoghue, 1929 |
| cryptic nudibranch | *Doridella steinbergi* | (Lance, 1962) |

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|---|---|---|
| red sponge nudibranch | *Rostanga pulchra* | MacFarland, 1905 |
| Cooper's dorid | *Aldisa cooperi* | Robilliard and Baba, 1972 |
| red dorid | *Aldisa sanguinea* | (J. G. Cooper, 1863) |
| Vancouver's okenia | *Okenia vancouverensis* | (O'Donoghue, 1921) |
| clown nudibranch | *Triopha catalinae* | (J. G. Cooper, 1863) |
| spotted triopha | *Triopha maculata* | MacFarland, 190 |
| Cockerell's nudibranch | *Limacia cockerelli* | none |
| salt-and-pepper nudibranch | *Aegires albopunctatus* | MacFarland, 1905 |
| banded polycera | *Palio dubia* | (M. Sars, 1829) |
| Pacific ancula / Atlantic ancula | *Ancula gibbosa* | (Risso, 1818) |
| diamondback nudibranch | *Tritonia festiva* | (Stearns, 1873) |
| mystery tritonid | *undetermined* | none |
| pink tritonia | *Tritonia diomedea* | Bergh, 1894 |
| orange-peel nudibranch | *Tochuina tetraquetra* | (Pallas, 1788) |
| giant nudibranch | *Dendronotus iris* | J. G. Cooper, 1863 |
| red dendronotid | *Dendronotus rufus* | O'Donoghue, 1921 |
| Dall's dendronotid | *Dendronotus dalli* | Bergh, 1879 |
| multicolor dendronotid | *Dendronotus diversicolor* | Robilliard, 1970 |
| white dendronotid | *Dendronotus albus* | MacFarland, 1966 |
| bushy-backed nudibranch | *Dendronotus frondosus* | (Ascanius, 1774) |
| stubby dendronotus | *Dendronotus subramosus* | MacFarland, 1966 |
| light-speckled dendronotid | *Dendronotus sp.* | Alder and Hancock, 1845 |
| undetermined dendronotid | *undetermined* | none |
| hooded nudibranch | *Melibe leonina* | (Gould, 1852) |
| British Columbia doto | *Doto columbiana* | O'Donoghue, 1921 |
| seal doto | *Doto kya* | Er. Marcus, 1961 |
| striped nudibranch | *Armina californica* | (J. G. Cooper, 1863) |
| frosted nudibranch | *Dirona albolineata* | MacFarland, 1905 |
| golden dirona | *Dirona pellucida* | none |
| white-and-orange-tipped nudibranch | *Janolus fuscus* | O'Donohue, 1924 |
| frosty-tipped nudibranch | *Janolus sp. nov.* | none |
| opalescent nudibranch | *Hermissenda crassicornis* | (Eschscholtz, 1831) |
| red flabellina | *Flabellina triophina* | (Bergh, 1894) |
| red-gilled nudibranch | *Flabellina verrucosa* | (M. Sars, 1829) |
| three-lined nudibranch | *Flabellina trilineata* | (O'Donoghue, 1921) |
| pearly nudibranch | *Flabellina japonica* | none |
| Price's aeolid | *Flabellina pricei* | (MacFarland, 1966) |
| undetermined red-gilled nudibranch | *Flabellina sp.* | Voigt, 1834 |
| rustic aeolid | *Eubranchus rustyus* | (Er. Marcus, 1961) |
| San Juan aeolid | *Eubranchus sanjuanensis* | Roller, 1972 |
| British Columbia's aeolid | *Catriona columbiana* | (O'Donoghue, 1922) |
| unidentified aeolid | *undetermined* | none |
| shag-rug nudibranch | *Aeolidia papillosa* | (Linnaeus, 1761) |
| wampum tuskshell | *Antalis pretiosum* | (G. B. Sowerby II, 1860) |
| giant Pacific octopus | *Enteroctopus dofleini* | (Wülker, 1910) |
| Pacific red octopus | *Octopus rubescens* | Berry, 1953 |
| smoothskin octopus | *Benthoctopus leioderma* | (Berry, 1911) |
| stubby squid | *Rossia pacifica* | Berry, 1911 |
| opalescent squid | *Loligo opalescens* | Berry, 1911 |
| neon flying squid | *Ommastrephes bartrami* | (Lesueur, 1821) |
| **Arthropods** | **Arthropoda** | |
| black-and-white sea flea | *Chromopleustes oculatus* | (Holmes, 1908) |

