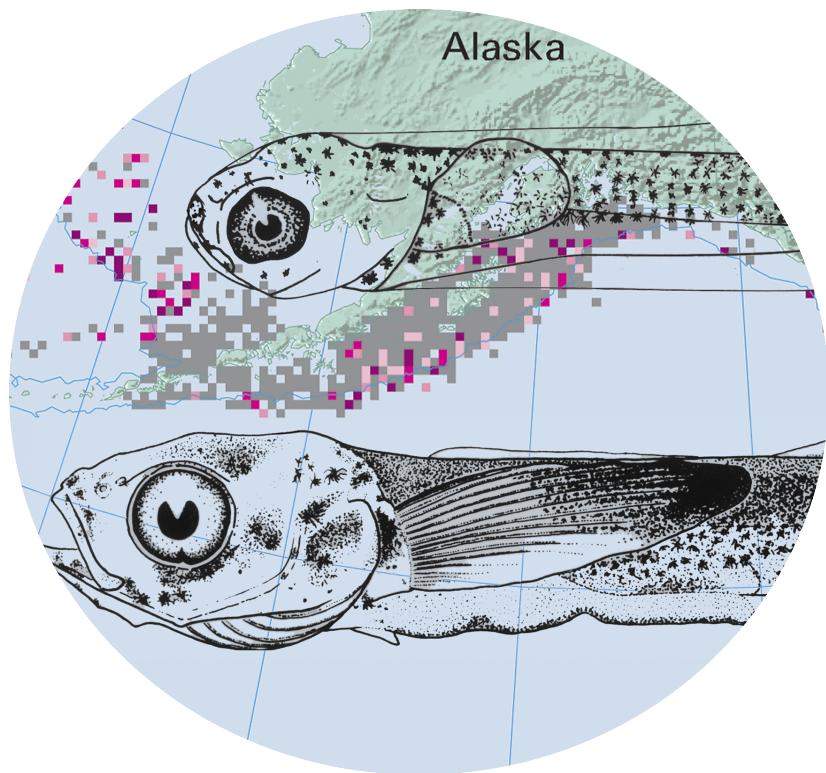


A Taxonomic Guide and Atlas for the Early Life History Stages of Northeast Pacific Fishes

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Acknowledgements

Several years ago, it became apparent that our taxonomic guide to the early life history stages of Northeast Pacific and Bering Sea fishes published in 1989 was in need of updating. At the same time, we were completing our companion atlas on the distribution and abundance of the early life history stages of fishes collected from the same geographic area. Faced with the daunting task of yet another large volume years in the making, we met and discussed alternative options. The results of our brainstorming are the Ichthyoplankton Information System (IIS): timely, searchable, printable and easily updated.

We thank those involved in getting this project off the ground for financial support, but more importantly for their vision and willingness to embrace change and creativity: Jeff Napp (Recruitment Processes (RP) Program Manager), Gary Stauffer (former Resource Assessment Conservation Engineering (RACE) Division Director) and Russ Nelson (current RACE Division Director). Art Kendall (retired) and Lisa Rugen (formerly Alaska Fisheries Science Center (AFSC)) developed a rockfish database several years ago that served as a model for concept and design. This project could never have been accomplished without the labor-intensive work done by students Erin MacDonald, Margarita Reimer, and Pamela Woods, under the direction of Ted Pietsch, through several contracts with the University of Washington Fish Collection (UWFC). Erin was part of the

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After our creative webmaster, William Rugen, retired in September 2007, Kimberly Bahl took on the responsibility of webmaster. She has taken the lead along with Jessica Tingg (Office of Fisheries Information Systems) in assisting the project team in producing the dynamic PDF version. We also thank the many RP scientists and students who continue to assist us in updating this website, but particularly Jan Benson, Morgan Busby, Lisa De Forest, Susan Picquelle, Stacey Remple, and Tiffany Vance.

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Introduction

The Recruitment Processes Program at NOAA's Alaska Fisheries Science Center (AFSC) has been collecting ichthyoplankton in the Northeast Pacific and Bering Sea since the early 1970s, yielding an invaluable collection of specimens and a comprehensive dataset of locality, distribution, and abundance information for the early-life-history (ELH) stages of fishes in the area. This work led to the publication of a taxonomic guide to the identification of the eggs and larvae of >200 species of fishes (Matarese et al., 1989) and an atlas that presents data on spatial and temporal trends in the dominant fish eggs and larvae (Matarese et al., 2003). The consolidation of data (updated from the taxonomic guide, atlas, and associated metadata) from these sources form the backbone of the Ichthyoplankton Information System (IIS). The IIS is an online, interactive, searchable information system that is routinely updated to include the most current publications. The IIS consolidates almost 40 years of fish ELH data representing almost 300 taxa into a single website that is accessible to everyone. The IIS is an invaluable tool providing the most up-to-date information on the ELH of fishes in the Northeast Pacific and Bering Sea, including some of the most diverse and commercially valuable ecosystems in the world.

Background and Historical Review

Recruitment Processes Program Ichthyoplankton Sampling Studies

(for a complete discussion see Matarese et al., 2003).

The Recruitment Processes Program has been collecting and analyzing ichthyoplankton for almost 40 years (Fig. 1, Appendix A). Beginning in 1965, AFSC, then known as the Bureau of Commercial Fisheries (BCF) Seattle Biological Laboratory, started an ichthyoplankton program off the Northeast Pacific coast to determine the northernmost extent of *Merluccius productus* ((Pacific hake) spawning. Only data on Pacific hake were kept and analyzed. The Marine Resources Monitoring, Assessment, and Prediction Program (MARMAP) began in 1971, sampling in the eastern Bering Sea, off Kodiak Island, Alaska, and off Vancouver Island, British Columbia. Samples were collected using MARMAP standard protocol (Jossi and Marak, 1983) and all taxa were sorted, counted, and identified by larval taxonomists at the Seattle laboratory, at that time known as the Northwest Fisheries Center (NWFC). The Outer Continental Shelf Environmental Assessment Program (OCSEAP) supported five cruises conducted 1977-1979 in the shelf waters east of Kodiak Island in the Gulf of Alaska. These studies were developed to assess the spatial and temporal distribution of plankton that might be affected by oil exploration and development. In 1980, the Plankton Sorting and Identification Laboratory in Szczecin, Poland, began processing ichthyoplankton samples collected by our center, which had been renamed the Northwest and Alaska Fisheries Center (NWAFC) in 1974. For most of the early 1980s, sampling was conducted along the Washington, Oregon, and northern California coasts in cooperation with the Soviet Union (USSR/USA cruises, 1980-87). As the first large-scale ichthyoplankton surveys to be done in this region, this work sought to document patterns in occurrence, distribution, and abundance of ichthyoplankton in coastal waters of the Northeast Pacific. The Fisheries Oceanography Coordinated Investigations (FOCI) Program began in 1985 and was initially centered on physical and biological factors affecting survival of ELH stages of walleye pollock (*Theragra chalcogramma*) in the Gulf of Alaska. Bering Sea FOCI was established in 1991 (after the NWAFC was split into two centers, the Northwest Fisheries Science Center (NWFSC) and the AFSC) under the auspices of NOAA's Coastal Ocean Program (COP) to address similar research in the eastern Bering Sea shelf region. Bering Sea FOCI ended in 1996, but was immediately followed in 1997 by the Southeast Bering Sea Carrying Capacity Program (SEBSCC), also sponsored by COP. This program sought to document the role of juvenile walleye pollock in the eastern Bering Sea ecosystem, to examine the factors affecting their survival, and to develop and test annual indices of prerecruitment abundance (Dagg and Royer, 2002). The Northeast Pacific Global Ocean Ecosystems Dynamics Program (GLOBEC) was added to the Recruitment Processes Program in 1998. The GLOBEC research, in addition to compiling a comprehensive atlas that presents data on spatial and temporal trends in the dominant fish eggs and larvae (Matarese et al., 2003), includes studies comparing multi-species ichthyoplankton assemblages from the Gulf of Alaska, Bering Sea, and U.S. west coast (Doyle et al., 2002a; Doyle et al., 2009) and larval flatfish transport studies, concentrating on the influence of El Niño in the Gulf of Alaska (Bailey and Picquelle, 2002). These investigations have provided insight into the spawning strategies of the fish populations in these regions and how they relate to oceanographic conditions.

Ongoing Investigations

Over the years, the Recruitment Processes program has broadened its focus from single species studies to a more holistic ecosystem approach. FOCI, one of our original projects, became so broad that this acronym was being used as the "umbrella" for many different projects. To reflect this broadening of our investigations, the group recently agreed to put all existing and future projects under the Eco-FOCI acronym (Ecosystem & Fishery-Oceanography Coordinated Investigations). This evolution occurred as NOAA Fisheries was also broadening its focus and adopting an ecosystem approach to management. One of our newest projects that is a perfect fit for Eco-FOCI is the North Pacific Climate Regimes and Ecosystem Productivity project (NPCREP), which seeks to observe and understand how climate determines the structure and function of marine ecosystems (Bering Sea and Gulf of Alaska). This new project, in collaboration with NOAA's Pacific Marine Environmental Laboratory, will also apply our new knowledge of climate-ecosystem linkages to the management of living marine resources, as does our original FOCI program.

Our original FOCI studies on walleye pollock and their ecosystem continue in the Gulf of Alaska and the eastern Bering Sea. For the Gulf of Alaska, FOCI conducts process studies and annual larval surveys and incorporates these data into recruitment estimates for walleye pollock (Megrey et al., 1996; Bailey, 2002). Correlation modeling methods have been developed to analyze hydroacoustic survey results of spawning aggregations, ichthyoplankton surveys of larvae, estimates of spawning biomass and recruitment from annual stock assessment, measurements of ocean temperature, winds, rainfall, sea-level pressure gradient, and other biological and physical factors (Megrey et al., 1995). Studies in the Bering Sea continue to document the role of walleye pollock in the eastern Bering Sea ecosystem, including their interaction with seabirds and marine mammals.

GLOBEC-supported investigations have identified dominant taxa and multispecies assemblages in the ichthyoplankton, described their horizontal distribution patterns, and related these patterns to the oceanographic variables (Doyle et al., 2002a). Temporal variation in the composition, distribution, and abundance of these assemblages is being further investigated. In addition, we are examining temporal variability in the occurrence, abundance, and distribution of many ichthyoplankton species that are numerically dominant (e.g., *Hippoglossoides elassodon*, flathead sole, Porter, 2005; *Lepidotsetta polyxystra*, northern rock sole, Lanksbury et al., 2007; *Atheresthes stomias*, arrowtooth flounder, Blood et al., 2007) and ecologically important (e.g., *Mallotus villosus*, capelin, Doyle et al., 2002b). Seasonal ichthyoplankton assemblages are being identified and described (e.g., summer ichthyoplankton in the Bering Sea, Duffy-Anderson, 2006; fall ichthyoplankton in the Gulf of Alaska, Lanksbury et al., 2005). Other studies are also investigating advective processes associated with onshore transport of ichthyoplankton, developing cross-shelf exchange tracers composed of offshore ichthyoplankton assemblages, and identifying key species that may be indicators of changes in oceanographic conditions or cross-shelf flow.

Background and Historical Review

Geographic and Temporal Coverage (Fig. 2, Appendix A)

Most data for the initial BCF Pacific hake and MARMAP studies in the mid-1960s and early 1970s were not entered into a permanent database. Our database became more consistent in 1977 with OCSEAP, the first broad-scale program offering NWAFC scientists the opportunity to study seasonal occurrences of eggs and larvae in the Northeast Pacific Ocean. During the 1970s, sampling intensity was highest in the Gulf of Alaska east of Kodiak Island (Map 1, Appendix B). The OCSEAP Program offered broad monthly coverage (February-November), but, overall, only 13 cruises were conducted between 1972 and 1979 (no cruises from 1973 to 1976). The graphs adjacent to each map show that the sampling effort over the months of the year varied by decade and by region. In the 1970s, comparatively few cruises were conducted, but most (81%) were conducted in the Gulf of Alaska with the remainder in the Bering Sea.

By the mid-1980s, there was a dramatic increase in the number of surveys due to the addition of U.S. west coast cruises (USSR/USA, 1980-1987) and the initiation of the FOCI Program (Map 2). Sampling was greatest in the Gulf of Alaska in Shelikof Strait and southwest of Kodiak Island. The number of cruises increased from 13 during the 1970s to 44 during the 1980s. January was included in the monthly coverage, but 88% of cruises occurred from March to May, which is the peak period of walleye pollock spawning in Shelikof Strait. Only three cruises were conducted in the Bering Sea, but coverage was expanded with ten cruises conducted along the U.S. west coast. Sampling distribution along the west coast was highest along the continental shelf region from Washington to northern California, while sampling was limited nearshore and in the deeper offshore waters.

Coverage in the 1990s was expanded to include more sampling in the Bering Sea with the onset of the Bering Sea FOCI and SEBSCC Programs (Map 3). More cruises were conducted than in the 1980s (58 versus 44) and a much higher percentage of Bering Sea cruises were conducted than ever before (46%). Summer coverage (27%) was also more extensive. Sampling gear other than bongo and neuston nets and Tucker trawls was used (e.g., MOCNESS nets to assess fine-scale vertical distribution) and cruises using Methot nets were designed to collect early juveniles; however, these special purpose gears were not included in the abundance and distribution data presented here.

For the years 2000-2006, most cruises were conducted in the Bering Sea (53%). Sampling was extended to the most northern areas of the Bering Sea (Map 4, Appendix B), while also adding some areas in the Gulf of Alaska beyond the shelf break off Southeast Alaska and British Columbia.

Overview of the Physical Oceanographic Environment

The abundance patterns of ichthyoplankton are summarized for three major ecosystems: the eastern Bering Sea (EBS), western Gulf of Alaska (GOA), and the U.S. west coast. An overall description of the physical and oceanographic characteristics of these three ecosystems is summarized below (Doyle et al., 2002a; Matarese et al., 2003).

The eastern Bering Sea is characterized by an exceptionally broad (>500 km) shelf region with a narrow continental slope adjoining an extensive Aleutian Basin (Map 5, Appendix B). The EBS shelf is one of the most productive regions in the world and sustains a high biomass of higher trophic level organisms (Loughlin et al., 1999). Circulation in the basin is generally cyclonic and is fed by inflow from the Alaskan Stream through the Aleutian Islands (Schumacher and Stabeno, 1998) (Map 6, Appendix B). Flow is greatest in the Bering Slope Current, which transports nutrients onto the outer shelf. Flow over the shelf itself is generally weak and large eddies are a common feature. Ice covers a substantial portion of the EBS each winter and spring, although there is considerable interannual variation in the duration and extent of ice coverage. There are three recognized biophysical domains on the shelf, separated by frontal boundaries at roughly the 50 m, 100 m, and 200 m isobaths, which differ hydrographically depending on the degree of stratification and mixing. Productivity appears to be highest at the shelf-break front and phytoplankton blooms there can begin in May and last throughout the summer (Springer et al., 1996). Zooplankton production is estimated to be highest along the shelf edge and outer shelf where the mesozooplankton consists primarily of large oceanic copepod species.

Numerous troughs and shallow banks characterize the topography of the western Gulf of Alaska. The Aleutian shelf area, as defined by the 200 m isobath, is narrower than the EBS shelf (65-175 km) and drops abruptly to depths of 5000-6000 m in the Aleutian Trench, which parallels the shelf edge (Map 5, Appendix B). The Alaskan Stream, which flows southwesterly and roughly parallel to the shelf break at 50-100 cm/sec, dominates offshore, near-surface circulation (Map 6, Appendix B). Nearshore, the Alaska Coastal Current (ACC) is the dominant feature (Reed and Schumacher, 1986). The upper layer flows in a southwesterly direction. With surface speeds of 25-100 cm/sec, the ACC in the vicinity of Shelikof Strait is one of the most vigorous and dynamic coastal currents in the world (Stabeno et al., 1995). Temperatures follow a clear seasonal pattern, with the coldest values occurring in March and the warmest values in August (Reed and Schumacher, 1986). Freshwater discharge into coastal waters peaks in the fall and strongly affects the circulation (Royer, 1998). This region has been referred to as the Coastal Downwelling Domain and is characterized by mainly onshore flow at the surface (Ware and McFarlane, 1989). A seasonal peak in phytoplankton production occurs first in the ACC, and then in the adjacent shelf area, during the first week in May (Napp et al., 1996). Production of copepod nauplii and other zooplankton usually accelerates significantly at this time, but, because of low temperatures and low concentrations of gravid adults, does not reach a maximum until mid-summer (Cooney, 1987).

In contrast to the EBS and the western GOA, the continental shelf is narrow off the U.S. west coast (Map 7, Appendix B). Off Washington and northern Oregon, the shelf width is less than 70 km, whereas off southern Oregon and northern California it narrows to less than 30 km, reaching a minimum of about 10 km off Cape Mendocino. A series of submarine canyons transect the shelf and slope off Washington and California.

These canyons are absent off Oregon where rocky submarine banks are found along the shelf. The U.S. west coast is part of an extensive Coastal Upwelling Domain extending from Baja California to southern British Columbia (Ware and McFarlane,

Background and Historical Review

1989). The oceanography of this region is characterized by the California Current system, a typical eastern boundary current regime (Hickey, 1989; 1998) (Map 6, Appendix B). The main California Current proceeds southwards along the U.S. west coast and is slow, meandering, broad, and indistinct. Prevailing winds cause downwelling close to the coast in winter and upwelling of cold, nutrient-laden, oceanic water close to the coast in summer. The intensity of Ekman transport and associated upwelling is variable along the coast and tends to increase from north to south with a local maximum at Cape Mendocino off northern California (Parrish et al., 1981). Annual sea-surface temperature minimums and salinity maximums generally occur in summer after sustained upwelling-favorable winds. Phytoplankton blooms occur during relaxed upwelling conditions between peak upwelling periods during spring and fall (Small and Menzies, 1981). A zone of high zooplankton standing stock is generally observed 10-30 km offshore in summer and the community is dominated by copepods (Landry and Lorenzen, 1989).

Information and Data Sources

Sampling Protocol

The taxonomic data used in this website were obtained from eggs and larvae collected during ichthyoplankton surveys conducted from 1972 to 2006 by the Recruitment Processes Program (Table 1). Data on distribution and abundance of eggs and larvae were based on surveys from 1972-2004, excluding 1973-1976. Collection data for cruises conducted up to 1988 can be found in Dunn and Rugen (1989), and in the AFSC ichthyoplankton cruise database (Rugen, 2008) for those cruises conducted from 1989 to 2004. The majority of the data are from samples collected using a MARMAP type bongo sampler (Posgay and Marak, 1980) with an inside diameter of 60 cm and a 0.333 or 0.505-mm mesh net. Before 1985, standard MARMAP oblique tows were made to 200 m following MARMAP sampling procedures (Smith and Richardson 1977). In 1985, sampling depth in the Gulf of Alaska was changed to near bottom in order to accurately determine the abundance of walleye pollock eggs and early larvae. Beginning in the early 1990s, annual larval surveys in the Gulf of Alaska began to sample to 100 m in late May because that is where the larvae are most abundant. Flowmeters suspended in the mouths of the nets of all ichthyoplankton gear were used to determine the volume of water filtered by each net. Data from 1-m Tucker trawls were used only for cruises in which Tucker trawls were the primary gear (12 cruises, 831 tows; Table 1).

