

# Distribution Mapping and Analysis Portal (DisMAP)

## INTRODUCTION

### 1. Background

Understanding how species are distributed in space and time and the factors which drive spatial patterns in distribution and abundance are central questions in ecology and important for species conservation and management. In fisheries stock assessments species distribution knowledge is used to identify stock structure and boundaries. Species distribution information also comes into play when making large scale marine spatial planning decisions, such as Marine Protected Area designations, or locations of human activities such as off-shore wind-farms or shipping lanes. However, as climatic and environmental conditions change, fish species may see changes in their productivity or their preferred locale (Pinsky et al. 2013, Poloczanska et al. 2016, Barange et al. 2018). Shifts in species distributions are already occurring at alarming rates, with one estimate placing it at 72 km/decade on average (Poloczanska et al. 2013). Well known examples of these shifts include mackerel in the eastern Atlantic and blueline tilefish and black sea bass in the western Atlantic which have all seen northward shifts in their distributions.

These shifts in distribution pose a central challenge to fisheries managers (Karp et al. 2019) as they can and already are having significant impacts on key management decisions. For instance, if a species moves out of its historical range, it may not be adequately sampled by research surveys, leading to biases in the index of abundance obtained from the survey data. Another complication can occur when a species shifts across management boundaries. This can be particularly challenging when the species is new to the management area into which it is shifting, and therefore no management regime is in place for it. Allocation also becomes an issue when species shift across management boundaries, as the fishermen in the species' historic range may want to maintain their historical allocation, and the fishermen in the area into which it has moved may also wish to be allocated some quota.

Given the potential impacts of shifting distributions on sustainable fisheries management, marine spatial planning and the cross-jurisdictional nature of the issue, it is crucial that scientists and managers have access to information on historic and projected stock distributions for use in decision-making. In a 2016 questionnaire, information on shifts in fish distributions ranked in the top two most important information needs among both fishers and non-fishers (MAFAC 2017). Although NMFS and partners collect extensive information on the distribution of species through surveys, and are increasingly conducting research into the distributions of fish stocks, this information is not currently available in a consistent, useful, easy to access format across regions. Species distribution modeling (SDM) analysis is done within a region on an ad hoc basis for specific stocks, generally relying on data from surveys from within that region. The primary public outlet for much of this SDM research is through peer-reviewed publications, ecosystem status reports, and/or stock assessment reports. However, there are several examples of online platforms which present species distribution modeling results to the public and resource managers, such as [OceanAdapt](#) and [Mid-Atlantic Ocean Data Portal](#). These portals have shown promise as decision support tools for fisheries managers, however these existing platforms and outlets do not enable easy

comparison between stocks within and across regions, or for the interactive exploration of results. Additionally, the SDM results and information are scattered between these various outlets making it challenging to find and compare information across stocks and regions.

Considering the large amounts of research on understanding species distributions, advancements in species distribution modeling, the clear management implications of shifting distributions, and the cross-jurisdictional nature of the issue, NMFS initiated development of a new portal building off of existing platforms to pull together the wealth of information on species distributions and provide robust information on marine species distributions to support science and management spanning across regions. The goal of the portal is to enable improved data integration, access to model results, and knowledge sharing across regions, to enhance not only NMFS ability to track species distribution shifts as they move across management boundaries or out of or into survey domains, but to also track NMFS progress and efforts to understand and account for these shifts.

This NMFS Technical Memorandum summarizing the data processing, quality control, analyses, and content of the DisMAP as of **March 31<sup>st</sup>, 2022**.

## 2. Revision History

March 2022: Portal published.

# SPECIES DISTRIBUTION PRODUCTS

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## 3. Data sources and Data Processing

In this first version of the portal all species distribution products are derived from the NMFS Regional Bottom Trawl Survey data, and do not take into account alternative sources of fisheries data such as long-line surveys, plankton surveys, or fishery-dependent surveys. Because of this, distribution products are not able to be developed for the Pacific Islands or Caribbean regions at this time as those regions do not have bottom-trawl surveys; however this is an area of interest for future releases (see Future Directions section). The trawl survey data is available in regional databases (see Table 1) in many different tables and formats. When more than one survey is conducted in a region (e.g. spring, summer, and fall) we analyze each season separately.

The first step in making this data available in DisMAP and in a format which can be used to develop the subsequent species distribution products, is compiling and processing the data into a standard format with common data structure and variable names. This was carried out using an R script originally developed by the Ocean Adapt team at Rutgers University (OceanAdapt 2021) and modified to meet the needs of DisMAP. For each survey data set, the code corrects for errors such as typos in species names, rows with column headers in them (e.g. Alaska), and changes -9999 to NA. The code also combines the various tables for each region, removes unnecessary columns, and renames columns as necessary to have standard column names across the regions. Additionally, for three regions (Southeast, West Coast (annual and triennial), and Gulf of Mexico) the wtcpue is not reported and therefore is calculated in the R script. This involves calculating the area swept for each haul associated with each weight, and then dividing the weight by the calculated area swept, to get the weight per unit effort. To ensure that changes in survey extent over time do not

<b>Region</b>	<b>Season</b>	<b>Duration</b>	<b>Taxa &gt; 3/4 of years</b>	<b>Taxa &gt; 1x/year</b>	<b>Data filtering notes</b>	<b>Data Source</b>
Aleutian Islands	Summer	1983-2018	132	51	none	<a href="https://www.fisheries.noaa.gov/alaska/commercial-fishing/alaska-groundfish-bottom-trawl-survey-data#all-alaska-groundfish-bottom-trawl-survey-data-sets">https://www.fisheries.noaa.gov/alaska/commercial-fishing/alaska-groundfish-bottom-trawl-survey-data#all-alaska-groundfish-bottom-trawl-survey-data-sets</a>
Eastern Bering Sea	Summer	1982-2019	125	64	remove strata 90, 82	
Gulf of Alaska	Summer	1984-2019	181	97	remove year 2001; strata > 510	
West Coast Triennial	Summer	1977-2004	93	69	keep only strata sampled all 10 years of survey	<a href="https://www.webapps.nwfsc.noaa.gov/data/map">https://www.webapps.nwfsc.noaa.gov/data/map</a>
West Coast Annual	Summer	2003-2018	312	216	Remove year 2019; strata sampled in 14 of the 16 years	
Gulf of Mexico	Summer	1982-2019	356	179	keep years >= 2008; keep strata sampled 11 of years 2008-2019	<a href="https://seamap.gsmfc.org/">https://seamap.gsmfc.org/</a>
Southeast U.S. Shelf	Fall	1989-2019	105	77	remove years 1986, 1978, 2018, 2019	<a href="http://www.seamap.org/datapage.html">http://www.seamap.org/datapage.html</a>
	Spring	1989-2019	99	63	keep only strata sampled all years of survey	
	Summer	1989-2019	96	71	none	
Northeast U.S. Shelf	Fall	1963-2019	95	55	keep years > 1973, dropped 2017; keep strata sampled all years	<a href="https://www.fisheries.noaa.gov/inport/item/22560">https://www.fisheries.noaa.gov/inport/item/22560</a>
	Spring	1968-2019	73	53	keep years > 1973, drop 2020, 2014, 1975; keep strata sampled all years	<a href="https://www.fisheries.noaa.gov/inport/item/22561">https://www.fisheries.noaa.gov/inport/item/22561</a>

**Table 1: NOAA Fisheries bottom trawl surveys compiled for this analysis**, including season of the survey, duration, number of taxa sampled in at least 3/4th of the survey years or at least once every year, notes on which strata and years were kept or removed through the data processing, and links to the original data source for each survey.

impact the estimate of distribution shifts, we also standardize each survey to a consistent spatial footprint by removing strata which have poor temporal coverage. Years with poor sampling coverage are also removed from the dataset used for analysis (see Table 1 for notes on data filtering in each region). In Alaska and the West Coast, we combine some species into species complexes due to difficulty in distinguishing them to the species level and/or to keep consistency with how they are assessed for management purposes.

After this data cleaning process, the following standard set of columns are selected for each region: region, haulid, year, lat, lon, stratum, stratumarea, depth, spp, wtcpue. At this point the cleaned and filtered regional datasets are combined into one table, and a final taxonomic QA/QC is conducted. This QA/QC involves removing higher taxon codes (such as family or order level classifications), which are generally used as a ‘catch all’ for hard to identify specimens within those families or orders, and species that are poorly sampled by the trawl gear (see Appendix I for list of taxon removed). The data is further trimmed to only include species which are caught in at least 3/4th of the survey years in each region (see Appendix II for complete list of retained species). Lastly, the dataset is expanded to include zeros for when a species that is found in the region is not caught in a particular trawl. The compiled, filtered, trimmed and zero expanded dataset is then sent through a Python script to provide the spatial distribution products described in the following sections.

## 4. Bubble Plot

Each raw observation of wtcpue for a species from the compiled dataset is provided and can be plotted as a circle on the map, where the circle size is proportional to the wtcpue (kg per tow).

## 5. Interpolated Biomass Distributions

The distribution surface is generated by using the inverse distance weighting (IDW) interpolation method in a Python script. The IDW approach is used as it is a simple, relatively easy approach to apply across the large number of species analyzed from the bottom trawl surveys. The approach makes it possible to predict and interpolate unobserved densities at any location in the survey area. For this approach the wtcpue data from the compiled dataset described in section 2.1 is cube-root transformed prior to interpolation, and transformed back to original units (cubed back to kg/tow (wtcpue) values) for all further analysis described below. However, the raster displayed on the map is the cubed root values for improved visualization. Interpolation weights in IDW are computed as a function of the distance between observed sample sites and the site at which the prediction is to be made, with the weight being the inverse distance raised to the power of 2. The search radius used with IDW was 200,000 m (200 km), with 10 being the minimum and 15 being the maximum number of sampling sites included in the interpolation.

In addition to spatial weighting, the IDW approach used here includes temporal weighting. A five year window of data is used, with data from the mapped year having the highest weight in the interpolation and data from 2 years prior to and after the mapped year having much lower weights. This weighting is determined as follows:

$$\text{YearWeights} = 3 - (\text{abs}(\text{Tc} - \text{Ti}))$$

where  $T_c$  is the year being mapped  $T_i$  is the year of the samples. This year weighting is then applied to the weighting scheme by multiplying the year weighting by the distance weighting in the mapping. Note for surveys that don't sample annually (e.g. West Coast Tri-annual, Aleutian islands, Gulf of Alaska) this weighting results in the use of only the data for the year being mapped, as the other years are further than 2 years out on either side of the year being mapped so are given a weight of zero. The interpolation is carried out using a 2km x 2km pixel cell size, and the interpolation boundaries are determined by a combination of examination of the full survey footprint and available observations from the trimmed dataset (e.g. in some regions the full survey footprint is trimmed to account for the removal of certain strata from the dataset due to poor temporal coverage in those strata). It is important to note that the choices of weighting, transformation, and pixel cell size, can have significant impacts on the resulting interpolation surfaces.