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|---|---|---|
| splash-zone beach hopper | *Traskorchestia traskiana* | (Stimpson, 1857) |
| kelp-dwelling sea flea | *Peramphithoe humeralis* | (Stimpson, 1864) |
| sea lettuce sea flea | *Ampithoe lacertosa* | Bate, 1858 |
| neon sea flea | *Podoceras cristatus* | none |
| tube-dwelling sea flea | *Erichthonius rubricornis* | none |
| pelagic amphipods | *undetermined* | none |
| Alaskan skeleton shrimp | *Caprella alaskana* | Mayer, 1903 |
| undetermined amphipod | *undetermined* | none |
| shrimp parasitic isopod | *Bopyroides hippolytes* | (Krøyer, 1838) |
| squat lobster parasitic isopods | *Munidon parvum / Pseudione galacanthae* | |
| pink parasitic isopod | *Rocinela propodialis* | H. Richardson, 1905 |
| scavenging isopod | *Cirolana harfordi* | (Lockington, 1877) |
| stubby isopod | *Gnorimosphaeroma oregonensis* | (Dana, 1853) |
| eelgrass isopod | *Idotea resecata* | Stimpson, 1857 |
| rockweed isopod | *Idotea wosnesenskii* | Brandt, 1851 |
| Monterey isopod | *Idotea montereyensis* | Maloney, 1933 |
| feather boa isopod | *Idotea stenops* | J. E. Benedict, 1898 |
| undetermined isopod | *undetermined* | none |
| common gray mysid | *undetermined* | none |
| kelp-brown, long rostrum mysid | *undetermined* | none |
| bent-backed, pale striped mysid | *undetermined* | none |
| undetermined mysid | *undetermined* | none |
| parasitic copepod | *Lepeophtherius sp. A* | none |
| parasitic copepod | *Lepeophtherius sp. B* | none |
| free-swimming copepods | *undetermined* | none |
| fish lice | *undetermined* | none |
| krill | *Euphausia spp.* | Dana, 1852 -- valid |
| surfperch fish louse | *Argulus pugettensis* | Dana, 1853 |
| flounder fish louse | *Argulus borealis* | C. B. Wilson, 1912 |
| blacktail shrimp | *Crangon nigricauda* | Stimpson, 1856 |
| northern crangon | *Crangon alaskensis* | Lockington, 1877 |
| gray shrimp | *Crangon sp.* | Fabricius, 1798 |
| horned shrimp | *Paracrangon echinata* | Dana, 1852 |
| coastal spinyhead | *Metacrangon munita* | (Dana, 1852) |
| miniature spinyhead | *Mesocrangon munitella* | (A. O. Walker, 1898) |
| saddleback shrimp | *Rhynocrangon alata* | (M. J. Rathbun, 1902) |
| glass shrimp | *Pasiphaea pacifica* | M. J. Rathbun, 1902 |
| shortscale eualid | *Eualus suckleyi* | (Stimpson, 1864) |
| sponge eualid | *Eualus sp. nov.* | none |
| doll eualid | *Eualus pusiolus* | (Krøyer, 1841) |
| striped eualid | *Eualus lineatus* | Wicksten and Butler, 1983 |
| pygmy eualid | *Eualus subtilis* | Carvacho and Olsen, 1984 |
| stout shrimp | *Heptacarpus brevirostris* | (Dana, 1852) |
| Stimpson's shrimp | *Heptacarpus stimpsoni* | Holthuis, 1947 |
| Kincaid's shrimp | *Heptacarpus kincaidi* | (M. J. Rathbun, 1902) |
| threespine shrimp | *Heptacarpus tridens* | (M. J. Rathbun, 1902) |
| slender shrimp | *Heptacarpus tenuissimus* | Holmes, 1900 |
| elegant coastal shrimp | *Heptacarpus decorus* | (M. J. Rathbun, 1902) |
| stiletto shrimp | *Heptacarpus stylus* | (Stimpson, 1864) |
| barred shrimp | *Heptacarpus pugettensis* | Jensen, 1983 |
| Sitka shrimp | *Heptacarpus sitchensis* | (Brandt, 1851 |
| grass shrimp | *Hippolyte clarki* | Chace, 1951 |