A Sameoto neuston sampler (Sameoto and Jaroszyinski, 1969), with a mouth opening 0.3 m high x 0.5 m wide and a 0.505-mm mesh net, was used sporadically throughout the time series to collect eggs and larvae that reside in the upper surface waters. A partial summary and analysis of our spring neuston collections from the Gulf of Alaska (1981-1986) are presented by Doyle et al. (1995). A summary and analysis of our neuston collections off the U.S. west coast are presented by Doyle (1992). In comparison to bongo collections presented here (Table 1, Appendix C), Table 2 (Appendix C) presents an overall summary, based on the standard data set for 1972-1996, of the 20 most common taxa collected with neuston gear and arranged by percent frequency of occurrence. Data from the neuston tows were selected to generate maps and graphs for 11 taxa for which the best geographic distribution pattern was described using surface gear (Table 3, Appendix C).

The sampled population is defined as fish in the size range that is effectively caught by the sampling gear, and may include both larvae and juveniles because the transformation point between these two stages is unknown for many species, and because fish were staged inconsistently over the years. The number of individuals caught in each of the three sampling gears (i.e., bongo net, neuston net, and Tucker trawl) was standardized to number caught per 10 m^2 of surface area. Catches from bongo and Tucker gear were standardized based on net mouth area and tow depth and length (Smith and Richardson, 1977). Some of the Tucker tows were depth stratified; that is, two nets sampled two contiguous depth intervals. In these cases, the catches per 10 m^2 from both nets were summed to integrate over the depths sampled by both nets. Since both gears were fished at similar depth ranges, we assumed that bongo and Tucker gear sample essentially the same population, and thus allowed data from these two gears to be combined. This assumption is supported by Shima and Bailey (1994), who concluded that the fish-length-specific sampling effectiveness of these two gears is not significantly different. It was

also assumed that no individuals occurred below the depth sampled by the gear, thus the number caught per 10 m^2 of surface area represents the total number of individuals in the water column below a surface area of 10 m^2 . Samples collected by neuston gear were standardized to number caught per 10 m^2 of surface area based on net mouth width and tow length. Neuston data are usually represented as number per 1000 m^3 , but we chose to scale the data to surface area because that describes the number of animals in a specified area of the neuston layer. In comparing neuston catches and bongo catches per unit area, the neuston catches are much smaller because the volume of water filtered is much smaller. The neuston net effectively samples the top 15 cm of the surface layer; hence animals occurring below this depth are not sampled. It was assumed that most individuals of neustonic species occur in the top 15 cm, although many species migrate vertically in and out of the neuston.

Plankton samples were preserved in the field using a 5% formalin-seawater solution buffered with calcium carbonate chips or sodium borate; after 1983, fish larvae were transferred to 70% ethanol after formalin fixation. All fish eggs, larvae, and juveniles have been removed and identified to the lowest possible taxon since 1980 at the Plankton Sorting and Identification Center in Szczecin, Poland (Fig. 1, Appendix A). Identifications are verified by the taxonomic team at AFSC using information found in Matarese et al. (1989) and supplemented by a number of more recent publications including those by Moser (1996), Busby (1998), and Orr and Matarese (2000).

Geographic Coverage

The study area extends from the Bering Sea, into the Gulf of Alaska, and along the U.S. west coast (Map 8, Appendix B). Most of the sampling throughout the time series occurred in Shelikof Strait and west toward the sea valley and along the Alaskan Peninsula (Map 9, Appendix B). Repeated sampling was more extensive with bongo/Tucker gear than with neuston gear (Map 10 and Map 11, Appendix B). Coverage is most complete in the Gulf of Alaska (except for 1980 when no sampling occurred there; Fig. 2, Appendix A) and less extensive in the Bering Sea and off the U.S. west coast. Coverage is also more complete along shelf regions and less extensive in deeper ocean waters where mesopelagic and deepwater flatfishes spawn. No ichthyoplankton sampling occurred in the North Pacific in Canadian waters. Most of the 625 km^2 grid cells were sampled 1-10 times.

Most of the data used in this study were obtained from bongo tows taken during April and May. Combined bongo tows and Tucker trawls during these two months account for 52-79% of the yearly total, depending on geographic region (Fig. 3, Appendix A). Data from neuston tows were more evenly distributed throughout the year, with tows made during April and May accounting for 0-54% of the yearly total in each region (Fig. 3, Appendix A). The distribution of combined bongo tows/Tucker trawls and neuston tows by year and geographic region further illustrates our extensive coverage of the Gulf of Alaska during the 11-yr period (1977-1987) of routine sampling with neuston gear (Fig. 4, Appendix A).

Information and Data Sources

Taxonomic Coverage (Matarese et al., 1989; Matarese et al., 2003)

The increase in our taxonomic knowledge over almost 40 years has allowed our basic knowledge of the early life history of species to be expanded and fine-tuned. Of the 646 known fish species that occur in the Northeast Pacific Ocean and Bering Sea, we can currently identify a portion of the early life history stages for about 320 (pers. commun., Busby unpubl.). The order of higher taxa generally follows Nelson (1994); genera and species are listed alphabetically within families.

Larvae -- Most of the larvae included in the IIS can be found in our laboratory guide (Matarese et al., 1989), atlas (Matarese et al., 2003), or CalCOFI Atlas 33 (Moser, 1996). Any taxa that spawn in our study area and have been described with accompanying illustrations can be found within this guide. Taxa that do not produce planktonic early-life-history stages are generally excluded (e.g., Embiotocidae) as are strictly freshwater and estuarine species or spawners. Sources useful in identifying early-life-history stages of freshwater and estuarine species found adjacent to our study area include Wang (1981, 1986) and Auer (1982). Updated and new ELH data and figures will be added as information is published.

The complete list of larval fish taxa collected from Recruitment Processes Program cruises 1972 through 1996 used for initial consideration in the atlas (Matarese et al., 2003) is presented in Table 4 (Appendix C). This list was reduced to 102 taxa within 34 families (Table 5, Appendix C). All individual species covered in Matarese et al. (2003) are found in this website; taxa covered only at the genus or family level are not included. Additional maps are added as distributional data are published. Currently, distribution maps are available for 89 taxa.

Eggs -- Similar to the larvae as described above, most of the fish egg taxa included in the IIS can be found in our laboratory guide (Matarese et al., 1989), atlas (Matarese et al., 2003), or CalCOFI Atlas 33 (Moser, 1996). Of larval taxa in the IIS, any of their respective eggs that have been described can be found within this website; most/many have accompanying illustrations.

The complete list of fish egg taxa collected from Recruitment Processes Program cruises 1972 through 1996 used for initial consideration in the atlas is presented in Table 6 (Appendix C). Data were restricted to pelagic fish eggs due to sampling strategies and gear limitations. The selection process resulted in a total of 30 taxa included in 14 families (Table 7, Appendix C). For each taxon in the final list, distributional maps depicting presence/absence are presented in the IIS. As with larvae, additional egg distribution maps are added as data are published.

General life history -- Life history data are provided as ancillary information, which may aid in identification of eggs and larvae. These data were extracted from the current general literature as well as original unpublished material. Geographic ranges are from three types of sources: RACEBASE, an oracle database developed by the Resource Assessment and Conservation Engineering Division (RACE) which contains information collected by fishery scientists on research survey cruises; ICHBASE, a database developed by AFSC which contains information on larval fish and eggs

collected from research cruises; and from current literature. Mecklenburg et al., 2002 provided a significant amount of new information. Range information is restricted to the study area. Thus, the limits of the southern distribution beyond the California-Mexican border (SSC = South of southern California, below 32° 30' N), the northern range beyond the Arctic to the north and east, and the western range beyond the Bering Sea are not specified.

Format and Methods

Statistical Overview for Map Generation (for complete details, see Matarese et al., 2003)

The data described in the Information and Data Sources Section were combined to produce an average spatial distribution as presented in the maps on individual taxon pages. Abundance from each station was measured as catch per 10 m² surface area. The statistical method, which we adopted, was to stratify the data into equal-sized time intervals (e.g., years), which partially controls the bias due to uneven sampling effort in time. This does not completely correct the bias because some time interval strata have no data at all, and stratification does not help in these cases. Bias for the strata that do have data is corrected by giving each stratum equal weight regardless of the number of stations. For the maps, the data within each 625 km² grid cell were stratified by year. This removes bias due to uneven sampling between years within each cell, but only for those years for which each cell was sampled; this does not correct for uneven sampling for those years where the cell was not sampled at all.

Data Layers

The maps were produced with a geographic information system (GIS) using ArcInfo software (ArcInfo, 2008), a product of Environmental Systems Research Institute (ESRI). Generic base data such as land extents were derived from a combination of Global Land One-kilometer Base Elevation (GLOBE) (GLOBE Task Team, 1999) and Digital Chart of the World (DCW) data. To produce the land relief, GLOBE data were hill-shaded to show relief, missing data values were filled in, and data were clipped to the extent shown with the DCW data and converted to image format. Bathymetry data are from in-house and the General Bathymetric Chart of the Oceans digital atlas (GEBCO) (IOC, IHO, and BODC, 1997).

Occurrence Map Generation

Larval Occurrence Map

Fish density data (catch per 10 m²) were read into a GIS, i.e. ArcInfo, software and converted into ArcInfo coverages (data layers). The fish density data layer shows all the sample locations referenced geographically. However, samples were often taken at the same location resulting in points plotting on top of each other. Because we wanted to show the quantity and distribution of the samples, a different symbology was needed. Fish density is continuous in space even though the density may be zero at some locations. So, point locations were aggregated into a surface by overlaying the points onto a regular grid and assigning a mean value to each grid cell. The cell size of the grid is 25 km x 25 km (625 km²), or roughly 15.5 miles x 15.5 miles. The mean value at each grid cell was derived in two stages. First, the mean catch per 10 m² was calculated per cell per year, and then the mean catch per 10 m² was calculated per cell averaged over the years. This equalized the contribution of any single year since some years may have had a greater number of samples. The resulting data layer was a polygon showing all cells where samples were taken and their associated abundance based on catch per 10 m².

A chloropleth map design was chosen to depict abundance. The purpose of the map is to show the general spatial extent of the data and the general trend of average larval abundance

over space. Chloropleth maps shade statistical units with intensity proportional to the data values. All cells that were sampled, but contained no individuals of the taxon, are symbolized as gray, indicating absence. The remaining data were classified using quantiles: data were ranked, ordered, and divided into four categories, each containing an equal number of observations. The legend shows the range for each class and the colors are hierarchical in that lighter colors connote lower levels of abundance and darker colors connote higher levels.

Adult Occurrence Map

The occurrences of adults were derived for the most part from unpublished AFSC data residing in RACEBASE, an Oracle database. RACEBASE was developed by the Resource Assessment and Conservation Engineering Division (RACE) and comprises data from assessment, hydroacoustic, and foreign surveys conducted by federal fishery scientists from 1948 to the present. The geographic extent of RACEBASE data covers the continental shelf and slope of western North America and northeastern Asia from the Arctic Ocean (72° 14' N, 167° 52' W) south through the eastern half of the Chukchi Sea, throughout the Bering Sea (including the continental shelf of northeast Siberia), the Aleutian Basin and eastward along the Aleutian Islands, and along the U.S. Pacific coast from the Gulf of Alaska to the southern border of California (32° 28' N, 119° 18' W). Adult occurrence data points for taxa where standard RACEBASE data were insufficient were obtained from literature and unpublished sources. Maps generated with alternative data are identified with an asterisk in the legend and represent presence data only.

Egg Occurrence Map

The data for the egg occurrence map was processed similarly to the adult occurrence map. Data were extracted from ICHBASE and exported in ASCII text format. A data layer was created with the data using ArcInfo, which was then overlaid with a polygon grid having a 25 km x 25 km cell size to produce the final data layer showing presence or absence of eggs of the taxon. The result was a layout design consistent with the larval abundance map, which overcame the issue of stacked data points. Gray squares denote where samples were taken, but no eggs were found. Black squares show the presence of the taxon. Cell sizes appear smaller than those in the average larval abundance map because of the change in map scale.

Using This Guide

The organization of this guide is to allow the user to browse through the 289 taxa (Table 8) currently included in the IIS and to aid in identification of ELH fish specimens. For each taxon, when available, there is information pertaining to distribution, meristics, life history and ecology, early life history descriptions, illustrations, and relevant literature. Phylogenetic order generally follows Nelson (1994) and Nelson et al. (2004) and scientific names follow Robins et al. (1991) and Nelson et al. (2004).

ELH Characters

As fish larvae do not often look like their adult counterparts, the following characters are useful when trying to identify an unknown egg or larval fish specimen from the Northeast Pacific or Bering Sea. The first step is to determine the developmental stage of the specimen because the size of the larvae at certain stages can sometimes be an identifying trait.

Developmental Stage Definitions (Fig. 5, Appendix A)

EGG/EMBRYO STAGE (spawning to hatching): There are two general categories of diagnostic characters pertaining to fish eggs. The first category pertains to the egg itself and contains characters such as: egg size and shape; envelope sculpturing and color; yolk diameter, pigmentation, and character (homogeneous or segmented); number, size, and position of oil globules; and width of perivitelline space. The second category pertains to the embryo developing within the egg and contains characters such as: pigmentation, timing of development, body shape, number of myomeres, and presence or absence of elongate fin rays.

YOLK-SAC STAGE (hatching to complete absorption of yolk sac): Larvae hatch from the egg at various stages of development. For larvae hatched from pelagic marine eggs, hatching generally occurs before the yolk sac has been completely absorbed. However, larvae of species with demersal eggs hatch as preflexion larvae having absorbed their yolk while still in the egg. In species that do have a yolk-sac stage, larvae usually hatch without a functional mouth, eye pigment, or differentiated fins. Diagnostic characters for yolk-sac larvae include body size and shape, gut shape and length, pigment patterns, number of myomeres, size and shape of yolk sac, oil globule size and position within the yolk, and presence or absence of specialized larval characters such as elongate fin rays, enlarged finfolds, and stalked eyes.

PREFLEXION STAGE (complete yolk-sac absorption to start of notochord flexion): The preflexion stage begins once both hatching and complete absorption of the yolk sac have occurred and ends with the start of notochord flexion. Diagnostic characters for preflexion larvae are similar to those for other larval stages: meristics (myomeres, fin rays), body size and shape, fin development sequence, gut shape and length, pigmentation pattern, presence or absence of head spines, and presence or absence of specialized larval characters such as fin-ray ornamentation, stalked eyes, and a trailing gut.

FLEXION STAGE (start of notochord flexion to completion of notochord flexion): The flexion stage is

defined as beginning with the dorsal bending of the notochord tip concurrent with development of the caudal-fin rays and supporting skeletal elements. Diagnostic characters for this stage are similar to those for other larval stages: meristics (myomeres, fin rays), body size and shape, fin development sequence, gut shape and length, pigmentation pattern, presence or absence of head spines, and presence or absence of specialized larval characters such as fin-ray ornamentation, stalked eyes, and a trailing gut. Additionally, osteological characters, such as the sequence and timing of ossification, become useful during this stage. The flexion stage ends when the notochord tip has reached its final position at approximately 45 degrees from the notochord axis and the principal caudal-fin rays and supporting skeletal elements are in the adult longitudinal position. The supporting skeletal elements may or may not be completely developed.

POSTFLEXION STAGE (completion of notochord flexion to start of metamorphosis): The postflexion stage begins after the completion of notochord flexion and ends at the onset of metamorphosis (transformation). Diagnostic characters for this stage are similar to those for other larval stages: meristics (myomeres, fin rays), body size and shape, fin development sequence, gut shape and length, pigmentation pattern, presence or absence of head spines, presence or absence of specialized larval characters such as fin-ray ornamentation and stalked eyes, and osteological characters such as timing and sequence of bone and cartilage development.

TRANSFORMATION STAGE (start of metamorphosis to completion of fin-ray development and beginning of scale formation; can be considered late postflexion): The loss of larval characters and the attainment of juvenile/adult characters distinguish the transformation stage. Changes in body shape and pigment pattern can be dramatic. Additional changes that may occur include fin migration, photophore formation, loss of specialized larval characters, eye migration, and scale formation. The transformation stage is generally defined as ending with the completion of fin-ray development and the onset of scales. The duration of this stage differs among taxa.

JUVENILE STAGE (completion of fin-ray development and start of scale formation to attainment of sexual maturity): Individuals that have reached the juvenile stage of development generally resemble small adults. Although the juvenile stage is characterized by the attainment of different developmental landmarks in different families, scale formation and complete ossification of the skeleton occurs during this period. The stage ends with the attainment of sexual maturity.

OTHER STAGE For several taxonomic groups, exceptions were made to the generalized life stage classification used above, e.g., rockfishes (extrusion larvae are categorized as yolk sac), leptocephalus larvae (pigment only filled out for "postflexion" stage), macrourids ("Preanal-fin formation" stage larvae are categorized as "preflexion," and laterstage "Anal-fin formation" specimens are categorized as "postflexion" [Ambrose 1996]), and gadids ("preflexion" have no caudal-fin elements yet developed, "flexion" exhibit some caudal-fin element development, "postflexion"

Using This Guide

exhibit near-completion of caudal-fin element development, "juvenile" indicate that caudal-fin elements are complete).

Meristic Definitions

For identification of fish larvae, meristic characters are essential and should be determined. The following meristic characters are listed for each taxa, when available.

BONY PARTS-	
Vertebrae	
Total	
Precaudal	
Caudal	
Gill Rakers	
Upper Gill Rakers	
Lower Gill Rakers	
Branchiostegal Rays	
FIN COUNTS (Spines and Rays)	
Pelvic	
Dorsal	
Pectoral	
Anal	
Caudal	
Upper Secondary	
Upper Principal	
Lower Principal	
Lower Secondary	

Larval Pigment Region Definitions

Pigmentation available as taxonomic characters on larvae is limited to melanophores, since other pigment cells (e.g., xanthophores) do not retain their color in currently used fixatives and preservatives. Melanophore patterns are very useful for identifying larval fishes. Their relative size, position, and sometimes the number of melanophores in series should be noted. In some cases, pigmentation consists of a group of melanophores in a specific area; in others the pigmentation consists of an individual melanophore. Pigmentation generally changes as larvae develop. Movement of individual melanophores is rather limited, but addition or loss of melanophores is common. Usually preflexion larvae are less pigmented than later larvae, and late in the larval period, as transformation occurs, the larval pigment pattern is overgrown by the largely superficial pattern of the juvenile. Between the preflexion and transformation stages in most fish there is a definite larval pigment pattern which is relatively stable, and unique to a species in many cases. In this guide, pigment present in each developmental stage previously described is listed for the following regions (Fig. 6, Appendix A).

PREANAL -

Mouth - pigment anterior to a vertical line drawn from anteriormost edge of eye. Usually includes posterior end of maxilla, (upper and lower jaw, lateral or ventral surface), snout, or anterior area of the forebrain.

Crown - pigment on dorsal surface of head, from anterior margin of eye to posterior edge of head defined by a line vertically from hindbrain to opercular margin, and then laterally to a horizontal line drawn at mid-orbit

(although no eye pigment is included in this or any other category).

Nape - pigment in dorsal region of body beginning at posterior edge of crown and extending to a line drawn vertically from posterior edge of pectoral fin base. Extending more laterally, and includes spots in cleithral area dorsal to pectoral fin insertion.