## 6. Single Species Distribution Metrics

### 6.1. Latitudinal center of gravity

The latitudinal center of gravity is the center of a population's distribution as indicated by the average latitude weighted by the biomass at each latitude within the survey domain. It is the geographic center of the total weight of the entire population. This metric is calculated using a Python script after the interpolated distribution surface is generated. The latitudinal center of gravity is the mean latitude of the species distribution, where each raster cell latitude is weighted by the value of wtcpue for that cell. This is shown in the formula below:

$$\text{COG}_{\text{year}} = \frac{\sum_{i=1}^k (d_i \times t_i)}{\sum_{i=1}^k t_i}$$

where  $d_i$  is a value of latitude associated with a raster (estimation) grid cell  $i$ .  $t_i$  denotes predicted (interpolated) wtcpue value at each raster (estimation) grid  $i$ .  $k$  is the total number of estimation grid cells in the study area. The result is one COG value for each year in the time series, for each species.

### 6.2. Range Limits

The species range limits are the geographic boundary beyond which a species does not occur. This can also be thought of as a measure of the location of the leading and trailing edges of a species' range. This metric is calculated based on the interpolated biomass raster layers. The min latitude (southern range limit) is the latitude where 95% of the species distribution/biomass (or latitudes where wtcpue >0) are north or this value (so it's the 5<sup>th</sup> percentile), and the max latitude (northern range limit) is the lat where 95% of the species biomass is south of (below) this latitude.

### 6.3. Depth center of gravity

This metric is similar to the latitudinal center of gravity, but instead of being the average latitude weighted by biomass, it is the average depth weighted by biomass. This metric is calculated in Python after the interpolated distribution surface is generated. It is the mean depth where each raster cell depth,

taken from bathymetry values within each 2 km grid cell, is weighted by the value of wtcpue for that cell, and follows the same formulation as Lat COG, but the di value is the depth of the grid cell, instead of lat. The result is one depth value for each year in the time series, for each species. For this calculation bathymetry data for each region to provide a depth value for each raster cell is obtained from the Alaska Region for the Aelution Islands, Eastern Bering Sea, and the Gulf of Alaska and GEBCO (GEBCO 2021) for the remaining regions.

#### 6.4. Area Analysis

This analysis is conducted based on the interpolated distribution surface layers, and is done in real-time based on user selected species and either selected or drawn area of interest. Two area analysis are calculated as:

- a. the proportion of the selected area where the species is present (i.e.,  $wtcpue > 0$  (or some other threshold?)). Area of grid cells within selected area where  $wtcpue > 0$  divided by total area of selected area (in km<sup>2</sup>).

$$= A_{\text{area,species}} / A_{\text{area}}$$

- b. the proportion of the species biomass distribution found in (or covered by) the area of interest. This is calculated by summing the biomass for grid cells found within the area of interest, and dividing by the total biomass of the species in each year.

$$= \text{Biomass}_{\text{area,species}} / \text{Biomass}_{\text{species}}$$

### 7. Regional Summary Products

#### 7.1. Species Richness Maps

Species richness maps are calculated for each region separately, and display the number of species present in each raster cell within a given region's survey domain. These maps are calculated by stacking each individual species' IDW biomass raster layers and counting the total number of species present in each cell. A species is considered present in a cell if the  $wtcpue > 0$ . It's important to note that these maps provide the predicted species richness, or number of species expected to encounter in the trawl survey at a given location, and do not reflect the species richness for the ecosystem as a whole.

#### 7.2. Distribution Metric Regional Averages

For each region the average change in center of biomass is calculated (in terms of both Latitude and Depth) of a core set of species, defined as species that are caught every year in the survey. This is done by calculating the 'offset' or difference between each year's center of gravity and that of the starting year. Thus the first year is standardized to zero and all other years are calculated as the difference from that starting year. The annual average of these individual species offsets is then calculated for the core set of species in each region, and then plotted on a time-series graph to enable evaluation of the overall change in center of biomass of species for a given region.

## FUTURE DIRECTIONS

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### 8. Additional data types

This first release focuses on fisheries-independent bottom trawl survey data in the US, but future iterations of the portal will seek to include additional survey data and model outputs both with the US regions and Canada. A key priority for future iterations of the portal is to bring in additional survey data beyond the bottom trawl surveys. This will enable the portal to be applicable to more regions; for instance, efforts are underway to bring in the Pacific Islands Bottom Fish Independent Survey (BFISH). In addition to expanding the surveys covered in this portal, we will also be exploring ways to bring in results of environmentally-linked species distribution models for display within the portal. Incorporating these model outputs not only will serve to improve access to and sharing of model code and results, but will also enable us to present predicted future shifts in distributions.

Additionally, we will build off of existing partnerships between the Ocean Adapt team and Canadian researchers in the Department of Fish and Oceanography (DFO) to explore ways to incorporate Canadian survey data and models into the portal. Our goal with working to incorporate these additional data sources and types is to help advance a community of practice among researchers and managers from around the U.S. and internationally who deal with the issue of shifting species distributions.

## 9. Additional functionality

### 9.1. Multispecies overlap analysis

We expect species interactions and community composition to change along with climate-driven distribution shifts in individual species (Santora et al. 2017, Pinsky et al. 2020). These changes in species interactions can lead to changes in the productivity of predators and prey. For example, the expansion of Atlantic cod into Arctic waters resulted in increased overlap with its prey which enabled greater reproductive potential and higher biomass of cod (Howell and Filin 2014). However, in the case of walleye pollock, increased overlap with a key predator, arrowtooth flounder, resulted in higher mortality of juvenile walleye pollock (Hunsicker et al. 2013). Therefore, enabling multispecies analysis and exploration of changes in species overlap and interactions is important, as species are unlikely to shift their distributions in isolation. Future iterations of the portal will enable users to explore species interactions, such as area or range overlap, within an area of interest and evaluate how those interactions have or may change over time.

### 9.2. Species shifts & human interactions

As species distributions shift, target species biomass may become less available to ports that have historically targeted a species, and more available to others. Changes in species distribution can also exacerbate or mitigate the effects of regional stock declines (or increases) for specific ports (Selden et al. 2019). To allow users to examine how shifting species distributions will alter availability to focal ports, a future module will be developed to allow users to choose a target species, a port of interest, and a specified radius from port. The analysis will then calculate the sum of the predicted biomass within the radius of the selected port as a metric of availability to port. Users will be able to examine how availability to ports has changed or is projected to change under future conditions for different ports.

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## APPENDIX I: REMOVED TAXON

<b>Region Dataset</b>	<b>Taxon name</b>	<b>Common Name</b>
Aleutian Islands	Actiniaria	Anemones
Aleutian Islands	Ammodytes sp.	Na
Aleutian Islands	Anthomastus sp.	Na
Aleutian Islands	Asciidiacea	Tunicates
Aleutian Islands	Asteroidea	Sea stars
Aleutian Islands	Balanus sp.	Barnacle
Aleutian Islands	Bathyplotes sp.	Sea cucumber
Aleutian Islands	Beringius sp.	True whelks
Aleutian Islands	Bryozoa	Bryozoan shrimp
Aleutian Islands	Buccinum sp.	True whelks
Aleutian Islands	Careproctus sp.	Snailfishes
Aleutian Islands	Ceramaster sp.	Cookie star
Aleutian Islands	Chlamys sp.	Scallops
Aleutian Islands	Decapodiformes	Squids
Aleutian Islands	Eunoe sp.	Na
Aleutian Islands	Gastropoda	Gastropods
Aleutian Islands	Gorgonacea	Soft corals
Aleutian Islands	Henricia sp.	Sea star
Aleutian Islands	Hippasteria sp.	Na
Aleutian Islands	Hirudinea	Na
Aleutian Islands	Holothuroidea	Sea cucumbers
Aleutian Islands	Hydroidolina	Na
Aleutian Islands	Isopoda	Pill bugs, wood lice and sea slaters
Aleutian Islands	Leptasterias sp.	Six-rayed sea stars
Aleutian Islands	Liparidae	Snailfishes
Aleutian Islands	Myctophidae	Lanternfishes
Aleutian Islands	Neptunea sp.	True whelks
Aleutian Islands	Nudibranchia	Nudibranchs
Aleutian Islands	Octopodidae	Octopuses
Aleutian Islands	Ophiuroidea	Brittle stars
Aleutian Islands	Polychaeta	Polychaetes
Aleutian Islands	Polynoidae	Scaleworms
Aleutian Islands	Porifera	Sponges
Aleutian Islands	Psolus sp.	Sea cucumber
Aleutian Islands	Pteraster sp.	Slime stars
Aleutian Islands	Scyphozoa	Jellyfishes
Aleutian Islands	Sebastes sp.	Rockfishes
Aleutian Islands	Sipuncula	Peanut worms
Aleutian Islands	Solaster sp.	Sea stars
Aleutian Islands	Solaster sp. A (Clark 1997)	Na
Aleutian Islands	Stenobrachius sp.	Na

Aleutian Islands	Stylaster sp.	Na
Aleutian Islands	Thaliacea	Pelagic tunicates
Aleutian Islands	Volutopsis sp.	True whelks
Eastern Bering Sea	Actiniaria	Anemones
Eastern Bering Sea	Ammodytes sp.	Na
Eastern Bering Sea	Aphroditidae	Sea mice
Eastern Bering Sea	Aplidium sp. A (Clark 2006)	Ascidians
Eastern Bering Sea	Argis sp.	Argid shrimps
Eastern Bering Sea	Asciacea	Tunicates
Eastern Bering Sea	Beringius sp.	True whelks
Eastern Bering Sea	Bivalvia	Bivalves
Eastern Bering Sea	Boltenia sp.	Sea squirt
Eastern Bering Sea	Bryozoa	Bryozoan shrimp
Eastern Bering Sea	Buccinum sp.	True whelks
Eastern Bering Sea	Chionoecetes hybrid	Snow crabs
Eastern Bering Sea	Chlamys sp.	Scallops
Eastern Bering Sea	Clinocardium sp.	Nuttall cockle
Eastern Bering Sea	Colus sp.	True whelks
Eastern Bering Sea	Crangon sp.	Shrimps
Eastern Bering Sea	Ctenodiscus crispatus	Mud star
Eastern Bering Sea	Gastropoda	Gastropods
Eastern Bering Sea	Gersemia sp.	Sea strawberry
Eastern Bering Sea	Halocynthia sp.	Tunicates
Eastern Bering Sea	Henricia sp.	Sea star
Eastern Bering Sea	Holothuroidea	Sea cucumbers
Eastern Bering Sea	Hydroidolina	Na
Eastern Bering Sea	Leptasterias sp.	Six-rayed sea stars
Eastern Bering Sea	Macoma sp.	Tellins
Eastern Bering Sea	Metridium sp.	Plumose anemones
Eastern Bering Sea	Neptunea sp.	True whelks
Eastern Bering Sea	Nudibranchia	Nudibranchs
Eastern Bering Sea	Octopodidae	Octopuses
Eastern Bering Sea	Ophiuroidea	Brittle stars
Eastern Bering Sea	Paguridae	Right-handed hermit crabs
Eastern Bering Sea	Pennatulacea	Sea panzies
Eastern Bering Sea	Plicifusus sp.	Na
Eastern Bering Sea	Polychaeta	Polychaetes
Eastern Bering Sea	Porifera	Sponges
Eastern Bering Sea	Psolus sp.	Sea cucumber
Eastern Bering Sea	Pteraster sp.	Slime stars
Eastern Bering Sea	Scyphozoa	Jellyfishes
Eastern Bering Sea	Serripes sp.	Cockle
Eastern Bering Sea	Sipuncula	Peanut worms
Eastern Bering Sea	Solaster sp.	Sea stars