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|---|---|---|
| candy stripe shrimp | *Lebbeus grandimanus* | (Brazhnikov, 1907) |
| cleaner lebbeid | *Lebbeus sp. 1* | none |
| elusive lebbeid | *Lebbeus sp. 2* | none |
| spiny lebbeid | *Lebbeus groenlandicus* | (J. C. Fabricius, 1775) |
| deep blade shrimp | *Spirontocaris prionota* | (Stimpson, 1864) |
| Dana's blade shrimp | *Spirontocaris lamellicornis* | (Dana, 1852) |
| Snyder's blade shrimp | *Spirontocaris snyderi* | M. J. Rathbun, 1902 |
| slender bladed shrimp | *Spirontocaris holmesi* | Holthuis, 1947 |
| dagger-bladed shrimp | *Spirontocaris sica* | M. J. Rathbun, 1902 |
| coonstripe shrimp | *Pandalus danae* | Stimpson, 1857 |
| rough patch shrimp | *Pandalus stenolepis* | M. J. Rathbun, 1902 |
| humpback shrimp | *Pandalus hypsinotus* | Brandt, 1851 |
| yellowleg pandalid | *Pandalus tridens* | M. J. Rathbun, 1902 |
| spiny pink shrimp | *Pandalus eous* | Makarov, 1935 |
| humpy shrimp | *Pandalus goniurus* | Stimpson, 1860 |
| Pacific prawn | *Pandalus platyceros* | Brandt, 1851 |
| sidestripe shrimp | *Pandalopsis dispar* | (M. J. Rathbun, 1902) |
| sparkling shrimp | *Pandalopsis lucidirimicola* | Jensen, 1998 |
| undetermined shrimp | *undetermined* | none |
| bay ghost shrimp | *Neotrypaea californiensis* | (Dana, 1854) |
| blue mud shrimp | *Upogebia pugettensis* | (Dana, 1852) |
| green shore crab | *Hemigrapsus oregonensis* | (Dana, 1851) |
| purple shore crab | *Hemigrapsus nudus* | (Dana, 1851) |
| black-clawed crab | *Lophopanopeus bellus* | Stimpson, 1860) |
| pygmy rock crab | *Cancer oregonensis* | (Dana, 1852) |
| red rock crab | *Cancer productus* | J. W. Randall, 1840 |
| spot-bellied rock crab | *Cancer antennarius* | Stimpson, 1856 |
| Dungeness crab | *Cancer magister* | Dana, 1852 |
| graceful crab | *Cancer gracilis* | Dana, 1852 |
| tanner crab | *Chionoecetes bairdi* | M. J. Rathbun, 1924 |
| helmet crab | *Telmessus cheiragonus* | (Tilesius, 1812) |
| northern kelp crab | *Pugettia producta* | (J. W. Randall, 1840) |
| graceful kelp crab | *Pugettia gracilis* | Dana, 1851 |
| cryptic kelp crab | *Pugettia richii* | Dana, 1851 |
| foliate kelp crab | *Mimulus foliatus* | Stimpson, 1860 |
| Pacific lyre crab | *Hyas lyratus* | Dana, 1851 |
| sharpnose crab | *Scyra acutifrons* | Dana, 1851 |
| graceful decorator crab | *Oregonia gracilis* | Dana, 1851 |
| split-nose decorator crab | *Oregonia bifurcata* | M. J. Rathbun, 1902 |
| longhorn decorator crab | *Chorilia longipes* | Dana, 1851 |
| mantle pea crab | *Pinnixa faba* | (Dana, 1851) |
| gaper pea crab | *Pinnixa littoralis* | Holmes, 1894 |
| flattop crab | *Petrolisthes eriomerus* | Stimpson, 1871 |
| flat porcelain crab | *Petrolisthes cinctipes* | (J. W. Randall, 1840) |
| thickclaw porcelain crab | *Pachycheles rudis* | Stimpson, 1859 |
| pubescent porcelain crab | *Pachycheles pubescens* | Holmes, 1900 |
| undetermined porcelain crab | *Petrolisthes sp.* | Stimpson, 1858 |
| squat lobster or galatheid crab | *Munida quadrispina* | J. E. Benedict, 1902 |
| granular claw crab | *Oedignathus inermis* | (Stimpson, 1860) |
| hairy crab | *Hapalogaster mertensii* | Brandt, 1850 |
| hairy-spined crab | *Acantholithodes hispidus* | (Stimpson, 1860) |
| rhinoceros crab | *Rhinolithodes wosnessenskii* | Brandt, 1848 |

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|---|---|---|
| heart crab | *Phyllolithodes papillosus* | Brandt, 1848 |
| Puget Sound king crab | *Lopholithodes mandtii* | Brandt, 1848 |
| brown box crab | *Lopholithodes foraminatus* | (Stimpson, 1859) |
| scaled crab | *Placetron wosnessenskii* | Schalfeew, 1892 |
| butterfly crab | *Cryptolithodes typicus* | Brandt, 1848 |
| umbrella crab | *Cryptolithodes sitchensis* | Brandt, 1853 |
| grainyhand hermit | *Pagurus granosimanus* | (Stimpson, 1859) |
| blueband hermit | *Pagurus samuelis* | (Stimpson, 1857) |
| greenmark hermit | *Pagurus caurinus* | J. F. L. Hart, 1971 |
| hairy hermit | *Pagurus hirsutiusculus* | (Dana, 1851) |
| Quayle's hermit | *Pagurus quaylei* | J. F. L. Hart, 1971 |
| whiteknee hermit | *Pagurus dalli* | (J. E. Benedict, 1892) |
| Bering hermit | *Pagurus beringanus* | (J. E. Benedict, 1892) |
| bluespine hermit | *Pagurus kennerlyi* | (Stimpson, 1864) |
| orange hairy hermit | *Paguristes turgidus* | (Stimpson, 1856) |
| furry hermit | *Paguristes ulreyi* | Schmitt, 1921 |
| orange hermit | *Elassochirus gilli* | (J. E. Benedict, 1892) |
| widehand hermit | *Elassochirus tenuimanus* | (Dana, 1851) |
| Stevens' hermit | *Pagurus stevensae* | J. F. L. Hart, 1971 |
| blackeyed hermit | *Pagurus armatus* | (Dana, 1851) |
| Alaskan hermit | *Pagurus ochotensis* | Brandt, 1851 |
| splendid hermit | *Labidochirus splendescens* | (Owen, 1839) |
| brilliant hermit | *Parapagurodes hartae* | McLaughlin and Jensen, 1996 |
| tubeworm hermit | *Discorsopagurus schmitti* | (Stevens, 1925) |
| toothshell hermit | *Orthopagurus minimus* | (Holmes, 1900) |
| undetermined hermit | *undetermined* | none |
| small acorn barnacle | *Chthamalus dalli* | Pilsbry, 1916 |
| common acorn barnacle | *Balanus glandula* | Darwin, 1854 |
| crenate barnacle | *Balanus crenatus* | Bruguière, 1789 |
| rostrate barnacle | *Balanus rostratus* | Hoek, 1883 |
| molar barnacle | *Balanus rostratus apertus* | none |
| hydrocoral barnacle | *Solidobalanus engbergi* | (Pilsbry, 1921) |
| giant acorn barnacle | *Balanus nubilus* | Darwin, 1854 |
| thatched acorn barnacle | *Semibalanus cariosus* | (Pallas, 1788) |
| ridge-less barnacle | *Semibalanus balanoides* | (Linnaeus, 1767) |
| goose-neck barnacle | *Pollicipes polymerus* | Sowerby, 1833 |
| undetermined barnacle | *undetermined* | none |
| yellow hairy sea spider | *Tanystylum anthomasti* | none |
| giant sea spider | *Nymphon pixellae* | none |
| **Echinoderms** | **Echinodermata** | |
| purple star or ochre star | *Pisaster ochraceus* | (Brandt, 1835) |
| giant star | *Pisaster giganteus* | (Stimpson, 1857) |
| giant pink star | *Pisaster brevispinus* | (Stimpson, 1857) |
| mottled star | *Evasterias troschelii* | (Stimpson, 1862) |
| rainbow star | *Orthasterias koehleri* | (de Loriol, 1897) |
| black-spined sea star | *Lethasterias nanimensis* | (Verrill, 1914) |
| velcro star | *Stylasterias forreri* | (de Loriol, 1887) |
| leather star | *Dermasterias imbricata* | (Grube, 1857) |
| bat star | *Asterina miniata* | (Brandt, 1835) |
| vermilion star | *Mediaster aequalis* | Stimpson, 1857 |
| gunpowder star | *Gephyreaster swifti* | (Fisher, 1905) |
| cookie star | *Ceramaster patagonicus* | (Sladen, 1889) |