Cheek - pigment on opercle that lies ventral to a horizontal line through mid-orbit, and posterior to a vertical line drawn at the end of maxilla. Including spots along ventral or posterior edge of opercle, on branchiostegals, and on mandibular articulation (jaw angle), even if these are only visible ventrally. "Mouth" uses the vertical line at the anteriormost edge of the eye, which means that in fish with long maxillas (myctophids and a few others), there will be a small undefined space between these lines.

Isthmus - pigment in ventral region of head connecting gular and cleithral regions; includes pigment on or anterior to cleithrum, but ventral to edge of pectoral fin base.

Dorsal gut - pigment outlining dorsal surface of gut cavity from just behind pectoral fin to anus, and may round only slightly onto lateral edges of gut. Pigment is on gut surface, on dorsal wall of gut cavity, on gas bladder, or on skin covering junction between hypaxial musculature and gut cavity. Includes "hind-gut", which is posteriorly instead of dorsally placed when the gut curves ventrally near the anus.

Lateral gut - includes any pigment between rounding edges of dorsal and ventral gut regions and is posterior to cleithrum. May include pigment ventral to pectoral fin base or pigment lining the anterior edge of gut cavity.

Ventral gut - includes pigment on ventral surface of gut cavity, rounding only slightly onto lateral edges of gut. Includes pigment on cleithrum that extends posteriorly (although no pigment that is solely on cleithrum), pigment that encircles anus, pigment on or around pelvic fins in most cases, and pigment lining anterior edge of the gut cavity that extends onto ventral surface.

POSTANAL -

Dorsal finfold - includes pigment that is found on or that extends onto rays or membranes of dorsal finfold or dorsal fins. Does not include pterygiophores.

Anal finfold - includes pigment that is found on or that extends onto rays or membranes of anal finfold or anal fins. Includes post-ventral melanophores (PVMs) that extend onto anal finfold, but excludes pterygiophores.

Caudal finfold - pigment that is found on or that extends onto rays or membranes of caudal finfold or fin. Does not include pigment that outlines notochord tip or urostyle, or thickened areas in preflexion and flexion larvae that will later develop into elements of the caudal fin (see "Caudal" for these areas).

Using This Guide

Pectoral fin - includes pigment on either blade or base of pectoral fin, as well as in area of cleithrum directly anterior to pectoral fin base, sometimes partially covered by the opercle.

Dorsal - pigment dorsal to, but not including, a dorsolateral line formed by the fulcra of V's in epaxial musculature; begins behind nape and extends to the end of the last vertebra, includes dorsal midline melanophores. In preflexion or flexion larva in which these fulcra have not yet formed, the dorsal edge of the notochord will replace this line.

Ventral - pigment ventral to, but not including, a ventrolateral line formed by the fulcrum of V's in hypaxial musculature; begins along the dorsal gut and extends to the end of vertebra, includes any post-ventral melanophores (PVMs). In preflexion or flexion larva in which these fulcra have not yet formed, the ventral edge of the notochord will replace this line.

Mediolateral - pigment on and medial to mediolateral lines of pigment that define ventral boundary of "Dorsal" and the dorsal boundary of "Ventral". Begins at nape or pectoral fin base, extends partially along dorsal gut, and continues along the "Ventral" and "Dorsal" boundaries until the last vertebra. Does not include notochord pigment.

Caudal - pigment on or outlining urostyle or notochord tip and hypural elements. May extend into the peduncle region, but pigment on the caudal peduncle and not on caudal elements is not included. May include last few PVMs, and pigment above thickened areas where hypural elements are developing in flexion larvae. If these elements have not yet begun developing in preflexion larvae but pigment is still found in this region, it is placed in the "caudal finfold" category.

Although photophores are found in various regions of the body, pigment associated with photophores during or after formation is considered distinct from the melanistic pigment described above, and is not included in any of the previous pigment definitions. Instead, photophore illustrations (Appendices A) of myctophids (Fig. 7), gonostomatids (Fig. 8), sternopychids (Fig. 9), and stomioids (Fig. 10) (with accompanying photophore key, Table 9, Appendix C) are available as identification tools.

Additionally, ecological information, such as depth of capture, geographic area of capture, and date of collection can aid in identification.

Taxon Page

For each taxon, the information is organized into six categories: distribution, meristics, life history, ELH descriptions, illustrations, and footnotes (general references).

Distribution - This page is composed of three maps for each taxon: a larval distribution and abundance map, an egg occurrence map, and an adult occurrence map (Matarese et al., 2003, in part). Gray squares show where samples occurred, but no individuals of a taxon were found. The sampling distribution is different among the three maps. The

square grid cell is the same size on all three maps, but appears smaller on the egg and adult occurrence maps due to scale changes.

Heading - The upper left corner of the page includes the common name of the taxon (see Nelson et al., 2004). A blank indicates that no common name is available for that taxon. The upper right corner includes the name of the family in which the taxon occurs.

Larval Distribution and Abundance Map - This map shows the quantity of larvae from combined bongo and Tucker trawl data in the mapped areas. The data are classified such that sampling location information and abundance are provided. Sampling location is represented by the small squares on the map. Gray squares show where sampling occurred, but no individuals of a taxon were found; colored squares show the average abundance of larvae found in the sampled area. The quantity is color coded with lighter color depicting less and darker color depicting more. The color codes function to show general trends in the quantity of the larvae. The map is designed to show the overall abundance of the larvae, rather than the specific values of individual samples. The individual range values in the legend include the lowest value, but not the highest; the highest number marks the end of the range and is not inclusive. The user should also keep in mind that the number of samples varies greatly among the squares.

Egg Occurrence Map - Egg identification or abundance data is available for less than 17% of those fish species for which larvae are identified in the Northeast Pacific Ocean and Bering Sea (Kendall and Matarese, 1994). Gear that is used for collecting fish eggs is biased toward planktonic individuals; demersal eggs are severely underrepresented or entirely absent from our database. Egg occurrence in this map is displayed as presence only; black squares show where eggs were present when sampled. For those taxa whose eggs are demersal or unknown, the legend within the map states that eggs are not collected.

Adult Occurrence Map - RACEBASE is a database based on adult groundfish assessment, hydroacoustic, and foreign surveys conducted by federal fishery scientists. Standard adult occurrence maps were generated with RACEBASE data that were limited to the years 1975-2005. Blue squares show where adults were found when sampled. Gray squares denote where samples were taken, but no individuals of that taxon were found. Adult occurrence maps generated with alternative data are identified with an asterisk in the legend on individual taxon pages (Matarese et al., 2003). Adult occurrence maps generated with alternative data other than RACEBASE show presence only because the geographic extent of individual surveys was unknown (no gray area appears on the map).

Using This Guide

Meristics - For each taxon, if available, minimum, modal, and maximum counts are given for the following meristic characters: vertebrae (total, precaudal, and < caudal), upper gill rakers, lower gill rakers, branchiostegal rays, caudal-fin rays (upper secondary, upper principal, lower principal and lower secondary), pelvic fin (spines and rays), pectoral-fin rays, dorsal fin (spines and rays) and anal fin (spines and rays). Unknown meristic counts are denoted with an 'X'. Data are from Matarese et al. (1989), updated from recent taxonomic works.

Life History - For each taxon, if available, data for the following life history features are presented: General (geographic range, ecology, ELH pattern, and longevity) and Spawning (area, season, mode, fecundity, age at maturity, and migration). Sections are blank if data are unknown. Data are from Matarese et al. (1989), Moser (1996) and Matarese et al. (2003), and from recent taxonomic works.

ELH Descriptions - For each taxon, a description of the eggs and larvae is provided along with pigment and/or morphological diagnostic characters for distinguishing them from similar-looking species. If available, data for the following ELH features are presented: Egg (diameter, number and size of oil globules, yolk, chorion, and pigment on yolk and embryo) and Larvae (hatch size, preanal length, flexion length, length at transformation, sequence of fin development, and larval pigment pattern). Sections are blank if data are unknown. Descriptions are from Matarese et al. (1989), and Moser (1996), and from recent taxonomic works.

Illustrations - For each taxon, if available, illustrations of the following life history stages are presented: egg, yolk sac, preflexion, flexion, postflexion, and either a transforming or early juvenile. Sources for these illustrations include those previously published and originals drawn from specimens in our collections (Table 8); collection data are provided for original illustrations. Original measurements of larvae are in millimeters and given in standard length (SL) unless otherwise noted. Some measurements taken from the literature are expressed as head length (HL) (Macrouridae), body length (BL), notochord length (NL), or total length (TL). The majority of illustrations are from Matarese et al. (1989), but new and revised figures have been added throughout to reflect the more recent taxonomic literature.

Footnotes - A list of literature referenced specifically for each taxon is provided. General references are listed first, followed by footnotes, and sources for figures.

Citations

A complete list of literature referenced for all 289 taxa found in the IIS. The citations include references cited in the text, footnotes, and sources of figures.

Appendix A - Figures

Figure 1. Ichthyoplankton protocols and level of identification for sampling programs conducted by the Recruitment Processes Program, 1965-2005.

Year	Sorting and Processing	Scientific Programs & Studies	Identification
1965			Pacific hake larvae
1966			
1967	BCF ¹ Biological Laboratory	BCF Hake Studies	
1968	and At Sea		
1969			
1970			
1971			
1972	NWFC ²	MARMAP ⁴	
1973			
1974	NWFC → NWAFC ³		All larvae and eggs
1975			
1976			
1977			
1978	Texas Instruments Corp.	OCSEAP ⁵	
1979			
1980			All larvae ⁶
1981			
1982		NWAFC Studies	USSR / USA Studies
1983			
1984			
1985		FOCI ⁷	
1986			
1987			
1988			
1989			
1990	Plankton Sorting and Identification Center, Szczecin, Poland		
1991		NWAFC → AFSC ⁸	All larvae; walleye pollock egg identification and staging
1992			
1993			
1994			
1995			
1996			
1997			
1998		Bering Sea FOCI	
1999			
2000		GLOBEC ⁹	All larvae and eggs
2001			
2002		SSL ¹⁰	
2003			
2004		NPCREP ¹¹	
2005	EcoFOCI		

¹Bureau of Commercial Fisheries.

²Northwest Fisheries Center.

³Northwest and Alaska Fisheries Center.

⁴Marine Resources Monitoring, Assessment, and Prediction.

⁵Outer Continental Shelf Environmental Assessment Program.

⁶Eggs identified and larvae verified by Recruitment Processes Program.

⁷Fisheries-Oceanography Coordinated Investigations.

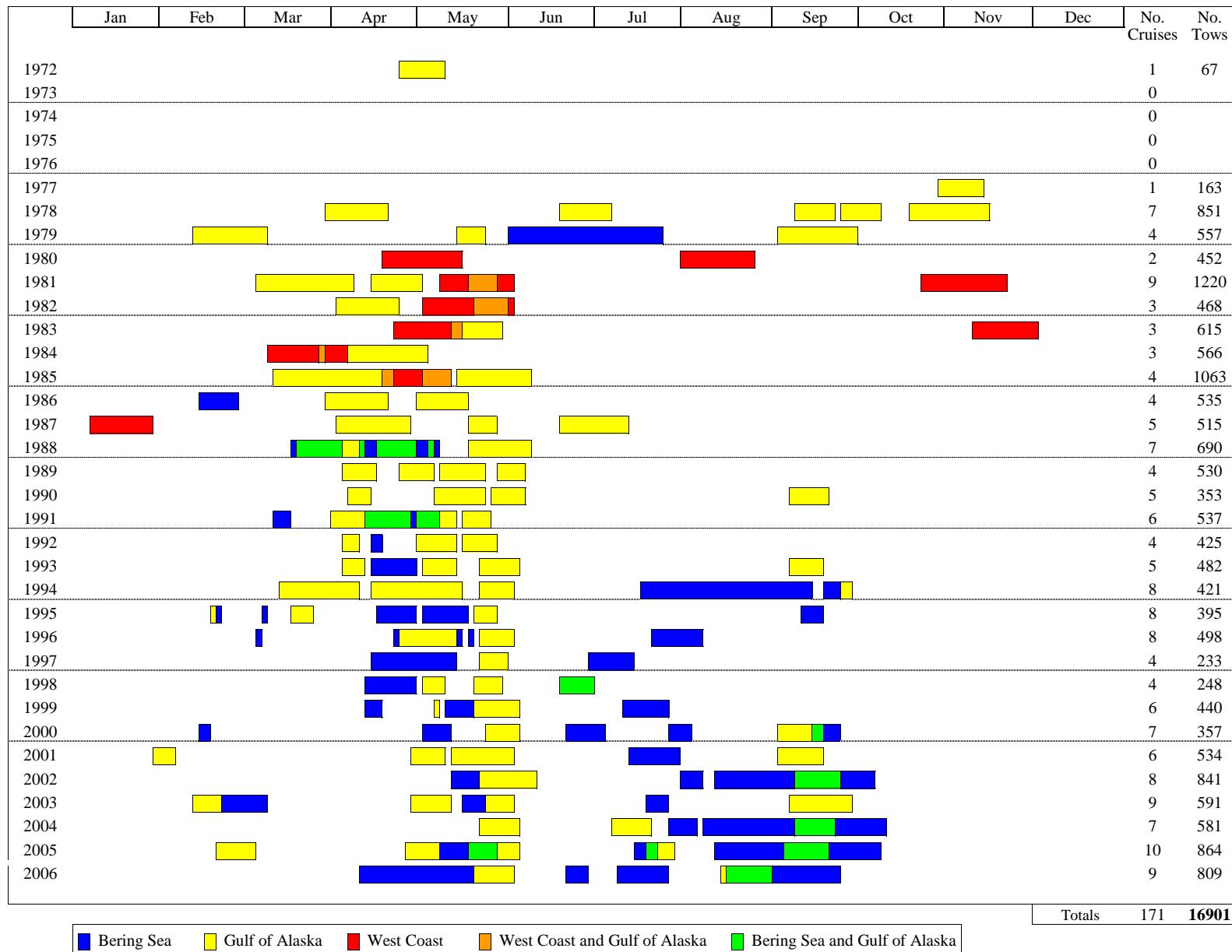
⁸Alaska Fisheries Science Center.

⁹Global Ocean Ecosystems Dynamics (1998-2003).

¹⁰Steller Sea Lion research (2002).

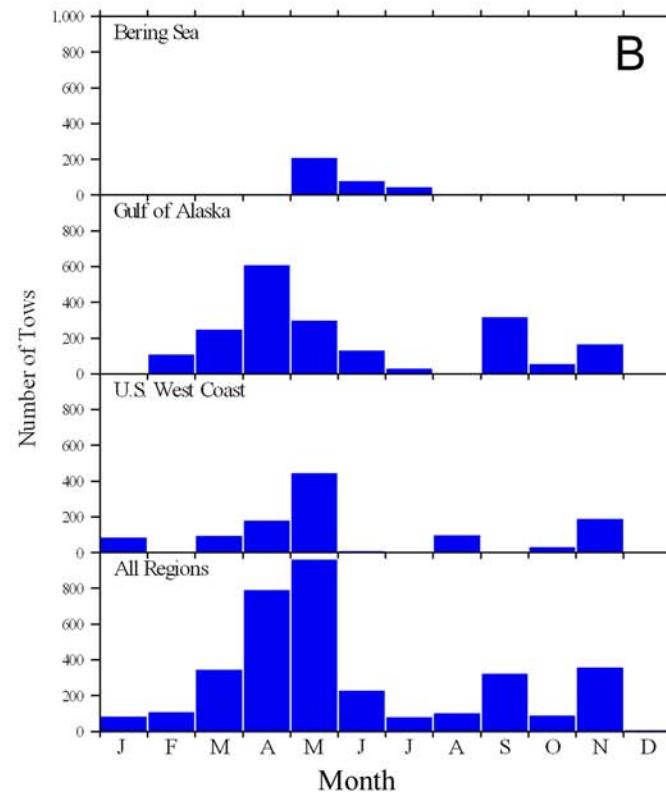
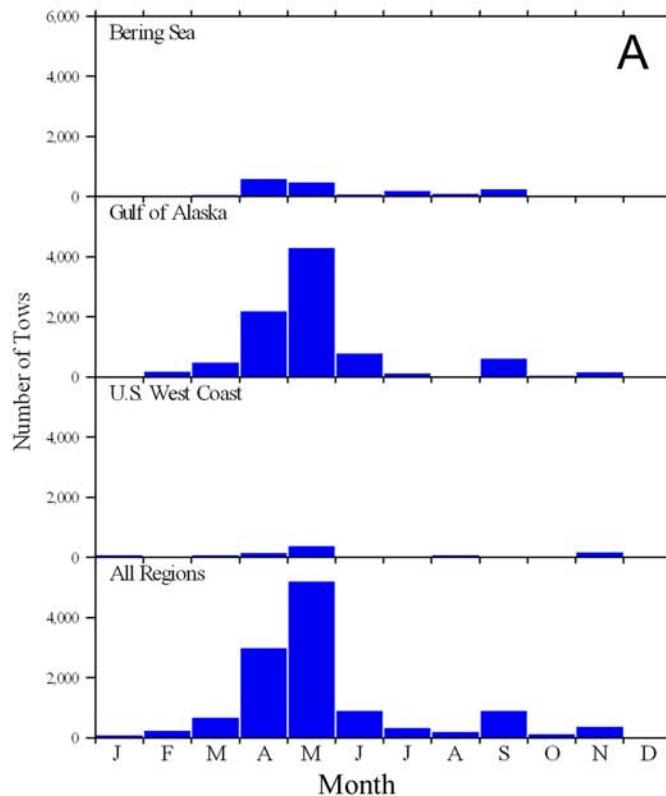
¹¹North Pacific Climate Regimes and Ecosystems Productivity.

Figure 2. Geographic and temporal coverage of Recruitment Processes Program ichthyoplankton survey data 1972-2006 available in larval fish database (ICHBASE).