Eastern Bering Sea	Thoracica	Barnacles
Eastern Bering Sea	Urticina sp.	Na
Eastern Bering Sea	Volutopsis sp.	True whelks
Gulf of Alaska	Actiniaria	Anemones
Gulf of Alaska	Ammodytes sp.	Na
Gulf of Alaska	Aphroditidae	Sea mice
Gulf of Alaska	Argis sp.	Argid shrimps
Gulf of Alaska	Asciidiacea	Tunicates
Gulf of Alaska	Asteroidea	Sea stars
Gulf of Alaska	Balanus sp.	Barnacle
Gulf of Alaska	Bathyplotes sp.	Sea cucumber
Gulf of Alaska	Bivalvia	Bivalves
Gulf of Alaska	Brachiopoda	Brachiopods
Gulf of Alaska	Bryozoa	Bryozoan shrimp
Gulf of Alaska	Buccinum sp.	True whelks
Gulf of Alaska	Ceramaster sp.	Cookie star
Gulf of Alaska	Chauliodontinae	Viperfishes
Gulf of Alaska	Chlamys sp.	Scallops
Gulf of Alaska	Crangon sp.	Shrimps
Gulf of Alaska	Crossaster sp.	Sunstar
Gulf of Alaska	Ctenophora	Na
Gulf of Alaska	Decapodiformes	Squids
Gulf of Alaska	Echinacea	Sea urchin
Gulf of Alaska	Gastropoda	Gastropods
Gulf of Alaska	Henricia sp.	Sea star
Gulf of Alaska	Hexactinellida	Sea sponge
Gulf of Alaska	Holothuroidea	Sea cucumbers
Gulf of Alaska	Hydroidolina	Na
Gulf of Alaska	Isopoda	Pill bugs, wood lice and sea slaters
Gulf of Alaska	Liparidae	Snailfishes
Gulf of Alaska	Luidia foliolata	Sand star
Gulf of Alaska	Metridium sp.	Plumose anemones
Gulf of Alaska	Modiolus modiolus	Northern horse mussel
Gulf of Alaska	Myctophidae	Lanternfishes
Gulf of Alaska	Neptunea pribiloffensis	Pribilof whelk
Gulf of Alaska	Neptunea sp.	True whelks
Gulf of Alaska	Nudibranchia	Nudibranchs
Gulf of Alaska	Octopodidae	Octopuses
Gulf of Alaska	Ophiuroidea	Brittle stars
Gulf of Alaska	Osmeridae	Smelts
Gulf of Alaska	Paguridae	Right-handed hermit crabs
Gulf of Alaska	Pagurus ochotensis	Alaskan hermit crab
Gulf of Alaska	Pagurus sp.	Hermit crabs
Gulf of Alaska	Pandalus sp.	Shrimp

Gulf of Alaska	Pennatulacea	Sea panzies
Gulf of Alaska	Polychaeta	Polychaetes
Gulf of Alaska	Polyplacophora	Chitons
Gulf of Alaska	Porifera	Sponges
Gulf of Alaska	Psolus sp.	Sea cucumber
Gulf of Alaska	Pteraster sp.	Slime stars
Gulf of Alaska	Pteraster tesselatus	Cushion star
Gulf of Alaska	Scyphozoa	Jellyfishes
Gulf of Alaska	Sebastes sp.	Rockfishes
Gulf of Alaska	Solaster sp.	Sea stars
Gulf of Alaska	Stenobrachius sp.	Na
Gulf of Alaska	Thaliacea	Pelagic tunicates
Gulf of Alaska	Thoracica	Barnacles
Gulf of Alaska	Tritonia sp.	Nudibranch
Gulf of Mexico	APLYSIA	Na
Gulf of Mexico	ASCIDIACEA	Na
Gulf of Mexico	ASTROPECTEN	Na
Gulf of Mexico	AURELIA	Moon jellies
Gulf of Mexico	BOTHUS	Na
Gulf of Mexico	CALLIACTIS	Na
Gulf of Mexico	CARETTA CARETTA	Loggerhead sea turtle
Gulf of Mexico	CLYPEASTER	Sea biscuits
Gulf of Mexico	CONUS	Na
Gulf of Mexico	CYNOSCIION	Weakfishes
Gulf of Mexico	ECHINASTER	Na
Gulf of Mexico	EUCINOSTOMUS	Mojarras
Gulf of Mexico	HALIEUTICHTHYS	Na
Gulf of Mexico	HOLOTHURIA	Na
Gulf of Mexico	HOLOTHUROIDEA	Sea cucumbers
Gulf of Mexico	LOLIGO	Loligo squids
Gulf of Mexico	LUIDIA	Na
Gulf of Mexico	MOLPADIA	Na
Gulf of Mexico	OPHIDION	Na
Gulf of Mexico	OPHIOTHRIX	Na
Gulf of Mexico	OPSANUS	Na
Gulf of Mexico	POLYCHAETA	Na
Gulf of Mexico	PORIFERA	Sponges
Gulf of Mexico	PORIFERBALL	Na
Gulf of Mexico	PORIFERBARREL	Na
Gulf of Mexico	PORIFERENCOTH	Na
Gulf of Mexico	PORIFERFINBRA	Na
Gulf of Mexico	PORIFERVASTUB	Na
Gulf of Mexico	SICYONIA	Na
Gulf of Mexico	SOLENOCERA	Shrimps

Gulf of Mexico	TRACHYPENEUS	Trachypeneid shrimps
Gulf of Mexico	TUNICATA	Na
Northeast US Fall	MACROURIDAE	Na
Northeast US Fall	MYCTOPHIDAE	Lanternfishes
Northeast US Spring	MACROURIDAE	Na
Northeast US Spring	MYCTOPHIDAE	Lanternfishes
Southeast US Fall	CARETTA CARETTA	Loggerhead sea turtle
Southeast US Spring	CARETTA CARETTA	Loggerhead sea turtle
Southeast US Summer	CARETTA CARETTA	Loggerhead sea turtle
West Coast Annual	Actiniaria	Anemones
West Coast Annual	Aphrodisia	Na
West Coast Annual	Asteroidea	Sea stars
West Coast Annual	Aurelia	Na
West Coast Annual	Benthoctopus	Na
West Coast Annual	Brachiopoda	Brachiopods
West Coast Annual	Brisaster	Na
West Coast Annual	Ceramaster	Na
West Coast Annual	Chrysaora	Na
West Coast Annual	Corallimorphus	Na
West Coast Annual	Crangon	Na
West Coast Annual	Florometra	Na
West Coast Annual	Gastropoda	Gastropods
West Coast Annual	Gorgonacea	Soft corals
West Coast Annual	Halipterus	Na
West Coast Annual	Henricia	Na
West Coast Annual	Hexactinosida	Sponge
West Coast Annual	Hormathiidae	Sea anemone
West Coast Annual	Invertebrata	Invertebrate
West Coast Annual	Isopoda	Pill bugs, wood lice and sea slaters
West Coast Annual	Mediaster	Na
West Coast Annual	Myctophidae	Lanternfishes
West Coast Annual	Myxinidae	Hagfishes
West Coast Annual	Neptunea	Na
West Coast Annual	Nudibranchia	Nudibranchs
West Coast Annual	Ophiopholis	Na
West Coast Annual	Ophiurida	Na
West Coast Annual	Paguridae	Right-handed hermit crabs
West Coast Annual	Pennatulacea	Sea pen
West Coast Annual	Porifera	Sponges
West Coast Annual	Pseudarchaster	Na
West Coast Annual	Pteraster	Na
West Coast Annual	Rossellinae	Sea sponge
West Coast Annual	Scyphozoa	Jellyfishes
West Coast Annual	Sebastodes	Rockfishes

West Coast Annual	Sipuncula	Peanut worms
West Coast Annual	Solaster	Na
West Coast Annual	Stomphia	Na
West Coast Annual	Strongylocentrotus	Na
West Coast Annual	Terebratellacea	Brachiopod
West Coast Annual	Thaliacea	Pelagic tunicates
West Coast Annual	Tunicata	Tunicates
West Coast Annual	unsorted shab	Na
West Coast Annual	Urticina	Na
West Coast Triennial	Actiniaria	Anemones
West Coast Triennial	Aphroditidae	Sea mice
West Coast Triennial	Asteroidea	Sea stars
West Coast Triennial	Brachiopoda	Brachiopods
West Coast Triennial	Cottidae	Sculpins
West Coast Triennial	Decapodiformes	Squids
West Coast Triennial	Echinacea	Sea urchin
West Coast Triennial	Gastropoda	Gastropods
West Coast Triennial	Holothuroidea	Sea cucumbers
West Coast Triennial	Myctophidae	Lanternfishes
West Coast Triennial	Nudibranchia	Nudibranchs
West Coast Triennial	Octopodidae	Octopuses
West Coast Triennial	Paguridae	Right-handed hermit crabs
West Coast Triennial	Pennatulacea	Sea panzies
West Coast Triennial	Porifera	Sponges
West Coast Triennial	Scyphozoa	Jellyfishes
West Coast Triennial	Sebastes sp.	Rockfishes
West Coast Triennial	Solaster sp.	Sea stars
West Coast Triennial	Thaliacea	Pelagic tunicates

**APPENDIX II: LIST OF THE 943 UNIQUE SPECIES RETAINED AND PRESENTED  
ON DISMAP**

Species Scientific Name	Common Name
<i>Acantholithodes hispidus</i>	Spiny lithode crab
<i>Anoplopoma fimbria</i>	Sablefish
<i>Aphrocallistes vastus</i>	Cloud sponge
<i>Aptocyclus ventricosus</i>	Smooth lump sucker
<i>Arctomelon stearnsii</i>	Alaska volute
<i>Atheresthes stomias</i> and <i>A. evermanni</i>	Arrowtooth and kamchatka flounders
<i>Bathyagonus nigripinnis</i>	Blackfin poacher
<i>Bathymaster caeruleofasciatus</i>	Alaskan ronquil
<i>Bathymaster signatus</i>	Searcher
<i>Bathyraja</i> spp.	Skate complex
<i>Beringraja binoculata</i>	Big skate
<i>Berryteuthis magister</i>	Magister armhook squid
<i>Bolinia euryptera</i>	Sculpin
<i>Bryozoichthys marjorius</i>	Pearly prickleback
<i>Glebocarcinus oregonensis</i>	Pygmy rock crab
<i>Careproctus melanurus</i>	Blacktail snailfish
<i>Careproctus rastrinus</i>	Salmon snailfish
<i>Ceramaster japonicus</i>	Red cookie star
<i>Ceramaster patagonicus</i>	Cookie star
<i>Chauliodus macouni</i>	Pacific viperfish
<i>Cheiraster dawsoni</i>	Sea star
<i>Chionoecetes bairdi</i>	Tanner crab
<i>Chirona evermanni</i>	Deepwater giant barnacle
<i>Chorilia longipes</i>	Longhorn decorator crab
<i>Cladaster validus</i>	Na
<i>Albatrossia pectoralis</i>	Giant grenadier
<i>Crossaster papposus</i>	Common sunstar
<i>Crystallichthys cyclospilus</i>	Blotched snailfish
<i>Ctenodiscus crispatus</i>	Mud star
<i>Cucumaria fallax</i>	Sea cucumber
<i>Dasycottus setiger</i>	Spinyhead sculpin
<i>Diaphus theta</i>	California headlightfish
<i>Diplopteraster multiples</i>	Cushion star
<i>Dipsacaster borealis</i>	Northern sand star
<i>Enteroctopus dofleini</i>	North pacific giant octopus
<i>Erimacrus isenbeckii</i>	Hair crab
<i>Eumicrotremus orbis</i>	Pacific spiny lump sucker
<i>Fusitriton oregonensis</i>	Oregon triton
<i>Gadus chalcogrammus</i>	Walleye pollock
<i>Gadus macrocephalus</i>	Pacific cod