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|---|---|---|
| arctic cookie star | *Ceramaster arcticus* | (Verrill, 1909) |
| spiny red star | *Hippasteria spinosa* | Verrill, 1909 |
| thorny sea star | *Poraniopsis inflatus inflatus* | (Fisher, 1906) |
| crested sea star | *Lophaster furcilliger vexator* | (Fisher, 1911) |
| slime star | *Pteraster tesselatus* | Ives, 1888 |
| wrinkled star | *Pteraster militaris* | (O. F. Müller, 1776) |
| blood star | *Henricia leviuscula leviuscula* | (Stimpson, 1857) |
| fat blood star | *Henricia sanguinolenta* | (O. F. Müller, 1776) |
| ridged blood star | *Henricia aspera aspera* | none |
| dwarf mottled henricia | *Henricia sp. nov.* | none |
| pale star | *Leptychaster pacificus* | Fisher, 1906 |
| sand star | *Luidia foliolata* | Grube, 1866 |
| drab six-armed star | *Leptasterias hexactis species complex* | none |
| colourful six-armed star | *Leptasterias aequalis species complex* | none |
| sunflower star | *Pycnopodia helianthoides* | (Brandt, 1835) |
| rose star | *Crossaster papposus* | (Linnaeus, 1767) |
| morning sun star | *Solaster dawsoni* | Verrill, 1880 |
| orange sunstar | *Solaster paxillatus* | Sladen, 1889 |
| striped sun star | *Solaster stimpsoni* | Verrill, 1880 |
| northern sun star | *Solaster endeca* | (Linnaeus, 1771) |
| daisy brittle star | *Ophiopholis aculeata* | Linnaeus, 1767 |
| long-armed brittle star | *Amphiodia occidentalis* | Lyman, 1860 |
| dwarf brittle star | *Amphipholis squamata* | Delle Chiaje, 1828 |
| black and white brittle star | *Amphipholis pugetana* | Lyman, 1860 |
| notched brittle star | *Ophiura sarsii* | Lutken, 1855 |
| gray brittle star | *Ophiura lutkeni* | Lyman, 1860 |
| burrowing brittle star | *Amphiodia periercta* | H.L. Clark, 1911 |
| undetermined brittle star | *undetermined* | none |
| basket star | *Gorgonocephalus eucnemis* | (Müller and Troschel, 1842) |
| feather star | *Florometra serratissima* | A.H. Clark, 1907 |
| red sea urchin | *Strongylocentrotus franciscanus* | (A. Agassiz, 1863) |
| purple sea urchin | *Strongylocentrotus purpuratus* | (Stimpson, 1857) |
| green sea urchin | *Strongylocentrotus droebachiensis* | (O. F. Müller, 1776) |
| white sea urchin | *Strongylocentrotus pallidus* | (G. O. Sars, 1871) |
| heart urchin | *Brisaster latifrons* | (A. Agassiz, 1898) |
| excentric sand dollar | *Dendraster excentricus* | (Eschscholtz, 1831) |
| giant sea cucumber | *Parastichopus californicus* | (Stimpson, 1857) |
| giant orange sea cucumber | *Parastichopus leukothele* | Lambert, 1986 |
| red sea cucumber | *Cucumaria miniata* | (Brandt, 1835) |
| pale sea cucumber | *Cucumaria pallida* | none |
| stiff-footed sea cucumber | *Eupentacta quinquesemita* | (Selenka, 1867) |
| false white sea cucumber | *Eupentacta pseudoquinquesemita* | Deichmann, 1938 |
| burrowing sea cucumber | *Leptosynapta clarki* | Heding, 1928 |
| bent sea cucumber | *Thyone benti* | Deichmann, 1937 |
| salt and pepper sea cucumber | *Cucumaria piperata* | (Stimpson, 1864) |
| black sea cucumber | *Pseudocnus curatus* | none |
| tar spot sea cucumber | *Cucumaria pseudocurata* | Deichmann, 1938 |
| tiny black sea cucumber | *Cucumaria vegae* | Theel, 1886 |
| furry sea cucumber | *Thyonidium kurilensis* | none |
| white-dotted sea cucumber | *Chiridota albatrossii* | Edwards, 1907 |
| creeping pedal sea cucumber | *Psolus chitonoides* | H. L. Clark |
| pale creeping pedal sea cucumber | *Psolidium bidiscum* | none |