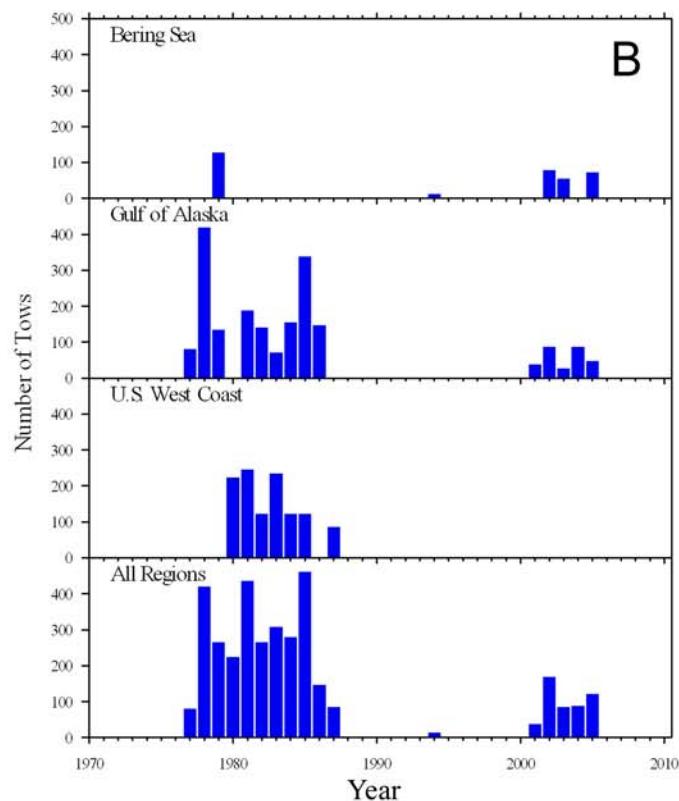
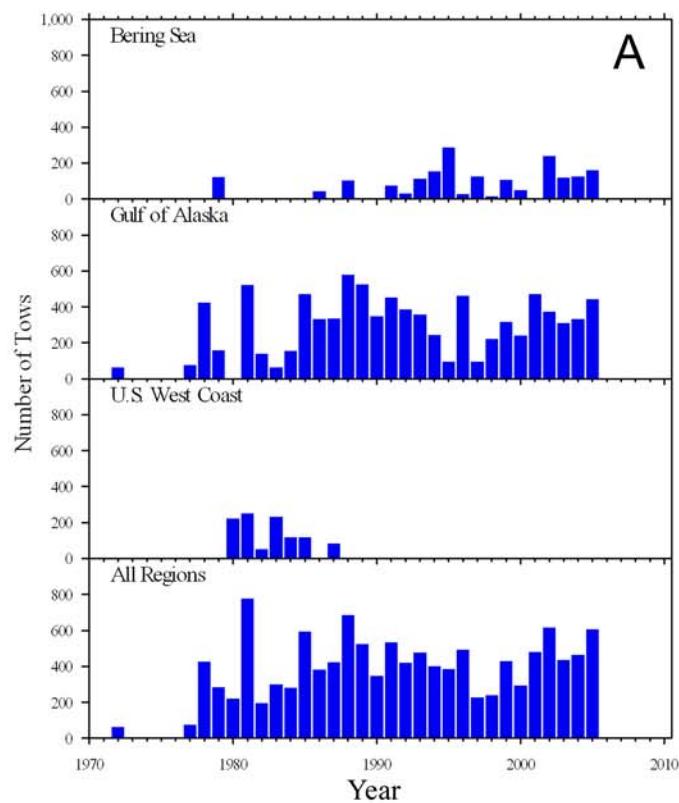
Appendix A - Figures

Figure 3. Monthly distribution and number of (A) combined bongo and Tucker tows (number of tows scaled to 6,000) and (B) neuston tows (number of tows scaled to 1,000) by region.



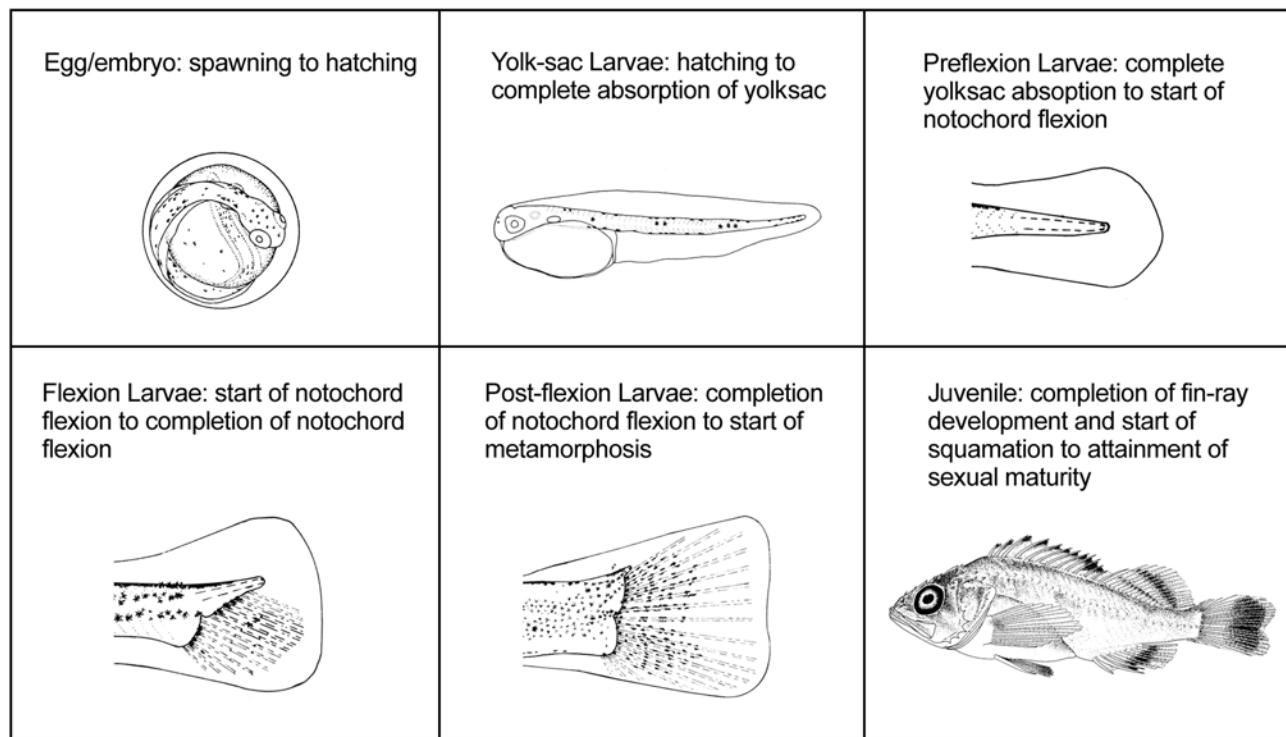
Appendix A - Figures

Figure 4. Yearly distribution and number of (A) combined bongo and Tucker tows (number of tows scaled to 1,000) and (B) neuston tows (number of tows scaled to 500) by region.



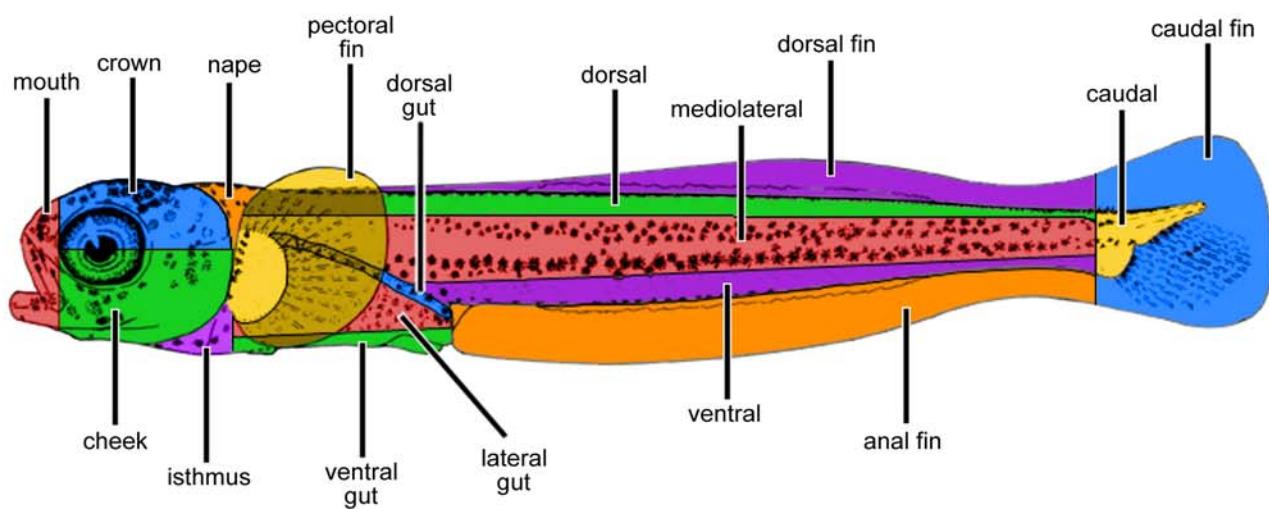
Appendix A - Figures

Figure 5. Illustration of developmental stages.



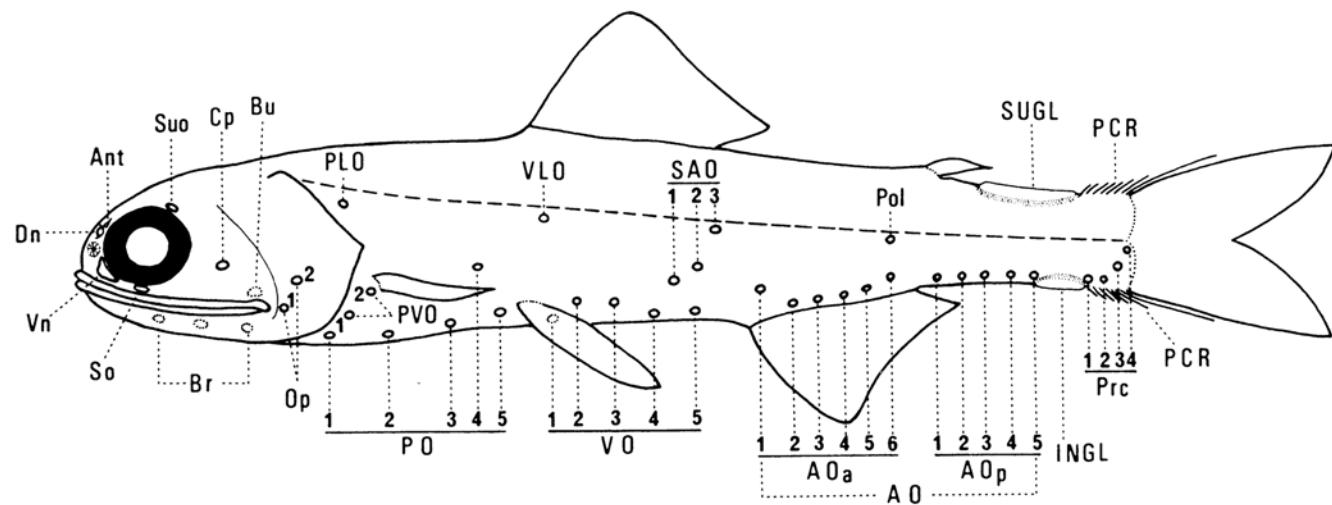
Appendix A - Figures

Figure 6. Pigmentation area definitions.



Appendix A - Figures

Figure 7. Generalized Myctophidae photophore pattern and terminology for Myctophidae (from Fujii 1984c). Ant—antorbital organ; AO—anal organs; AOa—anterior anal organs; AOp—posterior anal organs; Br—branchiostegal organs; Bu—buccal organ; Cp—cheek organ; Dn—dorsonasal organ; INGL—infracaudal luminous gland; Op—opercular organs; PLO—suprapectoral organ; PO—thoracic organs or pectoral organs; Pol—posterolateral organ; Prc— precaudal organs; PVO—subpectoral organs; SAO—supraanal organs; So—suborbital organ; SUGL—supracaudal luminous gland; Suo—supraorbital organ; VLO—supraventral organ; Vn—ventronasal organ; VO—ventral organs.



Appendix A - Figures

Figure 8. Generalized photophore patterns for gonostomatids (Fahay, 1983). For photophore definitions, see Table 9.

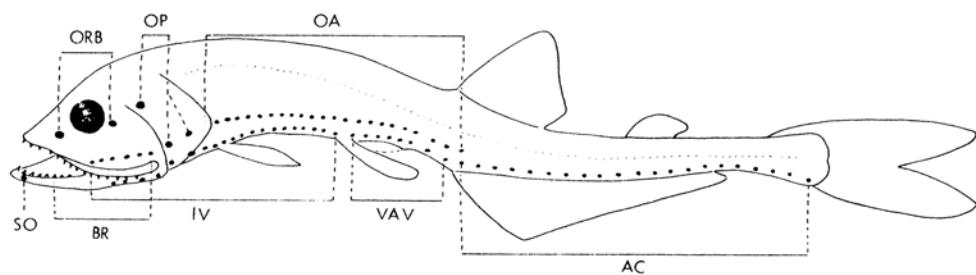
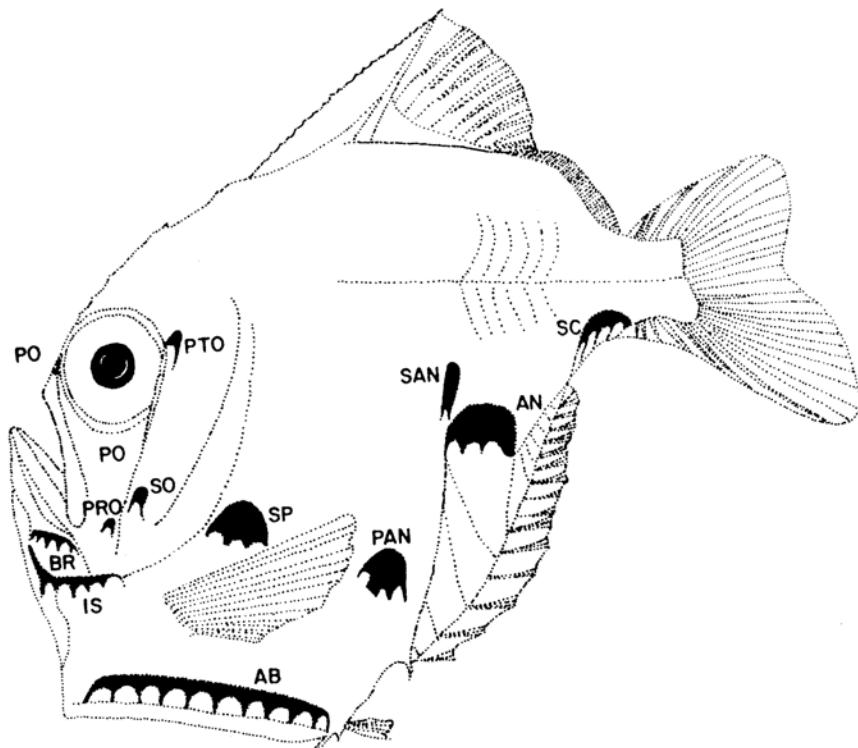
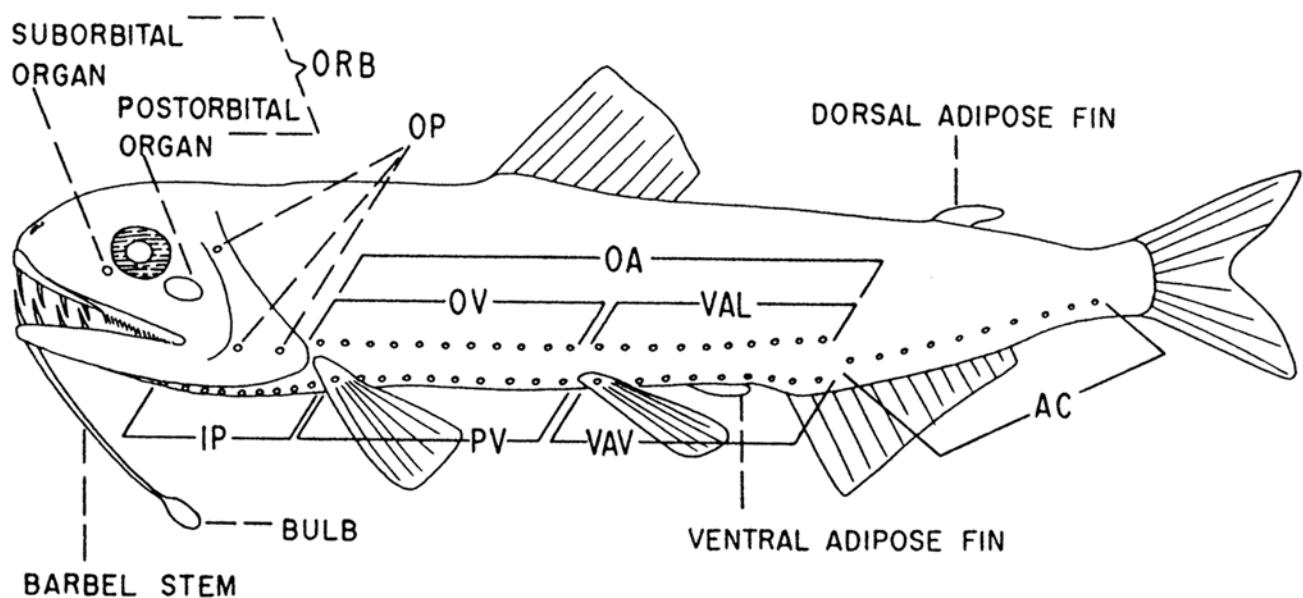


Figure 9. Generalized photophore patterns for sternoptychids (Moser and Watson, 1996; modified). For photophore definitions, see Table 9.



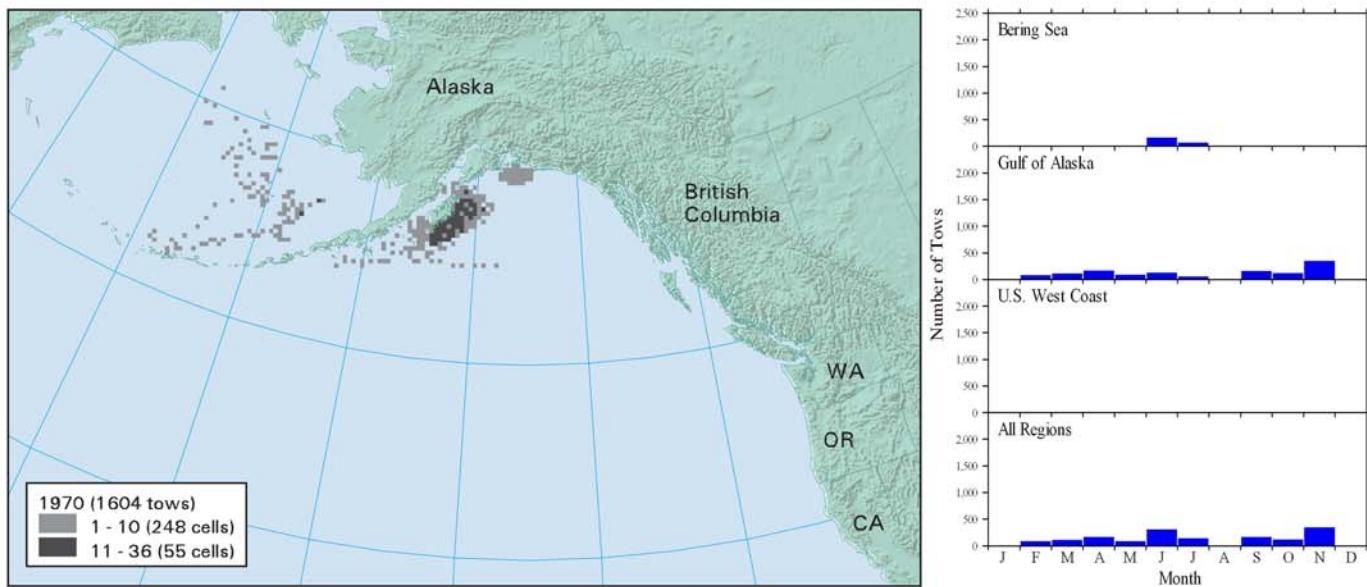
Appendix A - Figures

Figure 10. Generalized photophore patterns for stomioids (Morrow, 1964). For photophore definitions, see Table 9.