<i>Gephyreaster swifti</i>	Gunpowder star
<i>Glyptocephalus zachirus</i>	Rex sole
<i>Gonatopsis borealis</i>	Boreopacific gonate squid
<i>Gorgonocephalus eucnemis</i>	Basket star
<i>Gymnocanthus galeatus</i>	Armorhead sculpin
<i>Halichondria panicea</i>	Breadcrumb sponge
<i>Halocynthia aurantium</i>	Sea peach
<i>Hemilepidotus jordani</i>	Yellow irish lord
<i>Hemilepidotus zapus</i>	Longfin irish lord
<i>Hemitripterus bolini</i>	Bigmouth sculpin
<i>Hexagrammos decagrammus</i>	Kelp greenling
<i>Hiatella arctica</i>	Arctic hiatella
<i>Hippasteria phrygiana</i>	Trojan star
<i>Hippoglossoides elassodon</i>	Flathead sole
<i>Hippoglossus stenolepis</i>	Pacific halibut
<i>Hyas lyratus</i>	Pacific lyre crab
<i>Hypsagonus quadricornis</i>	Fourhorn poacher
<i>Icelus spiniger</i>	Thorny sculpin
<i>Isopsetta isolepis</i>	Butter sole
<i>Lebbeus groenlandicus</i>	Spiny lebtheid
<i>Lepidopsetta</i> sp.	Rock soles
<i>Sarritor frenatus</i>	Sawback poacher
<i>Leptychaster arcticus</i>	Arctic sand star
<i>Lethasterias nanimensis</i>	Black spined star
<i>Lethotremus muticus</i>	Docked snailfish
<i>Leuroglossus schmidti</i>	Northern smoothtongue
<i>Limanda aspera</i>	Yellowfin sole
<i>Lithodes aequispinus</i>	Golden king crab
<i>Lycodes beringi</i>	Bering eelpout
<i>Lycodes brevipes</i>	Shortfin eelpout
<i>Lycodes concolor</i>	Ebony eelpout
<i>Lycodes palearis</i>	Wattled eelpout
<i>Malacocottus zonurus</i>	Darkfin sculpin
<i>Mallotus villosus</i>	Capelin
<i>Microstomus pacificus</i>	Dover sole
<i>Modiolus modiolus</i>	Northern horse mussel
<i>Mycale loveni</i>	Tree sponge
<i>Myoxocephalus polyacanthocephalus</i>	Great sculpin
<i>Nautichthys oculofasciatus</i>	Sailfin sculpin
<i>Notostomum cyclostomum</i>	Annelid
<i>Oncorhynchus keta</i>	Chum salmon
<i>Ophiopholis aculeata</i>	Daisy brittle star
<i>Ophiura sarsi</i>	Notched brittle star
<i>Opisthoteuthis californiana</i>	Flapjack octopus

<i>Oregonia gracilis</i>	Graceful decorator crab
<i>Pagurus aleuticus</i>	Aleutian hermit
<i>Pagurus brandti</i>	Sponge hermit
<i>Pandalopsis dispar</i>	Sidestripe shrimp
<i>Pandalus eos</i>	Alaskan pink shrimp
<i>Pandalus tridens</i>	Yellowleg pandalid
<i>Paragorgia arborea</i>	Bubblegum coral
<i>Paralithodes camtschaticus</i>	Red king crab
<i>Parophrys vetulus</i>	English sole
<i>Placetron wosnessenskii</i>	Scaled crab
<i>Platichthys stellatus</i>	Starry flounder
<i>Pleurogrammus monopterygius</i>	Atka mackerel
<i>Pododesmus macrochisma</i>	Green falsejingle
<i>Podothecus accipenserinus</i>	Sturgeon poacher
<i>Porella compressa</i>	Flattened bryozoan
<i>Poromitra curilensis</i>	Crested bigscale
<i>Protomyctophum thompsoni</i>	Bigeye lanternfish
<i>Pseudarchaster parelii</i>	Northern scarlet star
<i>Pteraster militaris</i>	Wrinkled star
<i>Pteraster tesselatus</i>	Cushion star
<i>Pycnopodia helianthoides</i>	Sunflower sea star
<i>Rastrinus scutiger</i>	Roughskin sculpin
<i>Reinhardtius hippoglossoides</i>	Greenland halibut
<i>Rhamphostomella costata</i>	Ribbed bryozoan
<i>Rhinolithodes wosnessenskii</i>	Rhinoceros crab
<i>Rossia pacifica</i>	Eastern pacific bobtail
<i>Sclerocrangon boreas</i>	Sculptured shrimp
<i>Sebastes alutus</i>	Pacific ocean perch
<i>Sebastes babcocki</i>	Redbanded rockfish
<i>Sebastes borealis</i>	Shortraker rockfish
<i>Sebastes melanostictus</i> and <i>S. aleutianus</i>	Blackspotted and rougheye rockfish
<i>Sebastes polypinnis</i>	Northern rockfish
<i>Sebastes variabilis</i> and <i>S. ciliatus</i>	Dusky and dark rockfish
<i>Sebastes variegatus</i>	Harlequin rockfish
<i>Sebastolobus alascanus</i>	Shortspine thornyhead
<i>Solaster hypothrissus</i>	White sun star
<i>Somniosus pacificus</i>	Pacific sleeper shark
<i>Stegophiura ponderosa</i>	Sea star
<i>Stenobrachius leucopsarus</i>	Northern lampfish
<i>Strongylocentrotus droebachiensis</i>	Green sea urchin
<i>Styela rustica</i>	Sea potato
<i>Thaleichthys pacificus</i>	Eulachon
<i>Thyriscus anoplus</i>	Sponge sculpin
<i>Triglops forficatus</i>	Scissortail sculpin

<i>Triglops macellus</i>	Roughspine sculpin
<i>Triglops pingelii</i>	Ribbed sculpin
<i>Triglops scepticus</i>	Spectacled sculpin
<i>Zaprora silenus</i>	Prowfish
<i>Aforia circinata</i>	Keeled aforia
<i>Anarhichas orientalis</i>	Bering wolffish
<i>Argis dentata</i>	Artic argid
<i>Aspidophoroides monoptygius</i>	Alligatorfish
<i>Asterias amurensis</i>	North pacific seastar
<i>Beringius behringi</i>	True whelk
<i>Boltenia ovifera</i>	Stalked sea squirt
<i>Boreogadus saida</i>	Arctic cod
<i>Buccinum angulosum</i>	Angular whelk
<i>Buccinum plectrum</i>	Sinuous whelk
<i>Buccinum polare</i>	Polar whelk
<i>Buccinum scalariforme</i>	Ladder whelk
<i>Chionoecetes opilio</i>	Snow crab
<i>Ciliatoclinocardium ciliatum</i>	Hairy cockle
<i>Clinopegma magnum</i>	Helmet whelk
<i>Clupea pallasi</i>	Pacific herring
<i>Colus halli</i>	Snail
<i>Colus herendeenii</i>	Thin-ribbed whelk
<i>Cryptonatica russa</i>	Russty moonsail
<i>Echinorachnius parma</i>	Common sand dollar
<i>Eleginus gracilis</i>	Saffron cod
<i>Eunoe depressa</i>	Depressed scale worm
<i>Eunoe nodosa</i>	Giant scale worm
<i>Evasterias echinosoma</i>	Sea star
<i>Flustra serrulata</i>	Bryozoan
<i>Grandicrepidula grandis</i>	Great slippersnail
<i>Gymnocanthus pistilliger</i>	Threaded sculpin
<i>Hemilepidotus papilio</i>	Butterfly sculpin
<i>Hexagrammos stelleri</i>	Whitespotted greenling
<i>Hippoglossoides elassodon</i> and <i>H. robustus</i>	Flathead sole-bering flounder
<i>Hyas coarctatus</i>	Arctic lyre crab
<i>Leptasterias arctica</i>	Sea star
<i>Leptasterias polaris</i>	Polar six-rayed star
<i>Leptoclinus maculatus</i>	Daubed shanny
<i>Limanda proboscidea</i>	Longhead dab
<i>Limanda sakhalinensis</i>	Sakhalin sole
<i>Lunatia pallida</i>	Pale moonsail
<i>Lycodes raridens</i>	Sparse-toothed lycod
<i>Mactromeris polynyma</i>	Arctic surfclam

<i>Musculus discors</i>	Discordant mussel
<i>Myoxocephalus jaok</i>	Plain sculpin
<i>Myoxocephalus scorpius</i>	Shorthorn sculpin
<i>Neptunea borealis</i>	True whelk
<i>Neptunea heros</i>	True whelk
<i>Neptunea lyrata</i>	Lyre whelk
<i>Neptunea pribiloffensis</i>	Pribilof whelk
<i>Neptunea ventricosa</i>	Fat whelk
<i>Occella dodecaedron</i>	Bering poacher
<i>Osmerus mordax</i>	Rainbow smelt
<i>Pagurus ochotensis</i>	Alaskan hermit crab
<i>Pandalus goniurus</i>	Humpy shrimp
<i>Paralithodes platypus</i>	Blue king crab
<i>Patinopecten caurinus</i>	Weathervane scallop
<i>Pleuronectes quadrituberculatus</i>	Alaska plaice
<i>Plicifusus kroeyeri</i>	True whelk
<i>Poroclinus rothrocki</i>	Whitebarred prickleback
<i>Pteraster obscurus</i>	Obscure cushion star
<i>Pyrulofusus deformis</i>	Warped whelk
<i>Pyrulofusus melonis</i>	Melon shaped whelk
<i>Serripes groenlandicus</i>	Greenland cockle
<i>Siliqua alta</i>	Alaska razor
<i>Tellina lutea</i>	Alaska great tellin
<i>Telmessus cheiragonus</i>	Helmet crab
<i>Trichodon trichodon</i>	Pacific sandfish
<i>Tritonia diomedea</i>	Rosy tritonia
<i>Volutopsis fragilis</i>	Fragile whelk
<i>Allocentrotus fragilis</i>	Fragile urchin
<i>Anarrhichthys ocellatus</i>	Wolf-eel
<i>Atheresthes stomias</i>	Arrowtooth flounder
<i>Bathyagonus pentacanthus</i>	Bigeye poacher
<i>Benthoctopus leioderma</i>	Smoothskin octopus
<i>Brisaster latifrons</i>	Northern heart urchin
<i>Metacarcinus magister</i>	Dungeness crab
<i>Crangon communis</i>	Gray shrimp
<i>Crangon dalli</i>	Ridged crangon
<i>Crossaster borealis</i>	Grooved sun star
<i>Cryptacanthodes giganteus</i>	Giant wrymouth
<i>Cyanea capillata</i>	Lion's mane
<i>Eopsetta jordani</i>	Petrale sole
<i>Hemilepidotus hemilepidotus</i>	Red irish lord
<i>Henricia leviuscula</i>	Pacific blood star
<i>Hydrolagus colliei</i>	Spotted ratfish
<i>Labidochirus splendescens</i>	Splendid hermit