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|---|---|---|
| white creeping pedal sea cucumber | *Psolus squamatus* | (Koren, 1844) |
| undetermined sea cucumber | *undetermined sea cucumber* | none |
| **Tunicates** | **Urochordata** | |
| transparent tunicate | *Corella willmeriana* | Herdman, 1898 |
| brooding transparent tunicate | *Corella inflata* | none |
| sea vase | *Ciona savignyi* | none |
| glassy tunicate | *Ascidia paratropa* | (Huntsman, 1912) |
| sea blisters | *Ascidia columbiana / Ascidia callosa* | Stimpson, 1852 |
| California sea squirt | *Ascidia ceratodes* | (Huntsman, 1912) |
| tiny white tunicate | *Bathypera feminalba* | none |
| broadbase tunicate | *Cnemidocarpa finmarkiensis* | (Kiaer, 1893) |
| Pacific sea peach | *Halocynthia aurantium* | (Pallas, 1787) |
| bristly tunicate | *Halocynthia igaboja* | Oka, 1906 |
| warty tunicate | *Pyura haustor* | (Stimpson, 1864) |
| Aladdin's lamp tunicate | *Pyura mirabilis* | (Von Drasche, 1884) |
| brown tunicate | *Styela gibbsii* | (Stimpson, 1864) |
| club tunicate | *Styela clava* | Herdman, 1881 |
| stalked tunicate | *Styela montereyensis* | (Dall, 1872) |
| hairy tunicate | *Boltenia villosa* | (Stimpson, 1864) |
| spiny-tipped tunicate | *Boltenia echinata* | (Linnaeus, 1767) |
| disc-top tunicate | *Chelyosoma productum* | Stimpson, 1864 |
| transparent disc-top tunicate | *Chelyosoma columbianum* | Huntsman, 1912 |
| globular ascidian | *Molgula pacifica* | (Huntsman, 1912) |
| orange social tunicate | *Metandrocarpa taylori* | Huntsman, 1912 |
| yellow social tunicate | *Perophora annectens* | Ritter, 1893 |
| light-bulb tunicate | *Clavelina huntsmani* | Van Name, 1931 |
| yellow social ascidian | *Pycnoclavella stanleyi* | none |
| lobed compound tunicate | *Cystodytes lobatus* | none |
| mauve lobed compound tunicate | *Eudistoma purpuropunctatum* | none |
| mushroom compound tunicate | *Distaplia occidentalis* | Bancroft, 1899 |
| pale mushroom compound tunicate | *Aplidiopsis pannosum* | (Ritter, 1899) |
| stalked compound tunicate | *Distaplia smithi* | none |
| orange compound tunicate | *Ritterella pulchra* | (Oka, 1933) |
| California sea pork | *Aplidium californicum* | (Ritter and Forsyth, 1917) |
| red ascidian | *Aplidium solidum* | (Ritter and Forsyth, 1917) |
| stubby stalked compound tunicate | *Eudistoma sp. nov.* | none |
| red-dotted compound tunicate | *Eudistoma molle* | (Ritter, 1900) |
| gray encrusting compound tunicate | *Diplosoma listerianum* | none |
| Pacific white crust | *Didemnum carnulentum* | Ritter and Forsyth, 1917 |
| white glove leather | *Didemnum/Tridemnum complex* | none |
| invasive compound tunicate | *Didemnum sp. (Didemnum cf. lahillei)* | none |
| speckled compound tunicate | *Tridemnum alexi* | none |
| harbour star ascidian | *Botryllus schlosseri* | (Pallas, 1766) |
| lined compound ascidian | *Botrylloides violaceus* | none |
| peach-coloured compound tunicate | *Synoicum parfustis* | (Ritter and Forsyth, 1917) |
| undetermined compound tunicate | *undetermined* | none |
| **Acorn worms** | **Hemichordata** | |
| **Vertebrates** | **Chordata** | |
| bluntnose sixgill shark | *Hexanchus griseus* | (Bonnaterre, 1788) |
| Pacific spiny dogfish | *Squalus suckleyi* | (Girard, 1855) |
| longnose skate | *Raja rhina* | Jordan and Gilbert, 1880 |
| big skate | *Raja binoculata* | Girard, 1855 |