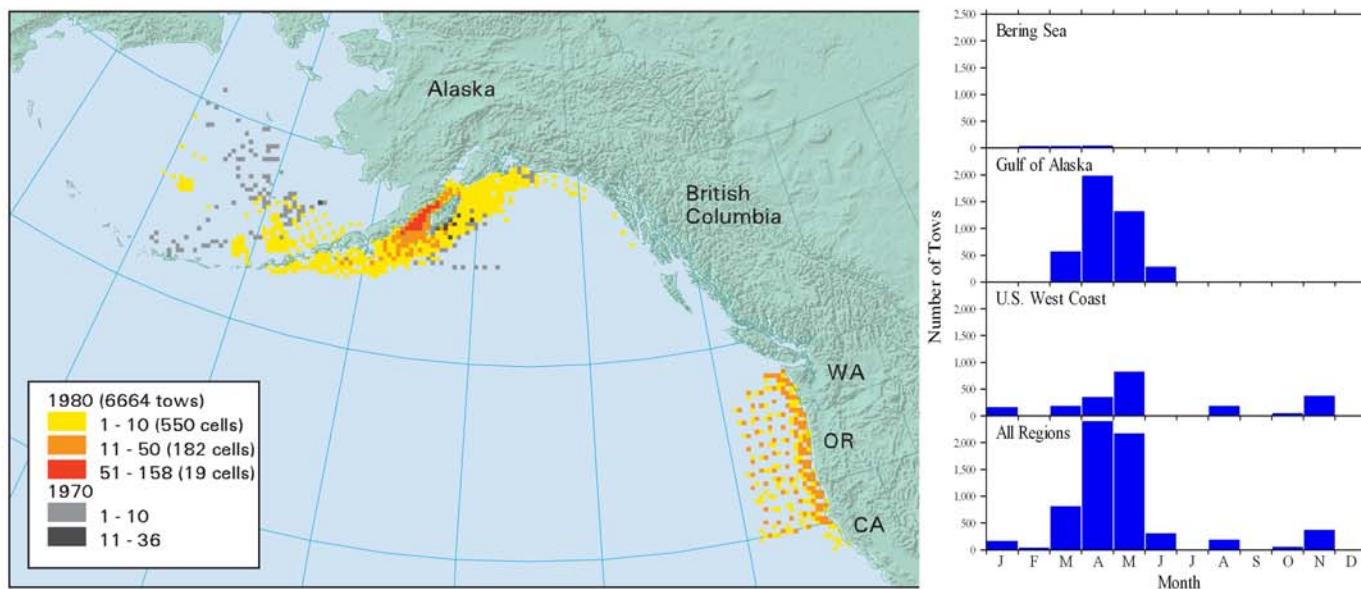
Appendix B - Maps

Map 1. Geographic distribution and sampling frequency of cruises conducted by the Recruitment Processes Program 1972-1979. Area sampled is divided into 625 km² cells. Gray cells were sampled 1-10 times; black cells were sampled 11-36 times. Graph at right shows monthly distribution and number of tows in the Bering Sea, Gulf of Alaska, and the two regions combined for the 1970s.



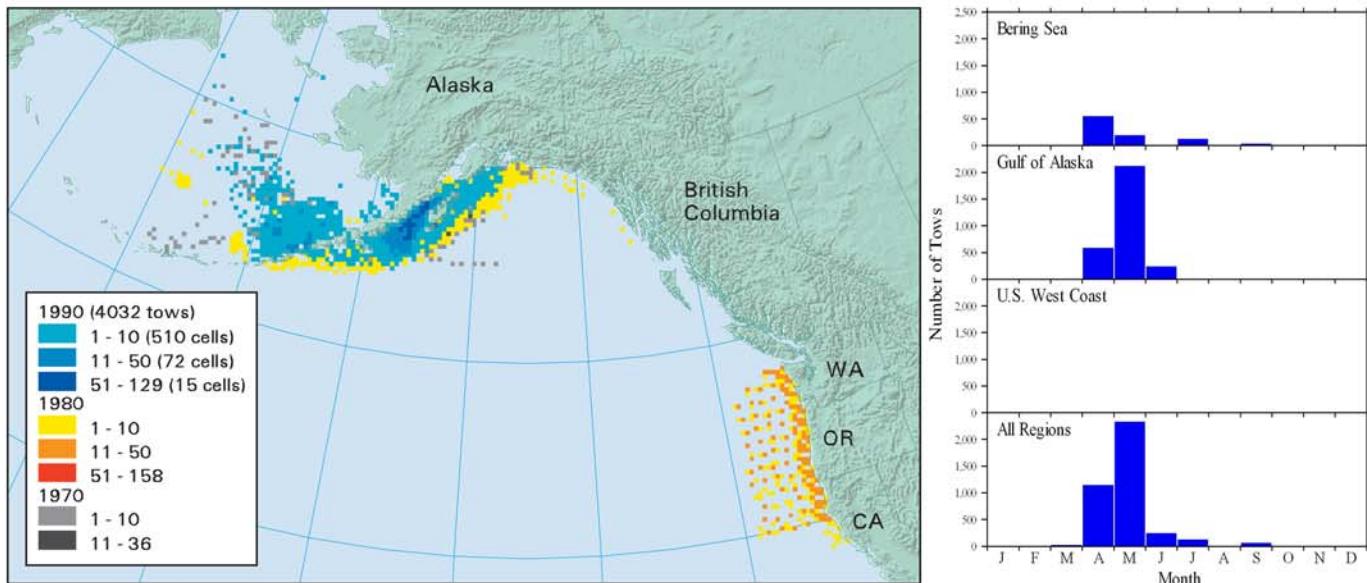
Appendix B - Maps

Map 2. Geographic distribution and sampling frequency of cruises conducted by Recruitment Processes Program 1972-1979 and 1980-1989. Area sampled is divided into 625 km² cells; 1970s data overlaid by 1980s data. For 1980s data, yellow cells were each sampled 1-10 times, orange cells were each sampled 11-50 times, and red cells were each sampled 51-158 times. Graph at right shows monthly distribution and number of tows in the Bering Sea, Gulf of Alaska, and off the U.S. west coast, and the three regions combined for the 1980s.



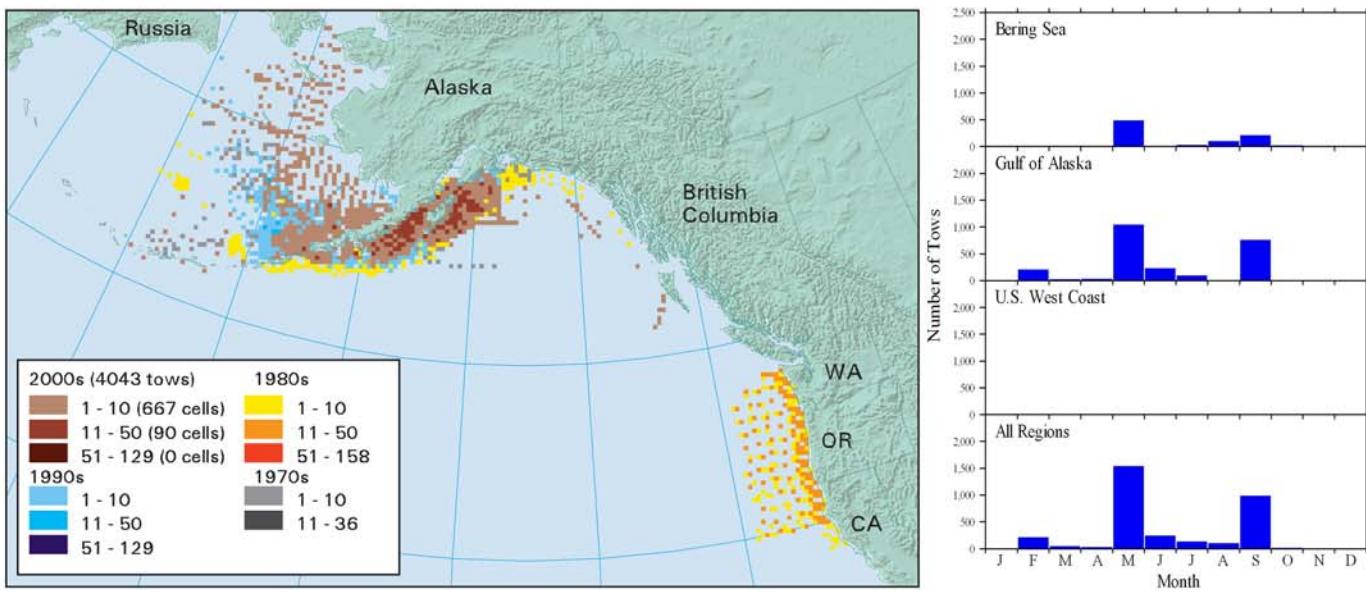
Appendix B - Maps

Map 3. Geographic distribution and sampling frequency of cruises conducted by Recruitment Processes Program 1972-1979, 1980-1989, and 1990-1999. Area sampled is divided into 625 km² cells; 1970s and 1980s data overlaid by 1990s data. For 1990s data, light blue cells were each sampled 1-10 times, medium blue cells were each sampled 11-50 times, and dark blue cells were each sampled 51-129 times. Graph at right shows monthly distribution and number of tows in the Bering Sea, Gulf of Alaska, and the two regions combined for the 1990s.



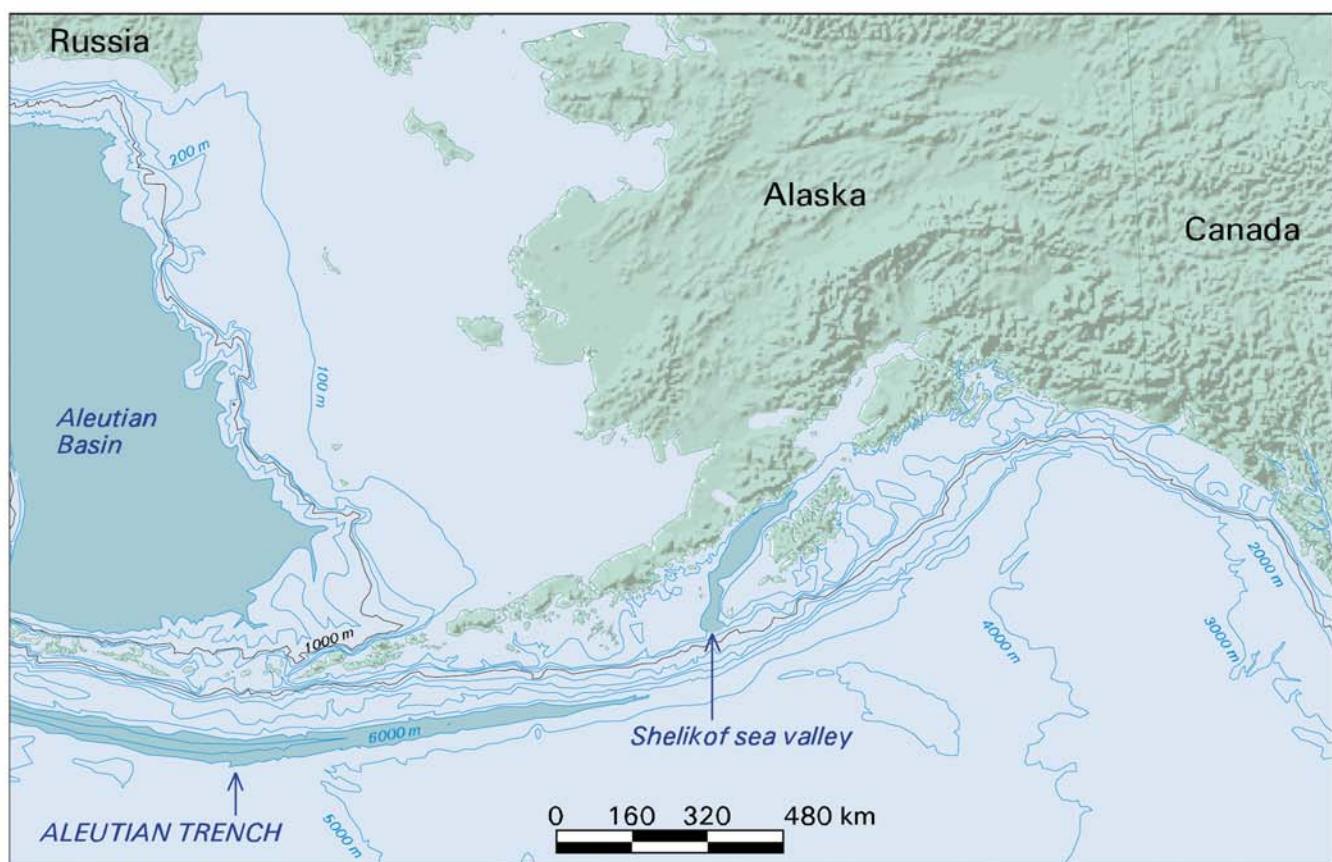
Appendix B - Maps

Map 4. Geographic distribution and sampling frequency of cruises conducted by Recruitment Processes Program 1972-1979, 1980-1989, 1990-1999, and 2000-2005. Area sampled is divided into 625 km² cells; 1970s, 1980s, and 1990s data overlaid by 2000s data. For 2000s data, light brown cells were each sampled 1-10 times, medium brown cells were each sampled 11-50 times, and dark brown cells were each sampled 51-129 times. Graph at right shows monthly distribution and number of tows in the Bering Sea and Gulf of Alaska, and the two regions combined for the 2000s.



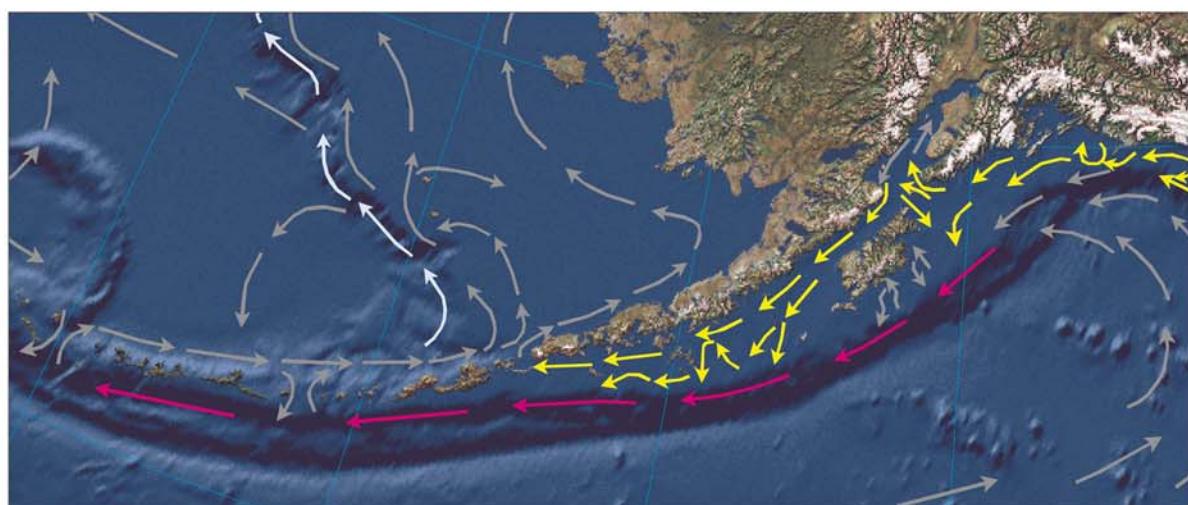
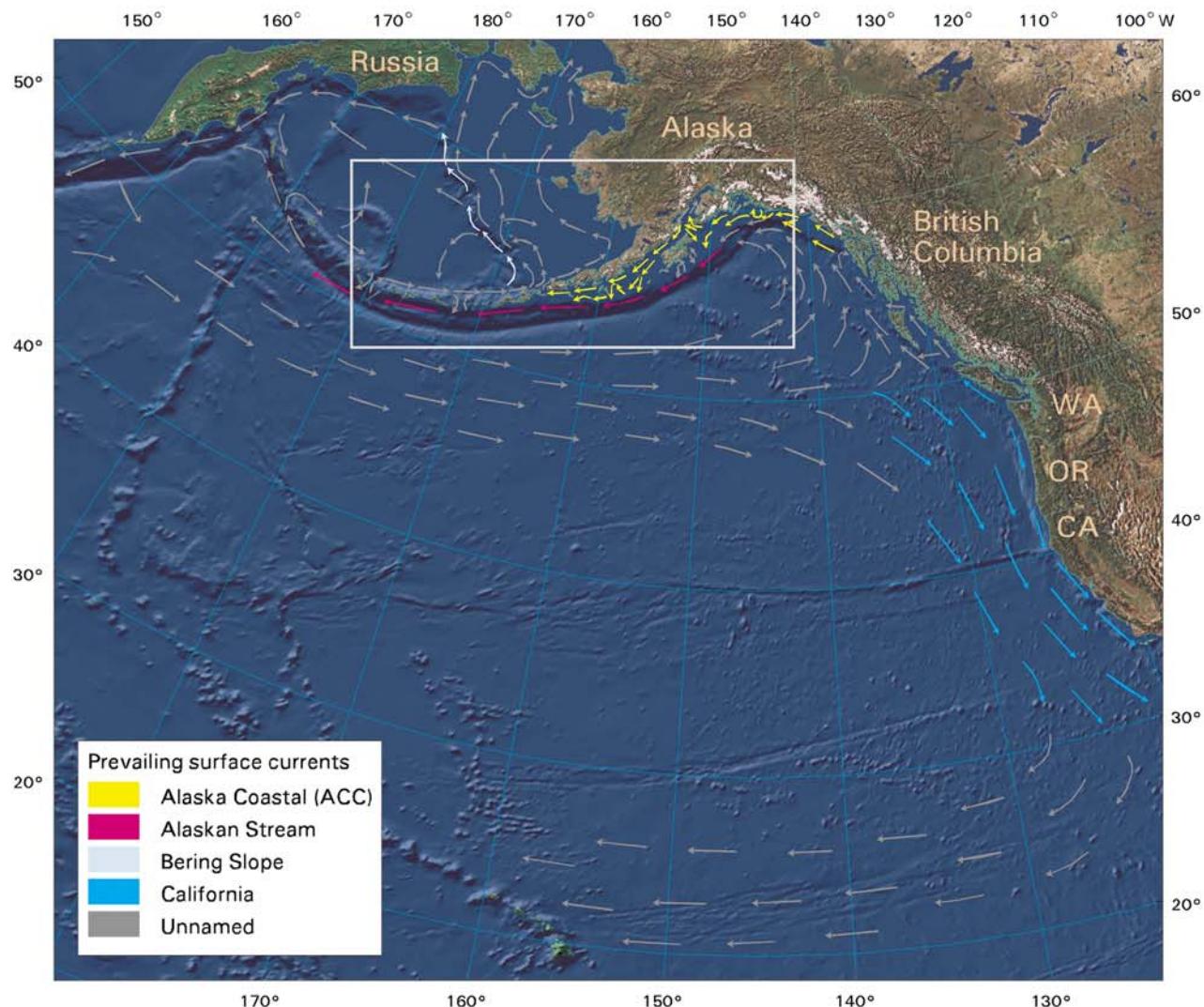
Appendix B - Maps

Map 5. Bathymetry of the eastern Bering Sea and Gulf of Alaska. Aleutian Basin, Aleutian Trench and Shelikof sea valley are shaded; 1000 m bathymetry contour line is black.