<i>Laqueus californianus</i>	California lamp shell
<i>Lopholithodes foraminatus</i>	Brown box crab
<i>Lumpenella longirostris</i>	Longsnout prickleback
<i>Lumpenus sagitta</i>	Snake prickleback
<i>Lycodes pacificus</i>	Blackbelly eelpout
<i>Lyopsetta exilis</i>	Slender sole
<i>Mediaster aequalis</i>	Vermilion star
<i>Merluccius productus</i>	Pacific hake
<i>Microgadus proximus</i>	Pacific tomcod
<i>Molpadia intermedia</i>	Sweet potato sea cucumber
<i>Munida quadrispina</i>	Squat lobster sp.
<i>Neptunea amianta</i>	True whelk
<i>Oncorhynchus gorbuscha</i>	Pink salmon
<i>Oncorhynchus kisutch</i>	Coho salmon
<i>Oncorhynchus tshawytscha</i>	Chinook salmon
<i>Ophiodon elongatus</i>	Lingcod
<i>Orthasterias koehleri</i>	Rainbow star
<i>Pagurus capillatus</i>	Fuzzy hermit crab
<i>Pagurus confragosus</i>	Knobbyhand hermit
<i>Pandalus hypsinotus</i>	Coonstriped shrimp
<i>Pandalus jordani</i>	Ocean shrimp
<i>Pandalus platyceros</i>	Spot shrimp
<i>Pasiphaea pacifica</i>	Pacific glass shrimp
<i>Poraniopsis inflata</i>	Spiny sea star
<i>Psettichthys melanostictus</i>	Pacific sand sole
<i>Ptilosarcus gurneyi</i>	Gurney's sea pen
<i>Pyrulofusus harpa</i>	Left-hand whelk
<i>Beringraja rhina</i>	Longnose skate
<i>Rhamphocottus richardsoni</i>	Grunt sculpin
<i>Sebastes brevispinis</i>	Silvergray rockfish
<i>Sebastes crameri</i>	Darkblotched rockfish
<i>Sebastes diploproa</i>	Splitnose rockfish
<i>Sebastes elongatus</i>	Greenstriped rockfish
<i>Sebastes entomelas</i>	Widow rockfish
<i>Sebastes flavidus</i>	Yellowtail rockfish
<i>Sebastes helvomaculatus</i>	Rosethorn rockfish
<i>Sebastes maliger</i>	Quillback rockfish
<i>Sebastes melanops</i>	Black rockfish
<i>Sebastes pinniger</i>	Canary rockfish
<i>Sebastes proriger</i>	Redstripe rockfish
<i>Sebastes reedi</i>	Yellowmouth rockfish
<i>Sebastes ruberrimus</i>	Raspyhead rockfish
<i>Sebastes wilsoni</i>	Pygmy rockfish
<i>Sebastes zacentrus</i>	Sharpchin rockfish

<i>Solaster stimpsoni</i>	Stimpson's sun star
<i>Spirinchus thaleichthys</i>	Longfin smelt
<i>Squalus suckleyi</i>	Pacific spiny dogfish
<i>Stylasterias forreri</i>	Velcro star
<i>Terebratalia transversa</i>	Common lamp shell
<i>Tochuina gigantea</i>	Giant orange tochui
<i>Acanthocarpus alexandri</i>	Gladiator box crab
<i>Acanthostracion quadricornis</i>	Scrawled cowfish
<i>Aequipecten muscosus</i>	Mossy scallop
<i>Aluterus heudelotii</i>	Dotterel filefish
<i>Aluterus schoepfii</i>	Orange filefish
<i>Aluterus scriptus</i>	Scribbled leatherjacket filefish
<i>Amusium papyraceum</i>	Paper scallop
<i>Anadara baughmani</i>	Skewed ark
<i>Anasimus latus</i>	Stilt spider crab
<i>Anchoa hepsetus</i>	Striped anchovy
<i>Anchoa mitchilli</i>	Bay anchovy
<i>Ancylopectta dilecta</i>	Three-eye flounder
<i>Ancylopectta ommata</i>	Ocellated flounder
<i>Antennarius ocellatus</i>	Ocellated frogfish
<i>Antennarius radiosus</i>	Singlespot frogfish
<i>Antennarius striatus</i>	Striated frogfish
<i>Anthenoides peircei</i>	Sea star
<i>Apogon affinis</i>	Bigtooth cardinalfish
<i>Apogon aurolineatus</i>	Bridle cardinalfish
<i>Apogon pseudomaculatus</i>	Twospot cardinalfish
<i>Apogon quadrisquamatus</i>	Sawcheek cardinalfish
<i>Arbacia punctulata</i>	Purple-spined sea urchin
<i>Arca zebra</i>	Turkey wing
<i>Arenaeus cribrarius</i>	Speckled swimming crab
<i>Argopecten gibbus</i>	Calico scallop
<i>Ariopsis felis</i>	Hardhead catfish
<i>Asteroporpora annulata</i>	Brittle star
<i>Astrapogon alutus</i>	Bronze cardinalfish
<i>Astropecten articulatus</i>	Royal sea star
<i>Astropecten cingulatus</i>	Sea star
<i>Astropecten duplicatus</i>	Two-spined star fish
<i>Astrophyton muricatum</i>	Giant basket star
<i>Atrina serrata</i>	Sawtooth penshell
<i>Bagre marinus</i>	Gafftopsail catfish
<i>Bairdiella chrysoura</i>	Silver perch
<i>Balistes capriscus</i>	Gray triggerfish
<i>Bathyanthias mexicanus</i>	Yellowtail bass
<i>Bellator militaris</i>	Horned searobin

<i>Bollmannia communis</i>	Ragged goby
<i>Bregmaceros atlanticus</i>	Antenna codlet
<i>Brevoortia patronus</i>	Gulf menhaden
<i>Brotula barbata</i>	Bearded brotula
<i>Calamus arctifrons</i>	Grass porgy
<i>Calamus bajonado</i>	Jolthead porgy
<i>Calamus leucosteus</i>	Whitebone porgy
<i>Calamus nodosus</i>	Knobbed porgy
<i>Calamus penna</i>	Sheepshead porgy
<i>Calamus proridens</i>	Littlehead porgy
<i>Calappa flammea</i>	Flame box crab
<i>Calappa sulcata</i>	Yellow box crab
<i>Calliactis tricolor</i>	Hermit anemone
<i>Callinectes sapidus</i>	Blue crab
<i>Callinectes similis</i>	Lesser blue crab
<i>Cantharus cancellarius</i>	Cancellate cantharus
<i>Canthigaster rostrata</i>	Caribbean sharpnose-puffer
<i>Caranx cryos</i>	Blue runner
<i>Caranx hippos</i>	Crevalle jack
<i>Carcharhinus acronotus</i>	Blacknose shark
<i>Caulolatilus cyanops</i>	Blackline tilefish
<i>Caulolatilus intermedius</i>	Anchor tilefish
<i>Centropristes ocyurus</i>	Bank sea bass
<i>Centropristes philadelphica</i>	Rock sea bass
<i>Centropristes striata</i>	Black sea bass
<i>Chaetodipterus faber</i>	Atlantic spadefish
<i>Chaetodon ocellatus</i>	Spotfin butterflyfish
<i>Chaetodon sedentarius</i>	Reef butterflyfish
<i>Chicoreus florifer-dilectus</i>	Flowery lace murex
<i>Chilomycterus schoepfii</i>	Striped burrfish
<i>Chione clenchii</i>	Na
<i>Chloroscombrus chrysurus</i>	Atlantic bumper
<i>Chromis encrysura</i>	Yellowtail reeffish
<i>Chrysaora quinquecirrha</i>	Sea nettle
<i>Citharichthys cornutus</i>	Horned whiff
<i>Citharichthys gymnorhinus</i>	Anglefin whiff
<i>Citharichthys macrops</i>	Spotted whiff
<i>Citharichthys spilopterus</i>	Bay whiff
<i>Collodes robustus</i>	Robust crab
<i>Cryptotomus roseus</i>	Bluelip parrotfish
<i>Cyclopsetta chittendeni</i>	Mexican flounder
<i>Cyclopsetta fimbriata</i>	Spotfin flounder
<i>Dardanus fucusus</i>	Bareye hermit
<i>Dardanus insignis</i>	Red brocade hermit

<i>Decapterus punctatus</i>	Round scad
<i>Decodon puellaris</i>	Red hogfish
<i>Diplectrum bivittatum</i>	Dwarf sand perch
<i>Diplectrum formosum</i>	Sand perch
<i>Diplodus holbrookii</i>	Spottail seabream
<i>Distorsio clathrata</i>	Atlantic distorsio
<i>Dromidia antillensis</i>	Hairy sponge crab
<i>Echeneis naucrates</i>	Sharksucker
<i>Echeneis neucratoides</i>	Whitefin sharksucker
<i>Echiophis intertinctus</i>	Spotted spoon-nose eel
<i>Encope aberrans</i>	Sand dollar
<i>Encope michelini</i>	Notched sand dollar
<i>Engyophrys senta</i>	Spiny flounder
<i>Epinephelus morio</i>	Red grouper
<i>Pareques iwamotoi</i>	Blackbar drum
<i>Equetus lanceolatus</i>	Jackknife-fish
<i>Pareques umbrosus</i>	Cubbyu
<i>Ethusa microphthalmia</i>	Broadback sumo crab
<i>Etropus crossotus</i>	Fringed flounder
<i>Etropus cyclosquamus</i>	Shelf flounder
<i>Etropus rimosus</i>	Gray flounder
<i>Etrumeus teres</i>	Round herring
<i>Eucidaris tribuloides</i>	Slate pencil urchin
<i>Eucinostomus argenteus</i>	Silver mojarra
<i>Eucinostomus gula</i>	Silver jenny
<i>Eucinostomus harengulus</i>	Tidewater mojarra
<i>Euphosynoplax clausa</i>	Craggy bathyal crab
<i>Ficus communis</i>	Atlantic figsnail
<i>Fistularia petimba</i>	Red cornetfish
<i>Gastropsetta frontalis</i>	Shrimp flounder
<i>Gobiesox strumosus</i>	Skilletfish
<i>Goniaster tesselatus</i>	Giant sunfish
<i>Gonodactylus bredini</i>	Split-Thumb mantis shrimp
<i>Gymnachirus melas</i>	Naked sole
<i>Gymnachirus texae</i>	Fringed sole
<i>Gymnothorax kolpos</i>	Blacktail moray
<i>Gymnothorax nigromarginatus</i>	Blackedge moray
<i>Gymnothorax saxicola</i>	Honeycomb moray
<i>Haemulon aurolineatum</i>	Tomate
<i>Haemulon plumieri</i>	White grunt
<i>Haemulon striatum</i>	Striped grunt
<i>Halieutichthys aculeatus</i>	Pancake batfish
<i>Harengula jaguana</i>	Scaled sardine
<i>Hemicaranx amblyrhynchus</i>	Bluntnose jack