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|---|---|---|
| undetermined skate | *Raja sp.* | Linnaeus, 1758 |
| spotted ratfish | *Hydrolagus colliei* | (Lay and Bennett, 1839) |
| Pacific herring | *Clupea pallasii* | Valenciennes in Cuvier and Valenciennes, 184 |
| northern anchovy | *Engraulis mordax* | Girard, 1854 |
| longfin smelt | *Spirinchus thaleichthys* | (Ayres, 1860) |
| surf smelt | *Hypomesus pretiosus* | (Girard, 1854) |
| pink salmon | *Oncorhynchus gorbuscha* | (Walbaum, 1792) |
| chum salmon | *Oncorhynchus keta* | (Walbaum in Artedi, 1792) |
| pink or chum salmon | *Oncorhynchus sp.* | Suckley, 1861 |
| Chinook salmon | *Oncorhynchus tshawytscha* | (Walbaum in Artedi, 1792) |
| Coho salmon | *Oncorhynchus kisutch* | (Walbaum, 1792) |
| Chinook or coho salmon | *Oncorhynchus sp.* | Suckley, 1861 |
| undetermined salmon | *Oncorhynchus sp.* | Suckley, 1861 |
| threespine stickleback | *Gasterosteus aculeatus* | Linnaeus, 1758 |
| tubesnout | *Aulorhynchus flavidus* | Gill, 1861 |
| bay pipefish | *Syngnathus leptorhynchus* | Girard, 1854 |
| Pacific sandfish | *Trichodon trichodon* | (Tilesius, 1813) |
| Pacific sand lance | *Ammodytes hexapterus* | Pallas, 1814 |
| Pacific cod | *Gadus macrocephalus* | Tilesius, 1810 |
| Pacific tomcod | *Microgadus proximus* | (Girard, 1854) |
| walleye pollock | *Theragra chalcogramma* | (Pallas, 1814) |
| Pacific hake | *Merluccius productus* | (Ayres, 1855) |
| blackbelly eelpout | *Lycodes pacificus* | Collett, 1879 |
| red brotula | *Brosmophycis marginata* | (Ayres, 1854) |
| blackeye goby | *Rhinogobiops nicholsii* | (Bean, 1882) |
| bay goby | *Lepidogobius lepidus* | (Girard, 1858) |
| northern ronquil | *Ronquilus jordani* | (Gilbert, 1889) |
| snake prickleback | *Lumpenus sagitta* | Wilimovsky, 1956 |
| rock prickleback | *Xiphister mucosus* | (Girard, 1858) |
| black prickleback | *Xiphister atropurpureus* | (Kittlitz, 1858) |
| high cockscomb | *Anoplarchus purpurescens* | Gill, 1861 |
| slender cockscomb | *Anoplarchus insignis* | Gilbert and Burke, 1912 |
| mosshead warbonnet | *Chirolophis nugator* | (Jordan and Williams in Jordan and Starks, 18 |
| decorated warbonnet | *Chirolophis decoratus* | (Jordan and Snyder, 1902) |
| undetermined cockscomb | *Anoplarchus sp.* | Gill, 1861 |
| rockweed gunnel | *Apodichthys fucorum* | Jordan and Gilbert, 1880 |
| penpoint gunnel | *Apodichthys flavidus* | Girard, 1854 |
| crescent gunnel | *Pholis laeta* | (Cope, 1873) |
| saddleback gunnel | *Pholis ornata* | (Girard, 1854) |
| longfin gunnel | *Pholis clemensi* | Rosenblatt, 1964 |
| undetermined gunnel | *Pholis sp.* | Scopoli, 1777 |
| quillfish | *Ptilichthys goodei* | Bean, 1881 |
| wolf-eel | *Anarrhichthys ocellatus* | Ayres, 1855 |
| pile perch | *Rhacochilus vacca* | (Girard, 1855) |
| striped perch | *Embiotoca lateralis* | Agassiz, 1854 |
| kelp perch | *Brachyistius frenatus* | Gill, 1862 |
| shiner perch | *Cymatogaster aggregata* | Gibbons, 1854 |
| copper rockfish | *Sebastes caurinus* | Richardson, 1844 |
| quillback rockfish | *Sebastes maliger* | (Jordan and Gilbert, 1880) |
| brown rockfish | *Sebastes auriculatus* | Girard, 1854 |
| China rockfish | *Sebastes nebulosus* | Ayres, 1854 |
| yellowtail rockfish | *Sebastes flavidus* | (Ayres, 1862) |