Appendix B - Maps

Map 6. Prevailing surface currents in the Bering Sea, Gulf of Alaska, and eastern North Pacific Ocean. Inset shows enlargement of surface currents in Alaskan waters.



Appendix B - Maps

Map 7. Bathymetry of the North Pacific Ocean off the U.S. west coast.



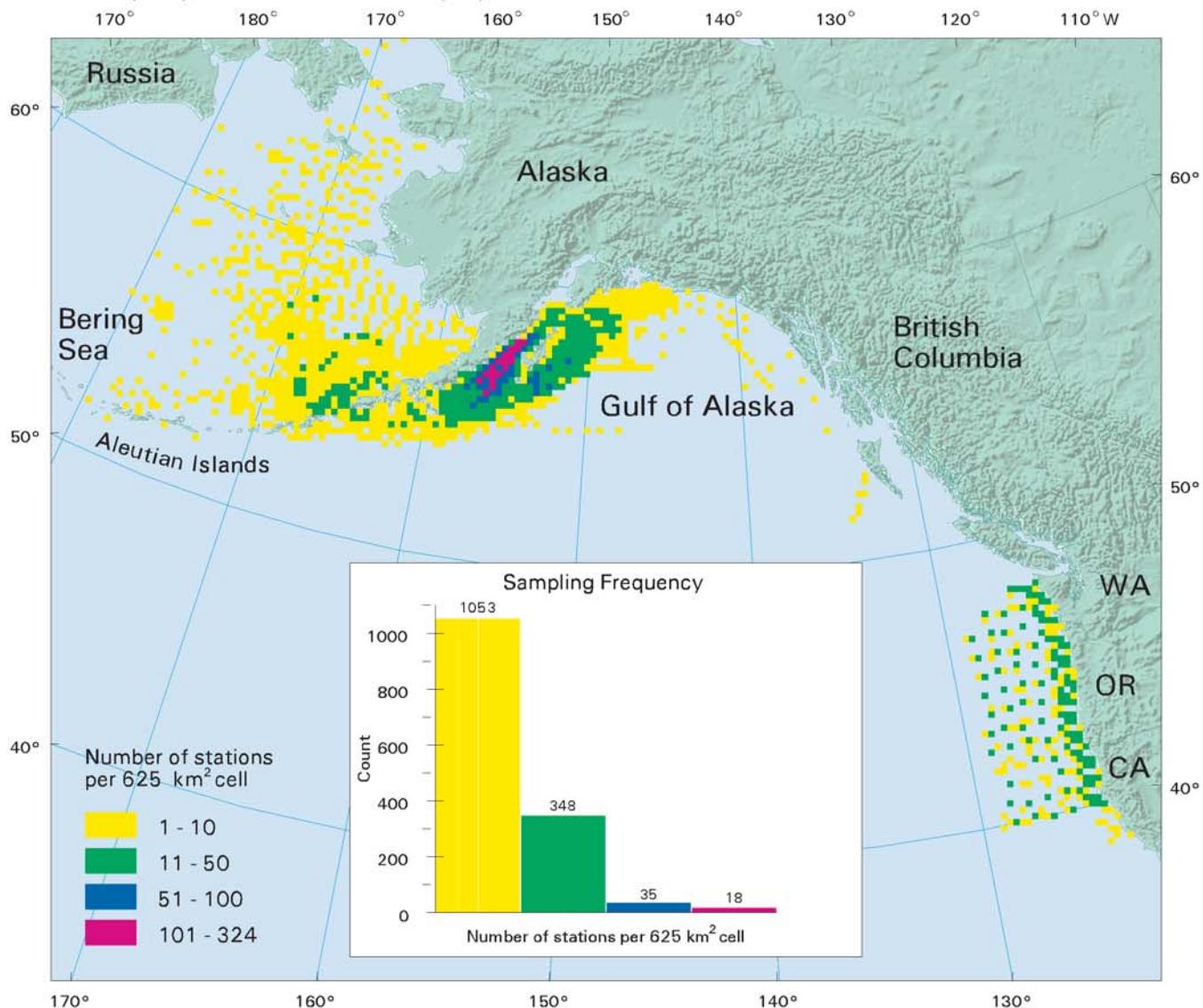
Appendix B - Maps

Map 8. Study area showing geographic features for Alaska (top map) and U.S. west coast (bottom map).



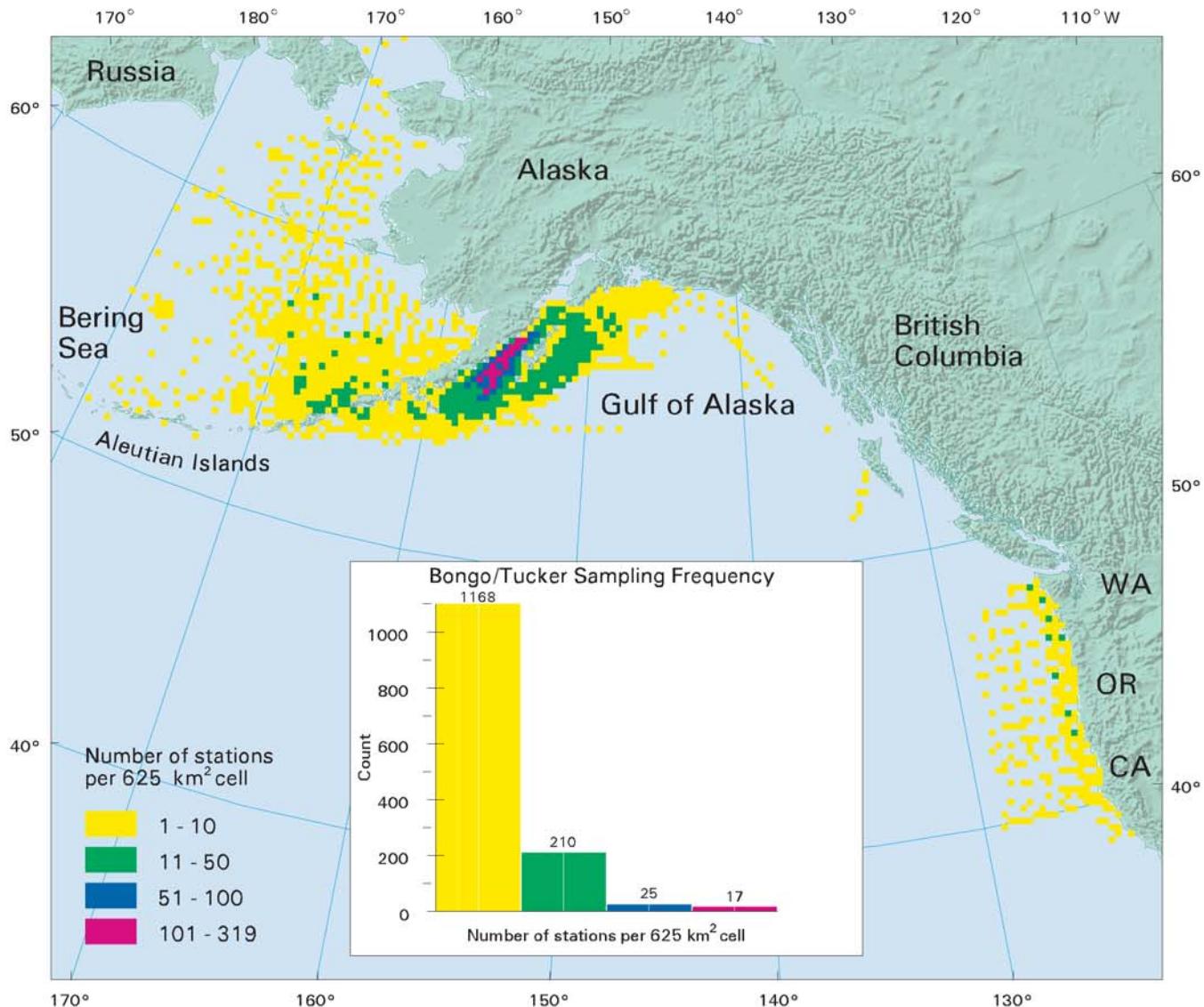
Appendix B - Maps

Map 9. Geographic distribution and frequency of sampling during Recruitment Processes Program ichthyoplankton surveys for 1972-2005. Area sampled is divided into 625 km² cells. Numbers over bars in histogram equal number of cells that contain 1-10 stations (yellow), 11-50 stations (green), 51-100 stations (blue), and 101-324 stations (red).



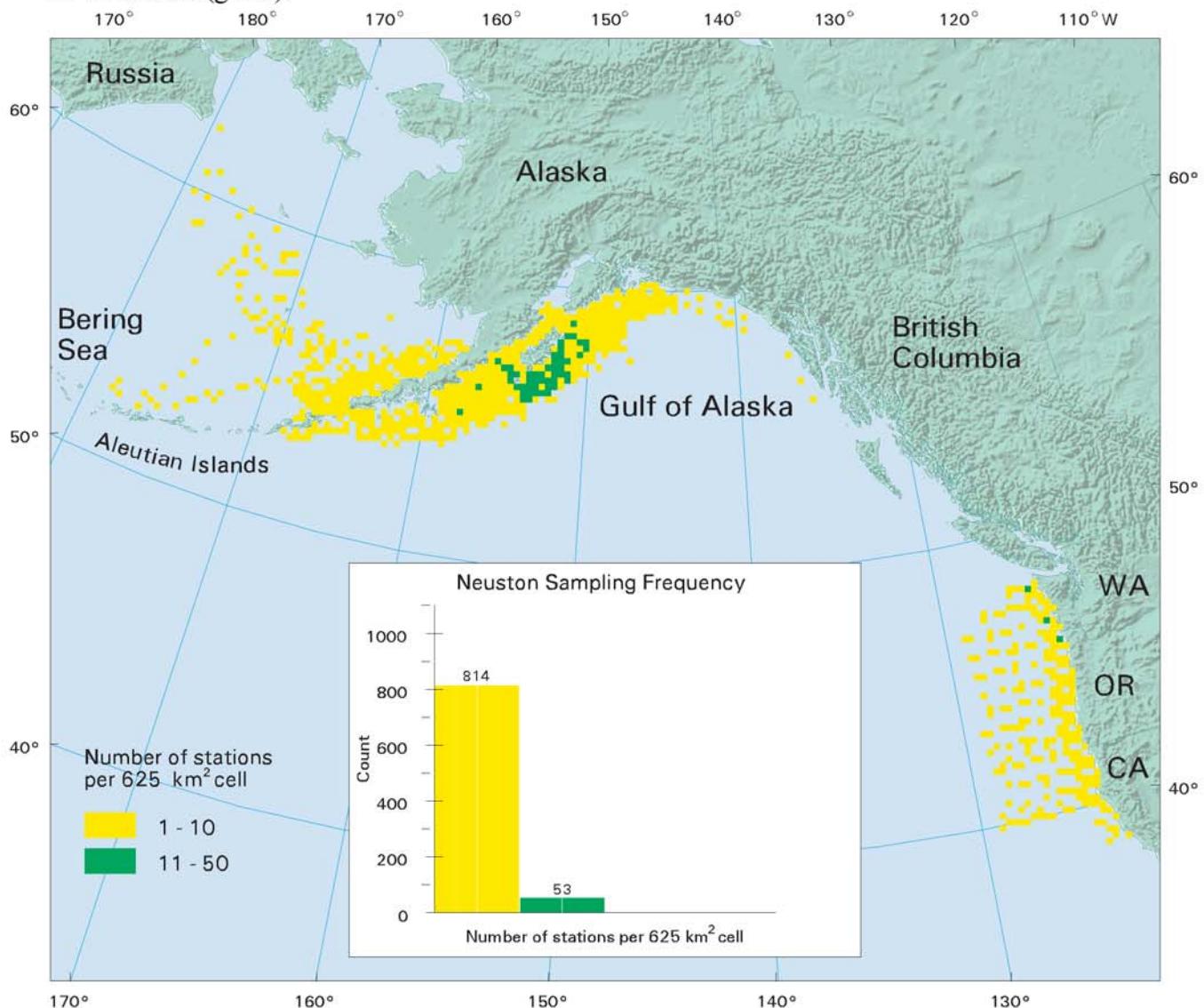
Appendix B - Maps

Map 10. Geographic distribution and frequency of sampling with bongo/Tucker gear during Recruitment Processes Program ichthyoplankton surveys for 1972-2005. Area sampled is divided into 625 km² cells. Numbers over bar in histogram equal number of cells that contain 1-10 stations (yellow), 11-50 stations (green), 51-100 stations (blue), and 101-319 stations (red).



Appendix B - Maps

Map 11. Geographic distribution and frequency of sampling with neuston gear during Recruitment Processes Program ichthyoplankton surveys for 1972-2005. Area sampled is divided into 625 km² cells. Numbers over bars in histogram equal number of cells that contain 1-10 stations (yellow) and 11-50 stations (green).



Appendix C - Tables

Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
1972	2KE72	GOA	4/26 - 5/9	67	bongo
1973					
1974					
1975					
1976					
1977	4MF77	GOA	10/30 - 11/14	80 83	Tucker neuston
1978	4DI78	GOA	3/29 - 4/20	85 113	bongo neuston
	2MF78	GOA	6/20 - 7/5	102 112	Tucker neuston
	3MF78	GOA	9/9 - 9/21	26 28	bongo neuston
	4MF78	GOA	9/26 - 10/7	66 45	bongo neuston
	5MF78	GOA	10/19 - 11/1	19 11	bongo neuston
	1WE78	GOA	10/27 - 11/13	88 92	bongo neuston
	6MF78	GOA	11/8 - 11/16	43 21	bongo neuston
1979	1MF79	GOA	2/14 - 3/8	88 89	bongo neuston
	5TK79	GOA	5/16 - 5/24	58	bongo
	3MF79	BS	6/1 - 7/23	126 130	bongo neuston
	1PO79	GOA	9/3 - 9/29	18 48	bongo neuston
1980	1TK80	WC	4/20 - 5/15	125	bongo

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Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
1981	1PO80	WC	8/1 - 8/25	125	neuston
				101	bongo
				101	neuston
1981	1SH81	GOA	3/5 - 3/30	131	bongo
			3/5 - 3/27	130	neuston
	1MF81	GOA	3/12 - 3/20	31	bongo
	2MF81	GOA	3/30 - 4/8	89	bongo
	2SH81	GOA	4/16 - 4/24	60	bongo
				60	neuston
	3MF81	GOA	4/26 - 5/2	79	bongo
	1PO81	WC	5/9 - 6/2	131	bongo
				123	neuston
	4MF81	GOA	5/20 - 5/24	80	bongo
1982	3SH81	GOA	5/20 - 5/28	56	bongo
	1DA81	WC	10/24 - 11/21	125	bongo
				125	neuston
	1DA82	GOA	4/4 - 4/23	83	bongo
				82	neuston
1983	1PO82	WC	5/3 - 6/1	56	bongo
				124	neuston
	2DA82	GOA	5/21 - 5/31	62	bongo
				61	neuston
1983	1EQ83	WC	4/23 - 5/15	124	bongo
				124	neuston
	1CH83	GOA	5/14 - 5/30	68	bongo
			5/14 - 5/28	73	neuston
	1MF83	WC	11/12 - 12/2	113	bongo
				113	neuston
1984	1PO84	WC	3/11 - 4/5	124	bongo
				124	neuston
1984	3CH84	GOA	3/28	4	bongo
	1SH84	GOA	4/7 - 5/4	157	bongo
				157	neuston

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Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
1985	1DI85	GOA	3/11 - 3/28	69	bongo
	1PO85	GOA	3/29 - 4/21	154	bongo
				151	neuston
	1MF85	GOA	4/9	1	bongo
	1BA85	WC	4/19 - 5/11	124	bongo
				124	neuston
	2MF85	GOA	5/3 - 5/11	62	bongo
	2PO85	GOA	5/16 - 6/8	189	bongo
				189	neuston
1986	MF862	BS	2/16 - 2/28	48	bongo
	1GI86	GOA	3/30 - 4/20	149	bongo
				149	neuston
	1MF86	GOA	4/4 - 4/12	81	bongo
	2MF86	GOA	5/2 - 5/18	108	bongo
1987	1MF87	WC	1/7 - 1/28	88	bongo
				88	neuston
	2MF87	GOA	4/4 - 4/16	143	bongo
	1BB87	GOA	4/9 - 4/27	117	bongo
	3MF87	GOA	5/19 - 5/27	60	bongo
	4MF87	GOA	6/20 - 7/11	19	bongo
1988	1OC88	BS	3/17 - 4/4	61	bongo
	1DN88	GOA	3/19 - 4/11	157	bongo
	1MF88	GOA	4/1 - 4/12	173	bongo
	1DN88	BS	4/11 - 5/8	46	bongo
	2MF88	GOA	4/17 - 4/30	64	bongo
	3MF88	GOA	5/6	13	bongo
	4MF88	GOA	5/20 - 6/7	176	Tucker
1989	1MF89	GOA	4/6 - 4/15	128	bongo
	2MF89	GOA	4/26 - 5/5	92	bongo
	3MF89	GOA	5/9 - 5/24	211	bongo
	4MF89	GOA	5/29 - 6/5	99	Tucker

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Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
1990	1MF90	GOA	4/8 - 4/13	107	bongo
	2MF90	GOA	5/7 - 5/15	90	bongo
	3MF90	GOA	5/18 - 5/24	17	bongo
	4MF90	GOA	5/28 - 6/5	133	bongo
	5MF90	GOA	9/8 - 9/20	6	bongo
1991	0MF91	BS	3/11 - 3/15	20	bongo
	1MF91	GOA	4/2 - 4/13	90	bongo
	1MP91	BS	4/14 - 5/8	61	bongo
	2MF91	GOA	4/16 - 4/27	150	bongo
	3MF91	GOA	5/1 - 5/13	119	bongo
	4MF91	GOA	5/17 - 5/25	97	bongo
1992	1MF92	GOA	4/5 - 4/10	94	bongo
	2MF92	BS	4/16 - 4/18	36	bongo
	3MF92	GOA	5/2 - 5/14	158	bongo
	4MF92	GOA	5/18 - 5/28	137	bongo
1993	2MF93	GOA	4/6 - 4/11	96	bongo
	3MF93	BS	4/15 - 4/30	119	bongo
	4MF93	GOA	5/3 - 5/13	141	bongo
	5MF93	GOA	5/23 - 6/3	114	bongo
	6MF93	GOA	9/7 - 9/17	12	Tucker
1994	3MF94	GOA	3/14 - 4/9	19	bongo
	4MF94	GOA	4/15 - 4/30	128	bongo
	5MF94	GOA	5/2 - 5/15	89	bongo
	6MF94	GOA	5/24 - 6/1	139	bongo
	7MF94	BS	7/17 - 9/6	10	neuston
1994	1SU94	BS	9/4 - 9/13	30	bongo
			9/12	2	neuston
	8MF94	BS	9/21 - 9/24	2	neuston
	8MF94	GOA	9/25 - 9/28	2	neuston
1995	1MF95	BS	2/19	1	bongo
	1MF95	BS	2/22	2	bongo
	2MF95	BS	3/8	1	bongo