<i>Xyrichtys novacula</i>	Pearly razorfish
<i>Hepatus epheliticus</i>	Calico box crab
<i>Hermodice carunculata</i>	Bearded fireworms
<i>Rhynchoconger flavus</i>	Yellow conger
<i>Hippocampus erectus</i>	Lined seahorse
<i>Holacanthus bermudensis</i>	Blue angelfish
<i>Holocentrus bullisi</i>	Deepwater squirrelfish
<i>Hoplunnis diomediana</i>	Blacktail pikeconger
<i>Hoplunnis macrura</i>	Freckled pike-conger
<i>Iliacantha iodactylus</i>	Na
<i>Iliacantha subglobosa</i>	Longfinger purse crab
<i>Isostichopus badionotus</i>	Chocolate chip sea cucumber
<i>Kathetostoma alboguttatum</i>	Lancer stargazer
<i>Lachnolaimus maximus</i>	Hogfish
<i>Lactophrys polygonia</i>	Honeycomb cowfish
<i>Laevicardium laevigatum</i>	Eggcockle
<i>Laevicardium mortoni</i>	Yellow eggcockle
<i>Lagocephalus laevigatus</i>	Smooth puffer
<i>Lagodon rhomboides</i>	Pinfish
<i>Larimus fasciatus</i>	Banded drum
<i>Leiolarbrus nitidus</i>	White elbow crab
<i>Leiostomus xanthurus</i>	Spot
<i>Lepophidium brevibarbe</i>	Blackedge cusk-eel
<i>Lepophidium jeannae</i>	Mottled cusk-eel
<i>Libinia emarginata</i>	Portly spider crab
<i>Lobopilumnus agassizii</i>	Areolated hairy crab
<i>Doryteuthis (Amerigo) pealeii</i>	Longfin inshore squid
<i>Doryteuthis (Loligo) plei</i>	Slender inshore squid
<i>Lolliguncula brevis</i>	Atlantic brief squid
<i>Lonchopisthus micrognathus</i>	Swordtail jawfish
<i>Luidia alternata</i>	Banded sea star
<i>Luidia clathrata</i>	Lined sea star
<i>Lutjanus campechanus</i>	Red snapper
<i>Lutjanus griseus</i>	Gray snapper
<i>Lutjanus synagris</i>	Lane snapper
<i>Lytechinus variegatus</i>	Variegated urchin
<i>Macoma brevifrons</i>	Short macoma
<i>Macoma pulleyi</i>	Delta macoma
<i>Macrocoeloma trispinosum</i>	Spongy decorator crab
<i>Menticirrhus americanus</i>	Southern kingfish
<i>Mesopenaeus tropicalis</i>	Salmon shrimp
<i>Metapenaeopsis goodei</i>	Caribbean velvet shrimp
<i>Metoporhaphis calcarata</i>	False arrow crab
<i>Micropogonias undulatus</i>	Atlantic croaker

<i>Mithrax forceps</i>	Red ridged clinging crab
<i>Mithrax hispidus</i>	Coral clinging crab
<i>Mithrax pleuracanthus</i>	Shaggy clinging crab
<i>Monacanthus ciliatus</i>	Fringed filefish
<i>Stephanolepis hispidus</i>	Planehead filefish
<i>Mullus auratus</i>	Red goatfish
<i>Munida forceps</i>	Squat lobster sp.
<i>Munida pusilla</i>	Squat lobster sp.
<i>Muricanthus fulvescens</i>	Giant eastern murex
<i>Mustelus canis</i>	Smooth dogfish
<i>Mycteroperca microlepis</i>	Gag
<i>Mycteroperca phenax</i>	Scamp
<i>Myropsis quinquespinosa</i>	Fivespine purse crab
<i>Narcine brasiliensis</i>	Lesser electric ray
<i>Narcissia trigonaria</i>	Na
<i>Neobythites gilli</i>	Twospot brotula
<i>Neomerinthe hemingwayi</i>	Spinycheek scorpionfish
<i>Nicholsina usta</i>	Emerald parrotfish
<i>Octopus joubini</i>	Pygmy octopus
<i>Octopus vulgaris</i>	Common octopus
<i>Ogcocephalus corniger</i>	Longnose batfish
<i>Ogcocephalus declivirostris</i>	Slantbrow batfish
<i>Ogcocephalus pantostictus</i>	Spotted batfish
<i>Ogcocephalus parvus</i>	Roughback batfish
<i>Ogcocephalus radiatus</i>	Polka-dot batfish
<i>Ophichthus gomesii</i>	Shrimp eel
<i>Ophichthus puncticeps</i>	Palespotted eel
<i>Ophidion spp.</i>	Cusk-eels
<i>Ophidion beani</i>	Longnose cusk-eel
<i>Ophidion grayi</i>	Blotched cusk-eel
<i>Ophidion holbrookii</i>	Bank cusk-eel
<i>Ophidion selenops</i>	Mooneye cusk-eel
<i>Ophidion welshi</i>	Crested cusk-eel
<i>Ophioderma appressa</i>	Harlequin brittle star
<i>Ophioderma brevispinum</i>	Brittle star
<i>Ophiolepis elegans</i>	Elegant brittle star
<i>Ophiothrix angulata</i>	Angular brittle star
<i>Opisthonema oglinum</i>	Atlantic thread herring
<i>Oreaster reticulatus</i>	Cushioned star
<i>Orthopristis chrysoptera</i>	Pigfish
<i>Otophidium omostigma</i>	Polka-dot cusk-eel
<i>Ovalipes floridanus</i>	Florida lady crab
<i>Pagrus pagrus</i>	Red porgy
<i>Paguristes sericeus</i>	Blue-eyed hermit

<i>Paguristes triangulatus</i>	Hermit crab
<i>Pagurus bullisi</i>	Hermit crab
<i>Palicus alternatus</i>	Labile stilt crab
<i>Parablennius marmoreus</i>	Seaweed blenny
<i>Paraconger caudilimbatus</i>	Margintail conger
<i>Paralichthys alboguttata</i>	Gulf flounder
<i>Paralichthys lethostigma</i>	Southern flounder
<i>Paralichthys squamilentus</i>	Broad flounder
<i>Parapenaeus politus</i>	Rose shrimp
<i>Parthenope agonus</i>	Elbow crab
<i>Parthenope fraterculus</i>	Elbow crab
<i>Platylambrus granulata</i>	Bladetooth elbow crab
<i>Pecten ravenelli</i>	Ravenel scallop
<i>Farfantepenaeus aztecus</i>	Brown shrimp
<i>Farfantepenaeus duorarum</i>	Pink shrimp
<i>Litopenaeus setiferus</i>	Northern white shrimp
<i>Peprilus paru</i>	Harvestfish
<i>Peprilus burti</i>	Gulf butterfish
<i>Peristedion gracile</i>	Slender searobin
<i>Persephona crinita</i>	Pink purse crab
<i>Persephona mediterranea</i>	Mottled purse crab
<i>Pentrochirus diogenes</i>	Giant hermit
<i>Phaeoptyx xenus</i>	Sponge cardinalfish
<i>Physiculus fulvus</i>	Hakeling
<i>Pilumnus sayi</i>	Spineback hairy crab
<i>Pitar cordatus</i>	Na
<i>Plesionika longicauda</i>	Shrimp
<i>Podochela sidneyi</i>	Shortfinger neck crab
<i>Polystira albida</i>	White giant-turris
<i>Polystira tellea</i>	Delicate giant-turris
<i>Pomacanthus arcuatus</i>	Gray angelfish
<i>Pomacentrus variabilis</i>	Cacao damselfish
<i>Pomatomus saltatrix</i>	Bluefish
<i>Pontinus longispinis</i>	Longspine scorpionfish
<i>Porcellana sayana</i>	Spotted porcelain crab
<i>Porcellana sigsbeiana</i>	Striped porcelain crab
<i>Porichthys plectrodon</i>	Atlantic midshipman
<i>Portunus gibbesii</i>	Iridescent swimming crab
<i>Portunus ordwayii</i>	Redhair swimming crab
<i>Portunus sayi</i>	Sargassum swimming crab
<i>Achelous spinicarpus</i>	Longspine swimming crab
<i>Achelous spinimanus</i>	Blotched swimming crab
<i>Priacanthus arenatus</i>	Atlantic bigeye
<i>Prionotus alatus</i>	Spiny searobin

<i>Prionotus longispinosus</i>	Bigeye searobin
<i>Prionotus martis</i>	Gulf of mexico barred searobin
<i>Prionotus ophryas</i>	Bandtail searobin
<i>Prionotus paralatus</i>	Mexican searobin
<i>Prionotus roseus</i>	Bluespotted searobin
<i>Prionotus rubio</i>	Blackfin searobin
<i>Prionotus scitulus</i>	Leopard searobin
<i>Prionotus stearnsi</i>	Shortwing searobin
<i>Prionotus tribulus</i>	Bighead searobin
<i>Pristigenys alta</i>	Short bigeye
<i>Pristipomoides aquilonaris</i>	Wenchman
<i>Pseudomedaeus agassizii</i>	Rough rubble crab
<i>Pseudorhombila quadridentata</i>	Flecked squareback crab
<i>Pseudupeneus maculatus</i>	Spotted goatfish
<i>Pteria columbus</i>	Atlantic wing-oyster
<i>Pterois volitans</i>	Red lionfish
<i>Raja eglanteria</i>	Cleartooth skate
<i>Raja texana</i>	Roundel skate
<i>Raninoides louisianensis</i>	Gulf frog crab
<i>Renilla mulleri</i>	Sea pansy
<i>Rhinobatos lentiginosus</i>	Atlantic guitarfish
<i>Rhinoptera bonasus</i>	Cownose ray
<i>Rhizoprionodon terraenovae</i>	Atlantic sharpnose shark
<i>Rhomboplites aurorubens</i>	Vermilion snapper
<i>Rossia spp.</i>	Benthic bobtail squid
<i>Rypticus bistrispinus</i>	Freckled soapfish
<i>Rypticus maculatus</i>	Whitespotted soapfish
<i>Sardinella aurita</i>	Spanish sardine
<i>Saurida brasiliensis</i>	Largescale lizardfish
<i>Saurida normani</i>	Shortjaw lizardfish
<i>Scomberomorus cavalla</i>	King mackerel
<i>Scomberomorus maculatus</i>	Spanish mackerel
<i>Sconsia striata</i>	Royal bonnet
<i>Scorpaena agassizii</i>	Longfin scorpionfish
<i>Scorpaena brasiliensis</i>	Barbfish
<i>Scorpaena calcarata</i>	Smoothhead scorpionfish
<i>Scyllarides nodifer</i>	Ridged slipper lobster
<i>Scyllarus chacei</i>	Chace slipper lobster
<i>Scyllarus depressus</i>	Scaled slipper lobster
<i>Selar crumenophthalmus</i>	Bigeye scad
<i>Selene setapinnis</i>	Atlantic moonfish
<i>Selene vomer</i>	Lookdown
<i>Seriola dumerili</i>	Greater amberjack
<i>Seriola zonata</i>	Banded rudderfish