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|---|---|---|
| black rockfish | *Sebastes melanops* | Girard, 1856 |
| blue rockfish | *Sebastes mystinus* | (Jordan and Gilbert, 1881) |
| bocaccio | *Sebastes paucispinus* | Ayres, 1854 |
| silvergray rockfish | *Sebastes brevispinus* | (Bean, 1884) |
| widow rockfish | *Sebastes entomelas* | (Jordan and Gilbert, 1880) |
| Puget Sound rockfish | *Sebastes emphaeus* | (Starks, 1911) |
| canary rockfish | *Sebastes pinniger* | (Gill, 1864) |
| vermilion rockfish | *Sebastes miniatus* | (Jordan and Gilbert, 1880) |
| tiger rockfish | *Sebastes nigrocinctus* | Ayres, 1859 |
| yelloweye rockfish | *Sebastes ruberrimus* | (Cramer, 1895) |
| splitnose rockfish | *Sebastes diploproa* | (Gilbert, 1890) |
| redstripe rockfish | *Sebastes proriger* | (Jordan and Gilbert, 1880) |
| greenstriped rockfish | *Sebastes elongatus* | Ayres, 1859 |
| undetermined rockfish | *Sebastes sp.* | Cuvier, 1829 |
| rock greenling | *Hexagrammos lagocephalus* | (Pallas, 1810) |
| kelp greenling | *Hexagrammos decagrammus* | (Pallas, 1810) |
| whitespotted greenling | *Hexagrammos stelleri* | Tilesius, 1810 |
| lingcod | *Ophiodon elongatus* | Girard, 1854 |
| painted greenling | *Oxylebius pictus* | Gill, 1862 |
| padded sculpin | *Artedius fenestralis* | Jordan and Gilbert, 1883 |
| smoothhead sculpin | *Artedius lateralis* | (Girard, 1854) |
| scalyhead sculpin | *Artedius harringtoni* | (Starks, 1896) |
| tidepool sculpin | *Oligocottus maculosus* | Girard, 1856 |
| calico sculpin | *Clinocottus embryum* | (Jordan and Starks, 1895) |
| rosylip sculpin | *Ascelichthys rhodorus* | Jordan and Gilbert, 1880 |
| manacled sculpin | *Synchirus gilli* | Bean, 1890 |
| longfin sculpin | *Jordania zonope* | Starks, 1895 |
| spinynose sculpin | *Radulinus taylori* | (Gilbert, 1912) |
| northern sculpin | *Icelinus borealis* | Gilbert, 1896 |
| spotfin sculpin | *Icelinus tenuis* | Gilbert, 1890 |
| fringed sculpin | *Icelinus fimbriatus* | Gilbert, 1890 |
| ribbed sculpin | *Triglops pingelii* | Reinhardt, 1837 |
| roughspine sculpin | *Triglops macellus* | (Bean, 1884) |
| slim sculpin | *Radulinus asprellus* | Gilbert, 1890 |
| darter sculpin | *Radulinus boleoides* | Gilbert in Jordan and Evermann, 1898 |
| roughback sculpin | *Chitonotus pugetensis* | (Steindachner, 1876) |
| spinyhead sculpin | *Dasycottus setiger* | Bean, 1890 |
| blackfin sculpin | *Malacocottus kincaidi* | Gilbert and Thompson, 1905 |
| tadpole sculpin | *Psychrolutes paradoxus* | Günther, 1861 |
| soft sculpin | *Psychrolutes sigalutes* | (Jordan and Starks, 1895) |
| cabezon | *Scorpaenichthys marmoratus* | (Ayres, 1854) |
| great sculpin | *Myoxocephalus polyacanthocephalus* | (Pallas, 1814) |
| buffalo sculpin | *Enophrys bison* | (Girard, 1854) |
| red Irish lord | *Hemilepidotus hemilepidotus* | (Tilesius, 1811) |
| Pacific staghorn sculpin | *Leptocottus armatus* | Girard, 1854 |
| undetermined sculpin | *Artedius sp.* | Girard, 1856 |
| grunt sculpin | *Rhamphocottus richardsonii* | Günther, 1874 |
| silverspotted sculpin | *Blepsias cirrhosus* | (Pallas, 1814) |
| sailfin sculpin | *Nautichthys oculofasciatus* | (Girard, 1858) |
| undetermined sculpin | *undetermined* | none |
| plainfin midshipman | *Porichthys notatus* | Girard, 1854 |
| northern clingfish | *Gobiesox maeandricus* | (Girard, 1858) |