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Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
	4MF95	GOA	3/17 - 3/24	5	bongo
	6MF95	BS	4/17 - 4/30	137	bongo
	7MF95	BS	5/4 - 5/18	134	bongo
	8MF95	GOA	5/21 - 5/28	99	bongo
	2SU95	BS	9/11 - 9/18	16	Tucker
1996	2MF96	BS	3/6	1	bongo
	5MF96	BS	4/23 - 4/24	4	Tucker
	1DI96	GOA	4/26 - 5/6	154	bongo
	6MF96	GOA	5/2 - 5/14	183	bongo
	6MF96	BS	5/15	5	bongo
	7MF96	BS	5/19 - 5/20	5	Tucker
	8MF96	GOA	5/24 - 6/1	130	bongo
	9MF96	BS	7/21 - 8/7	16	bongo
1997	5MF97	BS	4/15 - 5/1	34	bongo
	6MF97	BS	5/3 - 5/13	32	bongo
	8MF97	GOA	5/23 - 5/31	100	bongo
	4WE97	BS	6/29 - 7/14	67	bongo
1998	2MF98	BS	4/14 - 4/29	20	bongo
	4MF98	GOA	5/1 - 5/10	72	bongo
	5MF98	GOA	5/21 - 5/30	130	bongo
	3WE98	GOA	6/17 - 6/30	26	bongo
1999	1MF99	BS	4/10 - 4/19	37	bongo
	1WE99	GOA	5/7 - 5/9	6	bongo
1999	4MF99	BS	5/12 - 5/20	21	bongo
	5MF99	GOA	5/12 - 6/2	114	bongo
	2WE99	GOA	5/21 - 6/5	202	bongo
	1GP99	BS	7/12 - 7/26	60	bongo
2000	2MF00	BS	2/15 - 2/16	7	bongo
	5MF00	BS	5/1 - 5/12	67	bongo
	6MF00	GOA	5/25 - 6/4	142	bongo
	7MF00	BS	6/21 - 7/3	14	bongo
	1OM00	BS	7/21 - 8/3	8	bongo

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Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
	8MF00	GOA	9/2 - 9/20	103	Tucker
	1RB00	BS	9/16 - 9/23	16	bongo
2001	1MF01	GOA	6/21 - 2/5	18	bongo
	2MF01	GOA	4/28 - 5/8	148	bongo
	1RB01	GOA	5/13 - 5/23	81	bongo
	3MF01	GOA	5/24 - 6/2	148	bongo
	1OM01	BS	7/14 - 7/29	9	bongo
	4MF01	GOA	9/2 - 9/19	90	Tucker
				40	neuston
2002	3MF02	BS	5/12 - 5/21	80	bongo
				80	neuston
	1EW02	GOA	5/22 - 6/10	124	bongo
	4MF02	GOA	5/23 - 6/1	137	bongo
	1OM02	BS	7/28 - 8/11	7	bongo
	1MA02	BS	8/14 - 8/28	5	bongo
	1SS02	BS	8/20 - 10/6	108	bongo
	5MF02	GOA	9/8 - 9/23	122	bongo
				136	neuston
	1NW02	BS	9/8 - 10/6	42	bongo
2003	1MF03	GOA	2/13 - 2/22	66	bongo
				26	neuston
	2MF03	BS	2/24 - 3/7	15	bongo
	2KM03	GOA	4/29 - 5/11	67	bongo
	4MF03	BS	5/17 - 5/24	120	bongo
2003				58	neuston
	5MF03	GOA	5/25 - 6/2	115	bongo
				4	neuston
	1OM03	BS	7/19 - 7/26	5	bongo
	7MF03	GOA	9/7 - 9/21	65	Tucker
	1SS03	GOA	9/9 - 9/27	45	bongo
	3KM03	GOA	9/20 - 9/26	5	bongo
2004	5MF04	GOA	5/23 - 6/3	190	bongo

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Table 1

Summary of Recruitment Processes Task ichthyoplankton surveys (1972-2006) with positive tows for larvae used in this study. BS = Bering Sea, GOA = Gulf of Alaska, WC = U. S. west coast. Bongo = bongo net, neuston = neuston net, Tucker = Tucker trawl. ICHBASE data not available for years 1973-1976.

Year	Cruise	Area	Dates	Tows	Gear
	2HX04	GOA	7/8 - 7/19	60	bongo
	1OM04	BS	7/28 - 8/5	6	bongo
	1KR04	BS	8/10 - 8/22	36	bongo
	1SS04	BS	8/14 - 9/28	97	bongo
	7MF04	GOA	9/9 - 9/22	91	bongo
				90	neuston
	8MF04	BS	9/24 - 10/4	11	bongo
2005	2MF05	GOA	2/21 - 3/4	118	bongo
				51	neuston
	1TT05	GOA	4/28 - 5/7	23	bongo
	5MF05	BS	5/9 - 5/20	94	bongo
				74	neuston
	3TT05	BS	5/16 - 5/27	42	bongo
	6MF05	GOA	5/21 - 6/3	193	bongo
	1OM05	BS	7/15 - 7/21	9	bongo
	1FA05	GOA	7/19 - 7/28	47	bongo
	1SS05	BS	8/14 - 10/7	118	bongo
	7MF05	GOA	9/5 - 9/19	79	Tucker
	8MF05	BS	9/21 - 10/4	16	bongo
2006	1TT06	BS	4/12 - 5/10	92	bongo
	3MF06	BS	5/8 - 5/19	90	bongo
				90	neuston
	4MF06	GOA	5/21 - 6/1	175	bongo
	1OM06	BS	6/21 - 6/28	21	bongo
	1AR06	BS	7/10 - 7/25	15	bongo
	5MF06	GOA	8/16 - 8/31	19	bongo
	1SS06	BS	8/18 - 9/20	99	bongo
	1NW06	BS	8/23 - 9/5	36	bongo
	6MF06	BS	9/8 - 9/23	86	bongo
				86	neuston
Totals				16901	

Table 2

Ranked frequency of occurrence (FO) of the 20 most common larval fish taxa collected in neuston nets from Recruitment Processes Program survey cruises 1972-1996. Average catch (no./10m²) at positive hauls is included. Total number of Sameoto neuston tows = 3011 (Matarese et al., 2003).

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Hexagrammos decagrammus</i>	1385	46.00	637.652	0.212
<i>Hexagrammos stelleri</i>	384	12.75	75.230	0.025
<i>Anoplopoma fimbria</i>	382	12.69	74.945	0.025
<i>Cryptacanthodes aleutensis</i>	341	11.33	142.190	0.047
<i>Hemilepidotus</i> spp.	341	11.33	267.906	0.089
<i>Cololabis saira</i>	325	10.79	24.615	0.008
<i>Hemilepidotus hemilepidotus</i>	322	10.69	99.288	0.033
<i>Bathymaster</i> spp.	306	10.16	830.176	0.276
<i>Hexagrammos lagocephalus</i>	266	8.83	152.912	0.051
<i>Sebastes</i> spp.	263	8.73	42.836	0.014
<i>Ammodytes hexapterus</i>	257	8.54	236.692	0.079
<i>Hexagrammos octogrammus</i>	238	7.90	56.265	0.019
<i>Pleurogrammus monopterygius</i>	212	7.04	109.330	0.036
<i>Hemilepidotus spinosus</i>	211	7.01	73.237	0.024
<i>Scorpaenichthys marmoratus</i>	177	5.88	13.273	0.004
<i>Mallotus villosus</i>	160	5.31	30.691	0.010
<i>Hemilepidotus jordani</i>	103	3.42	8.203	0.003
<i>Hexagrammos</i> spp.	102	3.39	15.344	0.005
<i>Theragra chalcogramma</i>	100	3.32	24.469	0.008
Stichaeidae	90	2.99	4.870	0.002

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Table 3

Taxa abundance and distribution generated by neuston data.

Family	Taxon
Scomberesocidae	<i>Cololabis saira</i>
Anoplopomatidae	<i>Anoplopoma fimbria</i>
Hexagrammidae	<i>Hexagrammos lagocephalus</i> <i>Hexagrammos octogrammus</i> <i>Hexagrammos stelleri</i> <i>Ophiodon elongatus</i>
Cottidae	<i>Hemilepidotus jordani</i> <i>Hemilepidotus spinosus</i> <i>Scorpaenichthys marmoratus</i>
Cryptacanthodidae	<i>Cryptacanthodes aleutensis</i> <i>Cryptacanthodes gigantea</i>

Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Theragra chalcogramma</i>	4773	57.04	4984654.103	595.680
<i>Ammodytes hexapterus</i>	4542	54.28	358528.691	42.845
<i>Stenobrachius leucopsarus</i>	2581	30.84	111925.502	13.375
<i>Lepidopsetta polyxystra</i>	2093	25.01	72725.350	8.691
<i>Hippoglossoides elassodon</i>	1867	22.31	108951.468	13.020
<i>Gadus macrocephalus</i>	1823	21.79	98380.316	11.757
<i>Bathymaster</i> spp.	1457	17.41	151675.355	18.126
<i>Sebastes</i> spp. ¹	1309	15.64	59128.424	7.066
<i>Hexagrammos decagrammus</i>	1063	12.70	16103.647	1.924
Gadidae	1043	12.46	174694.365	20.876
<i>Atheresthes stomias</i>	932	11.14	40228.857	4.807
<i>Icelinus</i> spp.	774	9.25	13974.818	1.670
Cyclopteridae	718	8.58	8550.829	1.022
<i>Leuroglossus schmidti</i>	690	8.25	7606.181	0.909
<i>Hippoglossus stenolepis</i>	643	7.68	7203.780	0.861
<i>Bathyagonus alascanus</i>	583	6.97	4888.797	0.584
<i>Bathylagus pacificus</i>	523	6.25	5284.756	0.632
<i>Lumpenus maculatus</i>	481	5.75	4597.007	0.549
Disintegrated	475	5.68	7990.944	0.955
<i>Mallotus villosus</i>	475	5.68	11348.954	1.356
<i>Cryptacanthodes aleutensis</i>	453	5.41	3823.550	0.457
<i>Platichthys stellatus</i>	448	5.35	8004.080	0.957
<i>Protomyctophum thompsoni</i>	446	5.33	3850.982	0.460
<i>Hemilepidotus hemilepidotus</i>	433	5.17	4625.840	0.553
Cottidae	417	4.98	5315.520	0.635
<i>Tarletonbeania crenularis</i>	389	4.65	8875.654	1.061
<i>Lepidopsetta bilineata</i>	385	4.60	4424.407	0.529
<i>Atheresthes</i> spp.	382	4.57	9245.819	1.105
<i>Lumpenus</i> spp.	376	4.49	3302.633	0.395
<i>Bathylagus ochotensis</i>	373	4.46	14590.430	1.744
<i>Anoplarchus</i> spp.	330	3.94	6140.290	0.734
<i>Hemilepidotus</i> spp.	311	3.72	14138.913	1.690
<i>Glyptocephalus zachirus</i>	288	3.44	3328.929	0.398
<i>Protomyctophum crockeri</i>	274	3.27	3467.119	0.414

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Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Poroclinus rothrocki</i>	264	3.15	3224.067	0.385
<i>Diaphus theta</i>	256	3.06	21918.638	2.619
Unidentified	220	2.63	3384.227	0.404
<i>Artediusharringtoni</i>	210	2.51	1619.195	0.193
<i>Zaprora silenus</i>	196	2.34	1411.285	0.169
<i>Reinhardtius hippoglossoides</i>	192	2.29	2372.440	0.284
<i>Lyopsetta exilis</i>	184	2.20	3475.021	0.415
<i>Pleuronectes quadrituberculatus</i>	179	2.14	1408.827	0.168
<i>Anoplopoma fimbria</i>	176	2.10	1777.740	0.212
<i>Radulinus asprellus</i>	175	2.09	1269.537	0.152
Osmeridae²	173	2.07	44895.193	5.365
<i>Lumpenus sagitta</i>	164	1.96	1321.844	0.158
<i>Chauliodus macouni</i>	162	1.94	1365.560	0.163
Agonidae	125	1.49	987.317	0.118
<i>Microstomus pacificus</i>	125	1.49	1163.814	0.139
Stichaeidae	123	1.47	1197.698	0.143
<i>Lumpenella longirostris</i>	120	1.43	1660.305	0.198
<i>Isopsetta isolepis</i>	112	1.34	1774.415	0.212
<i>Ruscarius meanyi</i>	107	1.28	756.404	0.090
Liparidae	103	1.23	1169.191	0.140
<i>Lestidiops ringens</i>	102	1.22	1015.174	0.121
<i>Pleurogrammus monopterygius</i>	96	1.15	1109.763	0.133
<i>Parophrys vetulus</i>	88	1.05	2481.143	0.297
<i>Sebastolobus</i> spp.	88	1.05	1351.225	0.161
<i>Lampanyctus ritteri</i>	86	1.03	1049.816	0.125
<i>Pholis</i> spp.	83	0.99	1020.082	0.122
<i>Myoxocephalus</i> B³	82	0.98	1172.842	0.140
Bathylagidae	80	0.96	1008.448	0.121
<i>Bathyagonus infraspinatus</i>	78	0.93	419.048	0.050
<i>Hexagrammos lagocephalus</i>	78	0.93	2435.621	0.291
<i>Myoxocephalus</i> spp.³	78	0.93	588.522	0.070
Macrouridae⁴	74	0.88	462.768	0.055
<i>Citharichthys stigmaeus</i>	73	0.87	638.370	0.076
<i>Citharichthys sordidus</i>	72	0.86	778.503	0.093

Appendix C - Tables

Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Nansenia candida</i>	67	0.80	905.344	0.108
<i>Liparis</i> spp⁵	66	0.79	903.933	0.108
<i>Myoxocephalus</i> G³	63	0.75	529.201	0.063
<i>Engraulis mordax</i>	61	0.73	13876.181	1.658
<i>Hexagrammos stelleri</i>	59	0.71	524.865	0.063
Myctophidae	59	0.71	1800.924	0.215
<i>Psettichthys melanostictus</i>	59	0.71	728.765	0.087
<i>Gymnocalathus</i> A	58	0.69	416.647	0.050
<i>Hemilepidotus spinosus</i>	57	0.68	493.171	0.059
<i>Lampanyctus</i> spp.	57	0.68	841.834	0.101
Melamphaeidae⁶	53	0.63	526.923	0.063
<i>Ophiodon elongatus</i>	53	0.63	316.392	0.038
<i>Ronquilus jordani</i>	53	0.63	546.780	0.065
Stenobrachius spp.	52	0.62	877.596	0.105
<i>Bryozoichthys lysimus</i>	51	0.61	325.180	0.039
<i>Podothecus acipenserinus</i>	51	0.61	394.838	0.047
Pleuronectidae	49	0.59	493.858	0.059
<i>Malacocottus zonurus</i> 1	48	0.57	314.704	0.038
<i>Ichthys lockingtoni</i>	47	0.56	423.619	0.051
<i>Citharichthys</i> spp.	45	0.54	2026.624	0.242
<i>Chirolophis</i> spp.	44	0.53	361.609	0.043
<i>Hemilepidotus jordani</i>	41	0.49	224.907	0.027
<i>Dasygottus setiger</i>	40	0.48	274.199	0.033
<i>Bathylagus milleri</i>	39	0.47	293.025	0.035
<i>Hexagrammos octogrammus</i>	37	0.44	714.789	0.085
<i>Malacocottus zonurus</i>	37	0.44	265.162	0.032
<i>Cryptacanthodes gigantea</i>	36	0.43	276.190	0.033
<i>Microgadus proximus</i>	35	0.42	722.255	0.086
<i>Stichaeus punctatus</i>	35	0.42	224.049	0.027
<i>Lampanyctus regalis</i>	33	0.39	337.580	0.040
<i>Tactostoma macropus</i>	28	0.33	220.875	0.026
<i>Clupea pallasi</i>	26	0.31	604.672	0.072
<i>Gymnocalathus</i> spp.	26	0.31	254.121	0.030
<i>Nectoliparis pelagicus</i>	25	0.30	155.864	0.019

Appendix C - Tables

Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Cyclothona</i> spp.	23	0.27	173.651	0.021
<i>Triglops forficata</i>	23	0.27	146.538	0.018
<i>Triglops macellus</i>	23	0.27	127.087	0.015
<i>Ptilichthys goodei</i>	22	0.26	127.541	0.015
<i>Trachipterus altivelis</i>	22	0.26	159.338	0.019
<i>Leptagonus frenatus</i>	21	0.25	143.917	0.017
<i>Artediushenestralis</i>	18	0.22	147.778	0.018
<i>Bryozoichthys marjorius</i>	18	0.22	104.854	0.013
<i>Hemilepidotus zapus</i>	17	0.20	233.058	0.028
<i>Icelinus borealis</i>	17	0.20	146.731	0.018
<i>Bathyagonus</i> spp.	16	0.19	146.158	0.017
<i>Anoplagonus inermis</i>	14	0.17	88.207	0.011
<i>Leptocottus armatus</i>	14	0.17	87.974	0.011
<i>Bathyagonus nigripinnis</i>	13	0.16	83.579	0.010
<i>Chirolophis decoratus</i>	13	0.16	89.825	0.011
<i>Hemitripterus bolini</i>	13	0.16	73.340	0.009
Hexagrammidae	12	0.14	67.882	0.008
<i>Limanda aspera</i>	12	0.14	82.503	0.010
<i>Melamphaes</i> spp.	12	0.14	94.387	0.011
<i>Icosteus aenigmaticus</i>	11	0.13	97.372	0.012
<i>Paraliparis</i> spp.	11	0.13	108.125	0.013
<i>Psychrolutes paradoxus</i>	11	0.13	55.906	0.007
<i>Scorpaenichthys marmoratus</i>	11	0.13	60.297	0.007
Scorpaenidae	11	0.13	99.762	0.012
Zoarcidae⁷	11	0.13	189.707	0.023
<i>Chirolophis nugator</i>	10	0.12	72.875	0.009
<i>Psychrolutes sigalutes</i>	10	0.12	75.648	0.009
<i>Artediushenestralis</i>	9	0.11	112.285	0.013
<i>Aptocyclus ventricosus</i>	8	0.10	29.985	0.004
<i>Aspidophoroides monopterygius</i>	8	0.10	42.123	0.005
<i>Danaphos oculatus</i>	8	0.10	52.603	0.006
Ophidiidae	8	0.10	80.564	0.010
<i>Argyropelecus lychnus</i>	7	0.08	44.087	0.005
<i>Argyropelecus</i> spp.	7	0.08	56.018	0.007