<i>Serraniculus pumilio</i>	Pygmy sea bass
<i>Serranus atrobranchus</i>	Blackear bass
<i>Serranus notospilus</i>	Saddle bass
<i>Serranus phoebe</i>	Tattler
<i>Serranus subligarius</i>	Belted sandfish
<i>Sicyonia brevirostris</i>	Brown rock shrimp
<i>Sicyonia burkenroadi</i>	Spiny rock shrimp
<i>Sicyonia dorsalis</i>	Lesser rock shrimp
<i>Sicyonia typica</i>	Kinglet rock shrimp
<i>Speocarcinus lobatus</i>	Gulf squareback crab
<i>Sphoeroides dorsalis</i>	Marbled puffer
<i>Sphoeroides nephelus</i>	Southern puffer
<i>Sphoeroides parvus</i>	Least puffer
<i>Sphoeroides spengleri</i>	Bandtail puffer
<i>Sphyraena borealis</i>	Northern sennet
<i>Sphyraena guachancho</i>	Guachanche barracuda
<i>Sphyrna tiburo</i>	Bonnethead
<i>Spondylus americanus</i>	Atlantic thorny oyster
<i>Squatina dumeril</i>	Sand devil
<i>Squilla chydaea</i>	Offshore mantis shrimp
<i>Squilla deceptrix</i>	Mantis shrimp
<i>Squilla empusa</i>	Mantis shrimp
<i>Squilla neglecta</i>	Mantis shrimp
<i>Squilla rugosa</i>	Mantis shrimp
<i>Steindachneria argentea</i>	Luminous hake
<i>Stellifer lanceolatus</i>	Star drum
<i>Stenacionops coelatus</i>	Spider crab species
<i>Stenacionops furcatus</i>	Furcate spider crab
<i>Stenacionops spinimanus</i>	Prickly spider crab
<i>Stenorhynchus seticornis</i>	Yellowline arrow crab
<i>Stenotomus caprinus</i>	Longspine porgy
<i>Styela plicata</i>	Wrinkled sea squirt
<i>Stylocidaris affinis</i>	Pencil urchin
<i>Syacium gunteri</i>	Shoal flounder
<i>Syacium papillosum</i>	Dusky flounder
<i>Symphurus civitatum</i>	Offshore tonguefish
<i>Symphurus diomedeanus</i>	Spottedfin tonguefish
<i>Symphurus plagiura</i>	Blackcheek tonguefish
<i>Symphurus urospilus</i>	Spottail tonguefish
<i>Synodus foetens</i>	Inshore lizardfish
<i>Synodus intermedius</i>	Sand diver
<i>Synodus poeyi</i>	Offshore lizardfish
<i>Tamoya haplonema</i>	Box jelly
<i>Tethyaster grandis</i>	Sea star

<i>Tonna galea</i>	Giant tun
<i>Trachinocephalus myops</i>	Snakefish
<i>Trachurus lathami</i>	Rough scad
<i>Trichiurus lepturus</i>	Atlantic cutlassfish
<i>Trichopsetta ventralis</i>	Sash flounder
<i>Upeneus parvus</i>	Dwarf goatfish
<i>Urophycis cirrata</i>	Gulf hake
<i>Urophycis floridana</i>	Southern hake
<i>Urophycis regia</i>	Spotted hake
<i>Xiphopenaeus kroyeri</i>	Atlantic seabob
<i>Alosa aestivalis</i>	Blueback herring
<i>Alosa pseudoharengus</i>	Alewife
<i>Alosa sapidissima</i>	American shad
<i>Amblyraja radiata</i>	Thorny skate
<i>Ammodytes dubius</i>	Northern sand lance
<i>Anarhichas lupus</i>	Atlantic wolffish
<i>Argentina silus</i>	Atlantic argentine
<i>Brosme brosme</i>	Cusk
<i>Cancer borealis</i>	Jonah crab
<i>Cancer irroratus</i>	Atlantic rock crab
<i>Carcharhinus plumbeus</i>	Sandbar shark
<i>Citharichthys arctifrons</i>	Gulf stream flounder
<i>Clupea harengus</i>	Atlantic herring
<i>Conger oceanicus</i>	Conger eel
<i>Crustacea shrimp</i>	Crustaceans
<i>Cryptacanthodes maculatus</i>	Wrymouth
<i>Cyclopterus lumpus</i>	Lumpfish
<i>Cynoscion regalis</i>	Weakfish
<i>Dasyatis centroura</i>	Roughtail stingray
<i>Dasyatis say</i>	Bluntnose stingray
<i>Dipturus laevis</i>	Barndoor skate
<i>Enchelyopus cimbrius</i>	Fourbeard rockling
<i>Gadus morhua</i>	Atlantic cod
<i>Geryon (Chaceon) quinquedens</i>	Red deepsea crab
<i>Glyptocephalus cynoglossus</i>	Witch flounder
<i>Gymnura altavela</i>	Spiny butterfly ray
<i>Helicolenus dactylopterus</i>	Blackbelly rosefish
<i>Hemitripterus americanus</i>	Sea raven
<i>Hippoglossoides platessoides</i>	American plaice
<i>Hippoglossus hippoglossus</i>	Atlantic halibut
<i>Homarus americanus</i>	American lobster
<i>Illex illecebrosus</i>	Northern shortfin squid
<i>Lepophidium profundorum</i>	Fawn cusk-eel
<i>Leucoraja erinacea</i>	Little skate

<i>Leucoraja garmani</i>	Rosette skate
<i>Leucoraja ocellata</i>	Winter skate
<i>Limanda ferruginea</i>	Yellowtail flounder
<i>Limulus polyphemus</i>	Horseshoe crab
<i>Lithodes maja</i>	Norway king crab
<i>Lophius americanus</i>	Goosefish
<i>Zoarces americanus</i>	Ocean pout
<i>Malacoraja senta</i>	Smooth skate
<i>Melanogrammus aeglefinus</i>	Haddock
<i>Menticirrhus saxatilis</i>	Northern kingfish
<i>Merluccius albidus</i>	Offshore hake
<i>Merluccius bilinearis</i>	Silver hake
<i>Myliobatis freminvillei</i>	Bullnose ray
<i>Myoxocephalus octodecemspinosis</i>	Longhorn sculpin
<i>Myxine glutinosa</i>	Atlantic hagfish
<i>Ovalipes ocellatus</i>	Lady crab
<i>Ovalipes stephensi</i>	Coursehand lady crab
<i>Pandalus borealis</i>	Northern shrimp
<i>Paralichthys dentatus</i>	Summer flounder
<i>Paralichthys oblongus</i>	American fourspot flounder
<i>Peprilus triacanthus</i>	American butterfish
<i>Peristedion miniatum</i>	Armored searobin
<i>Placopecten magellanicus</i>	Sea scallop
<i>Pollachius virens</i>	Pollock
<i>Prionotus carolinus</i>	Northern searobin
<i>Prionotus evolans</i>	Striped searobin
<i>Pseudopleuronectes americanus</i>	Winter flounder
<i>Scomber scombrus</i>	Atlantic mackerel
<i>Scomberesox saurus</i>	Atlantic saury
<i>Scophthalmus aquosus</i>	Windowpane
<i>Scyliorhinus retifer</i>	Chain catshark
<i>Sebastes fasciatus</i>	Acadian redfish
<i>Sphoeroides maculatus</i>	Northern puffer
<i>Squalus acanthias</i>	Spiny dogfish
<i>Stenotomus chrysops</i>	Scup
<i>Tautogolabrus adspersus</i>	Cunner
<i>Triglops murrayi</i>	Moustache sculpin
<i>Phycis chesteri</i>	Longfin hake
<i>Urophycis chuss</i>	Red hake
<i>Urophycis tenuis</i>	White hake
<i>Zenopsis conchifer</i>	Silvery john dory
<i>Menidia menidia</i>	Atlantic silverside
<i>Petromyzon marinus</i>	Sea lamprey
<i>Aetobatus narinari</i>	Spotted eagle ray

Anchoa spp.	Anchovy
Archosargus probatocephalus	Sheepshead
Brevoortia smithi	Yellowfin menhaden
Brevoortia tyrannus	Atlantic menhaden
Callinectes ornatus	Shelligs
Cynoscion nothus	Silver seatrout
Dasyatis americana	Southern stingray
Dasyatis sabina	Atlantic stingray
Eucinostomus spp.	Mojarras
Gibbesia neglecta	Lesser mantis shrimp
Gymnura micrura	Smooth butterfly ray
Libinia spp.	Spider crabs
Loligo spp.	Loligo squids
Menippe mercenaria	Florida stone crab
Menticirrhus littoralis	Gulf kingfish
Mobula hypostoma	Devil ray
Pagurus pollicaris	Gray hermit crab
Pogonias cromis	Black drum
Rachycentron canadum	Cobia
Stenotomus spp.	Porgies
Trachinotus carolinus	Florida pompano
Trinectes maculatus	Hogchoker
Pagurus longicarpus	Longwrist hermit crab
Rimapenaeus constrictus	Roughneck shrimp
Sphyrna lewini	Scalloped hammerhead
Alectis ciliaris	African pompano
Hyleurochilus geminatus	Crested blenny
Acanthephyra curtirostris	Peaked shrimp
Acesta spongi	Limid clam sp.
Actinauge verrilli	Reticulate anemone
Agonopsis vulsa	Northern spearnose poacher
Alepocephalus tenebrosus	California slickhead
Allosmerus elongatus	Whitebait smelt
Ampheraster marianus	Na
Anisodoris nobilis	Pacific sea-lemon
Anoplogaster cornuta	Common fangtooth
Anthomastus ritteri	Na
Anthopleura xanthogrammica	Giant green anemone
Anthoptilum grandiflorum	Sea pen
Antimora microlepis	Finescale mora
Apristurus brunneus	Brown cat shark
Apristurus kampae	Longnose catshark
Argentina sialis	Pacific argentine
Argyropelecus affinis	Pacific hatchet fish