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|---|---|---|
| marbled snailfish | *Liparis dennyi* | Jordan and Starks, 1895 |
| showy snailfish | *Liparis pulchellus* | Ayres, 1855 |
| undetermined snailfish | *Liparis sp.* | Scopoli, 1777 |
| Pacific spiny lumpsucker | *Eumicrotremus orbis* | (Günther, 1861) |
| spinycheek starsnout | *Asterotheca infraspinata* | (Gilbert, 1904) |
| blacktip poacher | *Xeneretmus latifrons* | (Gilbert, 1890) |
| pygmy poacher | *Odontopyxis trispinosa* | Lockington, 1880 |
| tubesnout poacher | *Pallasina barbata* | (Steindachner, 1876) |
| smooth alligatorfish | *Anoplagonus inermis* | (Günther, 1860) |
| northern spearnose poacher | *Agonopsis vulsa* | (Jordan and Gilbert, 1880) |
| sturgeon poacher | *Podothecus accipenserinus* | (Tilesius, 1813) |
| kelp poacher | *Hypsagonus mozinoi* | (Wilimovsky and Wilson, 1979) |
| rockhead | *Bothragonus swanii* | (Steindachner, 1876) |
| Pacific sanddab | *Citharichthys sordidus* | (Girard, 1854) |
| speckled sanddab | *Citharichthys stigmaeus* | Jordan and Gilbert, 1882 |
| arrowtooth flounder | *Atheresthes stomias* | (Jordan and Gilbert, 1880) |
| flathead sole | *Hippoglossoides elassodon* | Jordan and Gilbert, 1880 |
| slender sole | *Lyopsetta exilis* | (Jordan and Gilbert, 1880) |
| rock sole | *Lepidopsetta bilineata* | (Ayres, 1855) |
| English sole | *Parophrys vetulus* | Girard, 1854 |
| Dover sole | *Microstomus pacificus* | (Lockington, 1879) |
| rex sole | *Glyptocephalus zachirus* | Lockington, 1879 |
| sand sole | *Psettichthys melanostictus* | Girard, 1854 |
| starry flounder | *Platichthys stellatus* | (Pallas, 1788) |
| C-O sole | *Pleuronichthys coenosus* | Girard, 1854 |
| wandering garter snake | *Thamnophis elegans* | (Baird and Girard, 1853) |
| cormorant | *Phalacrocorax sp.* | Brisson, 1760 |
| common goldeneye | *Bucephala clangula* | (Linnaeus, 1758) |
| common merganser | *Mergus merganser* | Linnaeus, 1758 |
| harbour seal | *Phoca vitulina* | Linnaeus, 1758 |
| Steller sea lion | *Eumetopias jubata* | (Schreber, 1776) |
| California sea lion | *Zalophus californicus* | (Lesson, 1828) |
| killer whale | *Orcinus orca* | (Linnaeus, 1758) |
| gray whale | *Eschirichtius glaucus* | (Lilljeborg, 1861) |
| river otter | *Lutra canadensis* | (Schreber, 1777) |

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| Dr. Bill Austin | Khoyatan Marine Laboratory | Sponges |
| Mr. David Behrens | Sea Challengers | Nudibranchs, Univalves |
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| Dr. Chris Cameron | University of Victoria | Hemichordates |
| Mr. Roger Clark | Independent Consultant | Chitons |
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| Mr. David Denning | Independent Consultant | Bryozoans |
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| Mr. Rick Harbo | DFO (retired) | Chitons, Univalves, Bivalves |
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| Dr. Fumio Iwata | Kushiro Public University, Japan | Ribbon worms |
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| Mr. Kelly Sendall | Royal British Columbia Museum | |
| Dr. Bob Van Syoc | California Academy of Sciences | Barnacles |
| Dr. Gary Williams | California Academy of Sciences | Corals |
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| Mr. Bruce Whitaker | DFO | Copepods |

# 9. REFERENCES

Berry, H.D., Sewell, A. and Van Wagenen, B. (2001) Temporal Trends in the Areal Extent of Canopy-forming Kelp Beds Along the Strait of Juan de Fuca and Washington's Outer Coast, Puget Sound Research 2001, 2 pp.

Berry, H.D., Mumford, T.F. and Dowty, P. (2005) Using Historical Data to Estimate Changes in Floating Kelp (*Nereocystis luetkeana* and *Macrocystis integrifolia*) in Puget Sound, Washington, Washington Department of Natural Resources, Olympia, Washington, 5 pp.

Carlton, J.T. (ed.) (2007) The Light and Smith Manual, Fourth Edition, University of California Press, Berkeley and Los Angeles, California and London, England, ISBN 978-0-520-23939-5

Druehl, L. (2000) Pacific Seaweeds: A Guide to Common Seaweeds of the West Coast. Harbour Publishing, Madeira Park. 190 pp.

Lamb, A. and Edgell, P. (2010) Coastal Fishes of the Pacific Northwest (2nd edition), Harbour Publishing, Madeira Park, B.C., ISBN 978-1-55017-471-7

Lamb, A. and Hanby, B.P. (2005) Marine Life of the Pacific Northwest: a photographic encyclopedia. Harbour Publishing, Madeira Park, B.C., 398 pp.

Lindeberg, M.R. and Lindstrom, S.C. (2010) Field Guide to Seaweeds of Alaska, Alaska Sea Grant College Program, University of Alaska Fairbanks, ISBN 978-1-56612-156-9

Marliave, J.B., Conway, K.W., Gibbs, D.M., Gibbs, C.J. and Lamb, A. (2009) Biodiversity and rockfish recruitment in sponge gardens and bioherms in southern British Columbia, Canada, Marine Biology 156:2247-2254.

Martell, S.J.D., Walters, C.J., and Wallace, S.S. (2000) The use of marine protected areas for conservation of lingcod (*Ophiodon elongatus)*. Bulletin of Marine Science 66:729-743

Tomascik, T. and Robinson, C.L.K. (2000) Fish Assemblages of the southern Gulf Islands, BC: an analysis of recreational SCUBA dive log data. Research Links, 8(3): 11-13, 20.

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