<i>Aristostomias scintillans</i>	Shiny loosejaw
<i>Armina californica</i>	California armina
<i>Asterina miniata</i>	Na
<i>Asteronyx longifissus</i>	Na
<i>Asteronyx loveni</i>	Na
<i>Astropecten armatus</i>	Spiny sand star
<i>Astropecten verilli</i>	California sand star
<i>Avocettina infans</i>	Avocet snipe eel
<i>Bathybembix bairdii</i>	Na
<i>Bathylagus milleri</i>	Na
<i>Bathylagus pacificus</i>	Slender blacksmelt
<i>Bothrocara brunneum</i>	Twoline eelpout
<i>Brisaster townsendi</i>	Na
<i>Brisingella exilis</i>	Na
<i>Briassopsis pacifica</i>	Na
<i>Calinaticina oldroydii</i>	Oldroyd's fragile moon snail
<i>Cancer anthonyi</i>	Yellow rock crab
<i>Cancer gracilis</i>	Graceful rock crab
<i>Cancer productus</i>	Red rock crab
<i>Careproctus cypselurus</i>	Falcate snailfish
<i>Careproctus gilberti</i>	Smalldisk snailfish
<i>Cataetyx rubrirostris</i>	Rubynose brotula
<i>Centroscyllium nigrum</i>	Combtooth dogfish
<i>Cephaloscyllium ventriosum</i>	Swell shark
<i>Chesnonia verrucosa</i>	Warty poacher
<i>Chiasmodon niger</i>	Black swallower
<i>Chilara taylori</i>	Spotted cusk-eel
<i>Chionoecetes tanneri</i>	Grooved tanner crab
<i>Chiroteuthis calyx</i>	Na
<i>Chitonotus pugetensis</i>	Roughback sculpin
<i>Chrysaora fuscens</i>	Pacific sea nettle
<i>Chrysaora melanaster</i>	Na
<i>Citharichthys sordidus</i>	Pacific sanddab
<i>Citharichthys xanthostigma</i>	Longfin sanddab
<i>Coryphaenoides acrolepis</i>	Pacific grenadier
<i>Coryphaenoides cinereus</i>	Popeye grenadier
<i>Cryptopeltaster lepidonotus</i>	Na
<i>Cymatogaster aggregata</i>	Shiner perch
<i>Delectopecten vancouverensis</i>	Vancouver scallop
<i>Dermasterias imbricata</i>	Leather star
<i>Dipsacaster eximius</i>	Na
<i>Doryteuthis (Loligo) opalescens</i>	California market squid
<i>Dromalia alexandri</i>	Na
<i>Elassodiscus caudatus</i>	Blackbelly snailfish

<i>Embassichthys bathybius</i>	Deep-sea sole
<i>Engraulis mordax</i>	Northern anchovy
<i>Enophrys taurina</i>	Bull sculpin
<i>Eptatretus deani</i>	Black hagfish
<i>Eptatretus stoutii</i>	Pacific hagfish
<i>Eualus macrophthalmus</i>	Bigeye eulid
<i>Euspira lewisii</i>	Lewis' moon snail
<i>Facciolella gilbertii</i>	Dogface witch-eel
<i>Galeorhinus galeus</i>	Tope shark
<i>Genyonemus lineatus</i>	White croaker
<i>Glyptolithodes cristatipes</i>	Peruvian centolla
<i>Gonatus onyx</i>	Clawed armhook squid
<i>Halocynthia igaboja</i>	Bristly tunicate
<i>Hemilepidotus spinosus</i>	Brown irish lord
<i>Heterozonias alternatus</i>	Sea star
<i>Hexanchus griseus</i>	Bluntnose sixgill shark
<i>Hippasteria californica</i>	Californian spiny star
<i>Hippasteria spinosa</i>	Spiny star
<i>Hippoglossina stomata</i>	Bigmouth flounder
<i>Histioteuthis heteropsis</i>	Na
<i>Histioteuthis hoylei</i>	Flowervase jewell squid
<i>Holothuroidea</i> spp.	Sea cucumbers
<i>Icelinus burchami</i>	Dusky sculpin
<i>Icelinus filamentosus</i>	Threadfin sculpin
<i>Icelinus fimbriatus</i>	Fringed sculpin
<i>Ichthys lockingtoni</i>	Medusafish
<i>Idiacanthus antrostomus</i>	Pacific blackdragon
<i>Japetella diaphana</i>	Diaphanous pelagic octopod
<i>Leptocottus armatus</i>	Pacific staghorn sculpin
<i>Leuroglossus stilbius</i>	California smoothtongue
<i>Liponema brevicornis</i>	Tentacle shedding anemone
<i>Lithodes couesi</i>	Scarlet king crab
<i>Lophaster furcilliger</i>	Na
<i>Lophaster vexator</i>	Na
<i>Loxorhynchus crispatus</i>	Moss crab
<i>Loxorhynchus grandis</i>	Sheep crab
<i>Luidia foliolata</i>	Sand star
<i>Lycenchelys camchatICA</i>	Na
<i>Lycenchelys crotalinus</i>	Snakehead eelpout
<i>Lycodapus endemoscotus</i>	Deepwater slipskin
<i>Lycodapus mandibularis</i>	Pallid eelpout
<i>Lycodes corteziANUS</i>	Bigfin eelpout
<i>Lycodes diapterus</i>	Black eelpout
<i>Lytechinus anamesus</i>	White sea urchin

<i>Mediaster tenellus</i>	Na
<i>Metridium farcimen</i>	Gigantic anemone
<i>Moroteuthis robusta</i>	Robust clubhook squid
<i>Munida hispida</i>	Squat lobster sp.
<i>Mustelus henlei</i>	Brown smooth-hound
<i>Myliobatis californica</i>	Bat eagle ray
<i>Myxoderma platyacanthum</i>	Sea star
<i>Myxoderma sacculatum</i>	Na
<i>Nearchester aciculosus</i>	Na
<i>Nemichthys scolopaceus</i>	Slender snipe eel
<i>Neognathophausia</i> sp.	Na
<i>Neognathophausia gigas</i>	Na
<i>Neognathophausia ingens</i>	Giant red mysid
<i>Neolithodes diomedae</i>	Na
<i>Nezumia liolepis</i>	Smooth grenadier
<i>Nezumia stelgidolepis</i>	California grenadier
<i>Octopodidae</i> spp.	Octopuses
<i>Octopoteuthis deletron</i>	Octopus squid
<i>Octopus californicus</i>	North pacific bigeye octopus
<i>Octopus rubescens</i>	East pacific red octopus
<i>Ophiomusium jolliensis</i>	Na
<i>Oractis diomedae</i>	Na
<i>Paguristes turgidus</i>	Hermit crab
<i>Pandalopsis ampla</i>	Deepwater bigeye
<i>Pannychia moseleyi</i>	Na
<i>Paractinostola faeculenta</i>	Hobnail vase anemone
<i>Paralichthys californicus</i>	California flounder/halibut
<i>Paraliparis cephalus</i>	Swellhead snailfish
<i>Paraliparis dactylosus</i>	Red snailfish
<i>Paralithodes californiensis</i>	California king crab
<i>Paralithodes rathbuni</i>	Na
<i>Paralomis multispina</i>	Na
<i>Parastichopus californicus</i>	Giant california sea cucumber
<i>Parastichopus leukothele</i>	Giant orange sea cucumber
<i>Parmaturus xaniurus</i>	Filetail catshark
<i>Pasiphaea tarda</i>	Crimson pasiphaeid
<i>Pennatula phosphorea</i>	Phosphorescent sea pen
<i>Peprilus simillimus</i>	Pacific pompano
<i>Periphylla periphylla</i>	Na
<i>Philine bakeri</i>	Na
<i>Physiculus rastrelliger</i>	Hundred fathom mora
<i>Pisaster brevispinus</i>	Giant pink sea star
<i>Platymera gaudichaudii</i>	Armed box crab
<i>Pleurobranchaea californica</i>	Sea slug

<i>Pleuronichthys decurrens</i>	Curlfin sole
<i>Pleuronichthys verticalis</i>	Hornyhead turbot
<i>Polycheles sculptus</i>	Blind lobsters
<i>Porichthys notatus</i>	Plainfin midshipman
<i>Pseudarchaster alascensis</i>	Alaskan scarlet star
<i>Pseudostichopus mollis</i>	Sandy sea cucumber
<i>Psolus squamatus</i>	White creeping pedal sea cucumber
<i>Pteraster jordani</i>	Jordan's cushion star
<i>Pugettia richii</i>	Cryptic kelp crab
Purple striated anemone	Purple striated anemone
<i>Radulinus asprellus</i>	Slim sculpin
<i>Beringraja inornata</i>	California skate
<i>Beringraja stellulata</i>	Starry skate
<i>Rathbunaster californicus</i>	Deep-sea sun star
Red striated anemone	Na
<i>Ronquilus jordani</i>	Northern ronquil
<i>Sagamichthys abei</i>	Shining tubeshoulder
<i>Sardinops sagax</i>	South american pilchard
<i>Scomber japonicus</i>	Chub mackerel
<i>Scorpaena guttata</i>	California scorpionfish
<i>Sebastes auriculatus</i>	Brown rockfish
<i>Sebastes aurora</i>	Aurora rockfish
<i>Sebastes caurinus</i>	Copper rockfish
<i>Sebastes chlorostictus</i>	Greenspotted rockfish
<i>Sebastes constellatus</i>	Starry rockfish
<i>Sebastes dallii</i>	Calico rockfish
<i>Sebastes ensifer</i>	Swordspine rockfish
<i>Sebastes eos</i>	Pink rockfish
<i>Sebastes goodei</i>	Chilipepper
<i>Sebastes hopkinsi</i>	Squarespot rockfish
<i>Sebastes jordani</i>	Shortbelly rockfish
<i>Sebastes levis</i>	Cowcod
<i>Sebastes melanostomus</i>	Blackgill rockfish
<i>Sebastes paucispinis</i>	Bocaccio
<i>Sebastes rosaceus</i>	Rosy rockfish
<i>Sebastes rosenblatti</i>	Greenblotched rockfish
<i>Sebastes rubrivinctus</i>	Flag rockfish
<i>Sebastes rufus</i>	Bank rockfish
<i>Sebastes saxicola</i>	Stripetail rockfish
<i>Sebastes semicinctus</i>	Halfbanded rockfish
<i>Sebastes miniatus</i> and <i>S. crocotulus</i>	Vermillion and Sunset rockfish
<i>Sebastes umbrosus</i>	honeycomb rockfish
<i>Sebastolobus altivelis</i>	Longspine thornyhead
<i>Sergestes similis</i>	Midwater shrimp

<i>Sicyonia ingentis</i>	Ridgeback rock shrimp
<i>Solaster exiguum</i>	Na
<i>Spatangus californicus</i>	Na
<i>Spirinchus starksii</i>	Night smelt
<i>Squatina californica</i>	Pacific angelshark
<i>Stomias atriventer</i>	Black-belly dragonfish
<i>Synodus lucioceps</i>	California lizardfish
<i>Tactostoma macropus</i>	Longfin dragonfish
<i>Talismania bifurcata</i>	Threadfin slickhead
<i>Taonius pavo</i>	Na
<i>Tarletonbeania crenularis</i>	Blue lanternfish
<i>Thetys vagina</i>	Virgin salpa
<i>Thrissacanthias penicillatus</i>	Sea star
<i>Torpedo californica</i>	Pacific electric ray
<i>Trachurus symmetricus</i>	Jack mackerel
<i>Urticina columbiana</i>	Crusty red anemone
<i>Urticina crassicornis</i>	Mottled anemone
<i>Vampyroteuthis infernalis</i>	Vampire squid
<i>Xeneretmus latifrons</i>	Blacktip poacher
<i>Xystreurus liolepis</i>	Fantail flounder
<i>Zalembius rosaceus</i>	Pink seaperch
<i>Zanolepis frenata</i>	Shortspine combfish
<i>Zanolepis latipinnis</i>	Longspine combfish
<i>Sagenaster evermanni</i>	Sea star