Appendix C - Tables

Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Bathyagonus pentacanthus</i>	7	0.08	32.764	0.004
<i>Bathylagus</i> spp.	7	0.08	97.328	0.012
<i>Bryozoichthys</i> spp.	7	0.08	66.791	0.008
<i>Embassichthys bathybius</i>	7	0.08	41.140	0.005
<i>Hexagrammos</i> spp.	7	0.08	426.851	0.051
<i>Stenobrachius nannochir</i>	7	0.08	79.892	0.010
<i>Triglops pingeli</i>	7	0.08	32.262	0.004
<i>Triglops</i> spp.	7	0.08	45.628	0.005
<i>Cololabis saira</i>	6	0.07	44.147	0.005
<i>Hypsagonus quadricornis</i>	6	0.07	34.101	0.004
<i>Melamphaes lugubris</i>	6	0.07	54.892	0.007
<i>Radulinus</i> spp.	6	0.07	36.126	0.004
<i>Symbolophorus californiensis</i>	6	0.07	44.149	0.005
<i>Anoplarchus insignis</i>	5	0.06	73.497	0.009
<i>Blepsias bilobus</i>	5	0.06	41.478	0.005
<i>Merluccius productus</i>	5	0.06	278.533	0.033
<i>Argyropelecus affinis</i>	4	0.05	8.297	0.001
<i>Hypsagonus mozinoi</i>	4	0.05	26.157	0.003
<i>Sebastes paucispinis</i>	4	0.05	32.029	0.004
<i>Xeneretmus latifrons</i>	4	0.05	34.464	0.004
<i>Brosmophycis marginata</i>	3	0.04	21.210	0.003
<i>Ceratoscopelus townsendi</i>	3	0.04	20.486	0.002
<i>Leuroglossus stilbius</i>	3	0.04	48.511	0.006
Myctophidae B	3	0.04	20.000	0.002
<i>Nautichthys oculofasciatus</i>	3	0.04	16.737	0.002
<i>Paricelinus hopliticus</i>	3	0.04	55.382	0.007
Pholidae	3	0.04	19.138	0.002
<i>Bathymaster</i> 2	2	0.02	20.344	0.002
<i>Bathymaster signatus</i>	2	0.02	8.707	0.001
Bathymasteridae	2	0.02	7.718	0.001
<i>Bothragonus swani</i>	2	0.02	24.587	0.003
<i>Clinocottus</i> spp.	2	0.02	13.229	0.002
Cottoid type A	2	0.02	4.460	0.001
<i>Cottus asper</i>	2	0.02	13.562	0.002

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Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Gasterosteus aculeatus</i>	2	0.02	8.222	0.001
<i>Icelus</i> spp.	2	0.02	18.800	0.002
<i>Lepidogobius lepidus</i>	2	0.02	12.833	0.002
<i>Liparis florate</i>	2	0.02	10.477	0.001
<i>Macropinna microstoma</i>	2	0.02	12.351	0.001
<i>Malacocottus zonurus</i> 2	2	0.02	14.415	0.002
<i>Microstoma</i> sp.	2	0.02	14.318	0.002
<i>Nautichthys robustus</i>	2	0.02	10.006	0.001
<i>Radulinus boleoides</i>	2	0.02	15.379	0.002
<i>Rhinoliparis barbulifer</i>	2	0.02	16.629	0.002
<i>Scopelosaurus</i> spp.	2	0.02	14.583	0.002
<i>Stellerina xyosterna</i>	2	0.02	11.333	0.001
<i>Tetragonurus cuvieri</i>	2	0.02	20.072	0.002
<i>Trachurus symmetricus</i>	2	0.02	179.402	0.021
<i>Triglops scepticus</i>	2	0.02	12.652	0.002
<i>Allosmerus elongatus</i>	1	0.01	5.579	0.001
<i>Anarhichas orientalis</i>	1	0.01	9.051	0.001
<i>Anoplarchus purpurescens</i>	1	0.01	16.782	0.002
<i>Argentina sialis</i>	1	0.01	8.213	0.001
<i>Argyropelecus sladeni</i>	1	0.01	8.735	0.001
<i>Aristostomias scintillans</i>	1	0.01	5.744	0.001
<i>Benthalbella dentata</i>	1	0.01	7.041	0.001
<i>Blepsias cirrhosus</i>	1	0.01	13.313	0.002
<i>Careproctus</i> spp.	1	0.01	9.635	0.001
<i>Chitonotus pugetensis</i>	1	0.01	6.848	0.001
<i>Clevelandia ios</i>	1	0.01	3.996	0.000
<i>Clinocottus acuticeps</i>	1	0.01	39.428	0.005
Clupeiformes	1	0.01	7.759	0.001
<i>Diogenichthys atlanticus</i>	1	0.01	8.483	0.001
<i>Diogenichthys</i> spp.	1	0.01	5.303	0.001
<i>Enophryns</i> spp.	1	0.01	6.584	0.001
<i>Eopsetta jordani</i>	1	0.01	8.536	0.001
<i>Eurypharynx</i> spp.	1	0.01	6.539	0.001
<i>Idiacanthus</i> spp.	1	0.01	6.272	0.001

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Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Leptagonus leptorhynchus</i>	1	0.01	2.018	0.000
<i>Liparis pulchellus</i>	1	0.01	6.368	0.001
<i>Loweina rara</i>	1	0.01	15.761	0.002
<i>Lycodapus</i> spp.	1	0.01	7.059	0.001
<i>Lycodes brevipes</i>	1	0.01	7.626	0.001
<i>Lycodes diapterus</i>	1	0.01	8.758	0.001
<i>Myoxocephalus polyacanthocephalus</i>	1	0.01	8.047	0.001
<i>Notolepis rissoii</i>	1	0.01	8.415	0.001
<i>Osmerus mordax</i>	1	0.01	6.500	0.001
<i>Oxylebius pictus</i>	1	0.01	5.060	0.001
<i>Pallisina barbata</i>	1	0.01	6.571	0.001
<i>Paraliparis holomelas</i>	1	0.01	8.874	0.001
<i>Parvilux ingens</i>	1	0.01	8.347	0.001
<i>Pholis laeta</i>	1	0.01	4.129	0.000
<i>Plectobranchus evides</i>	1	0.01	6.232	0.001
<i>Pleuronichthys coenosus</i>	1	0.01	6.580	0.001
<i>Rhamphocottus richardsoni</i>	1	0.01	2.764	0.000
<i>Thaleichthys pacificus</i>	1	0.01	8.689	0.001
Trachipteridae	1	0.01	7.894	0.001
<i>Trichodon trichodon</i>	1	0.01	3.457	0.000
<i>Xiphister</i> spp.	1	0.01	5.505	0.001

¹Species in the study area are *Sebastes aleutianus*, *S.alutus*, *S. auriculatus*, *S. aurora*, *S. babcocki*, *S. borealis*, *S. brevispinis*, *S. caurinus*, *S. chlorostictus*, *S. ciliatus*, *S. crameri*, *S. diploproa*, *S. elongatus*, *S. emphaeus*, *S. entomelas*, *S. flavidus*, *S. glaucus*, *S.goodei*, *S. helvomaculatus*, *S. jordani*, *S. maliger*, *S. melanops*, *S. melanostictus*, *S. miniatus*, *S. mystinus*, *S. nebulosus*, *S. nigrocinctus*, *S. paucispinis*, *S. pinniger*, *S. polyspinis*, *S. proriger*, *S. rastrelliger*, *S. reedi*, *S. ruberrimus*, *S. rufus*, *S. saxicola*, *S. variegatus*, *S. wilsoni*, and *S. zacentrus*.

²Species in the study area are *Allosmerus elongatus*, *Hypomesus pretiosus*, *Mallotus villosus*, *Osmerus mordax*, *Spirinchus starksii*, *S. thaleichthys*, and *Thaleichthys pacificus*.

³Species in the study area are *Myoxocephalus axillaris*, *M. brandti*, *M. jaok*, *M. niger*, *M. polyacanthocephalus*, *M. quadricornis*, *M. scorpius*, *M. stelleri*, and *M. verrucosus*.

⁴Species in the study area are *Albatrossia pectoralis*, *Coryphaenoides acrolepis*, *C. armatus*, *C. cinereus*, *C. filifer*, *C. leptolepis*, *C. liocephalus*, *C. longifilis*, *C. yaquinae*, and *Nezumia*

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Table 4

Ranked frequency of occurrence (FO) of larval fish taxa collected in bongo nets from Recruitment Processes Task survey cruises 1972-1996. Average catch (number per 10m²) at positive hauls is included. Total number of 60 cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003). Gray taxa are combined at a higher taxonomic level.

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
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stelgidolepis.

⁵Species found in the study area are *Liparis bristolensis*, *L. callyodon*, *L. catharus*, *L. cyclopus*, *L. dennyi*, *L. florate*, *L. fucensis*, *L. gibbus*, *L. grebnitzki*, *L. marmoratus*, *L. mednus*, *L. megacephalus*, *L. micraspidophorus*, *L. mucosus*, *L. ochotensis*, *L. pulchellus*, *L. rutteri*, and *L. tunicatus*.

⁶Species found in the study area are *Melamphaes lugubris*, *Poromitra crassiceps*, and *Scopeloberyx robustus*.

⁷Species in the study area are *Bothocara brunneum*, *B. hollandi*, *B. molle*, *B. pusillum*, *B. remigerum*, *Derepodichthys alepidotus*, *Gymnelis hemifasciatus*, *G. popovi*, *G. viridis*, *Krusensterniella pavlovskii*, *Lycenchelys altus*, *L. camchaticus*, *L. crotalinus*, *L. hippopotamus*, *L. jordani*, *L. longirostris*, *L. microporus*, *L. pliciferus*, *L. rassi*, *L. ratmanovi*, *L. roseus*, *L. volki*, *Lycodapus derjugini*, *L. dermatinus*, *L. endemoscotus*, *L. fierasfer*, *L. leptus*, *L. mandibularis*, *L. pachysoma*, *L. parviceps*, *L. poecilis*, *L. psarosomatus*, *Lycodes brevipes*, *L. concolor*, *L. cortezianus*, *L. diapterus*, *L. mucosus*, *L. pacifica*, *L. palearis*, *L. raridens*, *L. turneri*, *Lyconema barbatum*, *Melanostigma pammelas*, *Nalbantichtys elongatus*, *Opaeophagus acrogeneius*, *Pachycara bulbiceps*, *Puzanovia rubra*, and *Taranetza lycoderma*.

Appendix C - Tables

Table 5

Larval taxa covered in Matarese et al. (2003).

Family	Taxon	Common Name
Engraulidae	<i>Engraulis mordax</i>	Northern anchovy
Clupeidae	<i>Clupea pallasi</i>	Pacific herring
Microstomatidae	<i>Nansenia candida</i>	Bluethroat argentine
Bathylagidae	<i>Bathylagus milleri</i>	Robust blacksmelt
	<i>Bathylagus ochotensis</i>	Popeye blacksmelt
	<i>Bathylagus pacificus</i>	Pacific blacksmelt
	<i>Leuroglossus schmidti</i>	Northern smoothtongue
Osmeridae	Osmeridae	Smelts
	<i>Mallotus villosus</i>	Capelin
Stomiidae	<i>Chauliodus macouni</i>	Pacific viperfish
	<i>Tactostoma macropus</i>	Longfin dragonfish
Paralepididae	<i>Lestidiops ringens</i>	Slender barracudina
Myctophidae	<i>Diaphus theta</i>	California headlightfish
	<i>Lampanyctus regalis</i>	Pinpoint lampfish
	<i>Lampanyctus ritteri</i>	Broadfin lampfish
	<i>Protomyctophum crockeri</i>	California flashlightfish
	<i>Protomyctophum thompsoni</i>	Northern flashlightfish
	<i>Stenobrachius leucopsarus</i>	Northern lampfish
	<i>Tarletonbeania crenularis</i>	Blue lanternfish
Trachipteridae	<i>Trachipterus altivelis</i>	King-of-the-salmon
Macrouridae	Macrouridae	Grenadiers
Merlucciidae	<i>Merluccius productus</i>	Pacific hake
Gadidae	<i>Gadus macrocephalus</i>	Pacific cod
	<i>Microgadus proximus</i>	Pacific tomcod
	<i>Theragra chalcogramma</i>	Walleye pollock
Scomberesocidae	<i>Cololabis saira</i>	Pacific saury
Melamphaidae	Melamphaidae	Bigscales
Scorpaenidae	<i>Sebastes</i> spp.	Rockfishes
	<i>Sebastolobus</i> spp.	Thornyheads
Anoplopomatidae	<i>Anoplopoma fimbria</i>	Sablefish
Hexagrammidae	<i>Hexagrammos decagrammus</i>	Kelp greenling
	<i>Hexagrammos lagocephalus</i>	Rock greenling
	<i>Hexagrammos octogrammus</i>	Masked greenling
	<i>Hexagrammos stelleri</i>	Whitespotted greenling
	<i>Ophiodon elongatus</i>	Lingcod
	<i>Pleurogrammus monopterygius</i>	Atka mackerel
Cottidae	<i>Artedius fenestralis</i>	Padded sculpin
	<i>Artedius harringtoni</i>	Scalyhead sculpin

Appendix C - Tables

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Larval taxa covered in Matarese et al. (2003).

Family	Taxon	Common Name
Cottidae	<i>Gymnocanthus</i> spp.	
	<i>Hemilepidotus hemilepidotus</i>	Red Irish lord
	<i>Hemilepidotus jordani</i>	Yellow Irish lord
	<i>Hemilepidotus spinosus</i>	Brown Irish lord
	<i>Hemilepidotus zapus</i>	Longfin Irish lord
	<i>Icelinus</i> spp.	
	<i>Leptocottus armatus</i>	Pacific staghorn sculpin
	<i>Myoxocephalus</i> spp.	
	<i>Radulinus asprellus</i>	Slim sculpin
	<i>Ruscarius meanyi</i>	Puget Sound sculpin
	<i>Scorpaenichthys marmoratus</i>	Cabezon
	<i>Anoplagonus inermis</i>	Smooth alligatorfish
	<i>Aspidophoroides monopterygius</i>	Alligatorfish
	<i>Bathyagonus alascanus</i>	Gray starsnout
Agonidae	<i>Bathyagonus infraspinatus</i>	Spinycheek starsnout
	<i>Bathyagonus nigripinnis</i>	Blackfin poacher
	<i>Bathyagonus pentacanthus</i>	Bigeye poacher
	<i>Hypsagonus mozinoi</i>	Kelp poacher
	<i>Hypsagonus quadricornis</i>	Fourhorn poacher
	<i>Leptagonus frenatus</i>	Sawback poacher
	<i>Podothecus acipenserinus</i>	Sturgeon poacher
	<i>Xeneretmus latifrons</i>	Blacktip poacher
	<i>Dasyctonus setiger</i>	Spinyhead sculpin
	<i>Psychrolutes paradoxus</i>	Tadpole sculpin
	<i>Psychrolutes sigalutes</i>	Soft sculpin
	<i>Aptocyclus ventricosus</i>	Smooth lump sucker
	<i>Liparis</i> spp.	Snailfishes
	<i>Nectoliparis pelagicus</i>	Tadpole snailfish
Psychrolutidae	<i>Bathymaster</i> spp.	
	<i>Ronquilus jordani</i>	Northern ronquil
Cyclopteridae	<i>Zoarcidae</i>	Eelpouts
	<i>Anoplarchus</i> spp.	Cockscombs
Liparidae	<i>Chirolophis</i> spp.	Warbonnets
	<i>Lumpenella longirostris</i>	Longsnout prickleback
	<i>Lumpenus</i> spp.	
	<i>Lumpenus sagitta</i>	Snake prickleback
	<i>Poroclinus rothrocki</i>	Whitebarred prickleback
	<i>Stichaeus punctatus</i>	Arctic shanny
Bathymasteridae		
Zoarcidae		
Stichaeidae		

Appendix C - Tables

Table 5

Larval taxa covered in Matarese et al. (2003).

Family	Taxon	Common Name
Cryptacanthodidae	<i>Cryptacanthodes aleutensis</i>	Dwarf wrymouth
	<i>Cryptacanthodes giganteus</i>	Giant wrymouth
Pholidae	<i>Pholis</i> spp.	Gunnels
Ptilichthyidae	<i>Ptilichthys goodei</i>	Quillfish
Zaproridae	<i>Zaprora silenus</i>	Prowfish
Ammodytidae	<i>Ammodytes hexapterus</i>	Pacific sand lance
Icosteidae	<i>Icosteus aenigmaticus</i>	Ragfish
Centrolophidae	<i>Ichthys lockingtoni</i>	Medusafish
Paralichthyidae	<i>Citharichthys sordidus</i>	Pacific sanddab
	<i>Citharichthys stigmaeus</i>	Speckled sanddab
Pleuronectidae	<i>Atheresthes stomias</i>	Arrowtooth flounder
	<i>Embassichthys bathybius</i>	Deepsea sole
	<i>Glyptocephalus zachirus</i>	Rex sole
	<i>Hippoglossoides elassodon</i>	Flathead sole
	<i>Hippoglossus stenolepis</i>	Pacific halibut
	<i>Isopsetta isolepis</i>	Butter sole
	<i>Lepidotetta bilineata</i>	Southern rock sole
	<i>Lepidotetta polyxystra</i>	Northern rock sole
	<i>Limanda aspera</i>	Yellowfin sole
	<i>Lyopsetta exilis</i>	Slender sole
	<i>Microstomus pacificus</i>	Dover sole
	<i>Parophrys vetulus</i>	English sole
	<i>Platichthys stellatus</i>	Starry flounder
	<i>Pleuronectes quadrituberculatus</i>	Alaska plaice
	<i>Psettichthys melanostictus</i>	Sand sole
	<i>Reinhardtius hippoglossoides</i>	Greenland halibut

Appendix C - Tables

Table 6

Ranked frequency of occurrence (FO) of pelagic fish egg taxa collected in bongo nets from AFSC survey cruises 1972-1996. Average catch (no./10m²) at positive hauls is included. Total number of 60-cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003).

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
<i>Hippoglossoides elassodon</i>	2864	34.23	475785.28	166.13
<i>Glyptocephalus zachirus</i>	1063	12.70	45043.70	42.37
<i>Microstomus pacificus</i>	870	10.40	65049.14	74.77
Pleuronectidae	682	8.15	44669.33	65.50
<i>Pleuronectes quadrituberculatus</i>	622	7.43	9336.05	15.01
<i>Trachipterus altivelis</i>	353	4.22	4604.84	13.04
Bathylagidae	328	3.92	11428.22	34.84
<i>Lyopsetta exilis</i>	245	2.93	15135.02	61.78
Unidentified	234	2.80	8267.54	35.33
<i>Icichthys lockingtoni</i>	231	2.76	3791.03	16.41
<i>Chauliodus macouni</i>	222	2.65	2603.39	11.73
<i>Bathylagus</i> spp.	202	2.41	3720.66	18.42
Paralichthyidae	197	2.35	44053.13	223.62
<i>Platichthys stellatus</i>	176	2.10	3369.03	19.14
Myctophidae	167	2.00	66279.60	396.88
<i>Macrouridae</i>	158	1.89	5852.28	37.04
<i>Icosteus aenigmaticus</i>	145	1.73	2202.99	15.19
<i>Leuroglossus schmidti</i>	119	1.42	4840.86	40.68
<i>Embassichthys bathybius</i>	115	1.37	1017.19	8.85
Disintegrated	94	1.12	4393.12	46.74
<i>Citharichthys</i> spp.	84	1.00	3065.76	36.50
<i>Parophrys vetulus</i>	82	0.98	1876.34	22.88
<i>Bathylagus ochotensis</i>	80	0.96	1279.03	15.99
<i>Isopsetta isolepis</i>	75	0.90	1386.28	18.48
Teleost type G*	65	0.78	1263.05	19.43
<i>Psettichthys melanostictus</i>	55	0.66	641.14	11.66
<i>Limanda aspera</i>	46	0.55	1820.18	39.57
<i>Merluccius productus</i>	35	0.42	508.12	14.52
<i>Nansenia candida</i>	25	0.30	276.76	11.07
<i>Sebastolobus</i> spp.	24	0.29	674.45	28.10
<i>Tactostoma macropus</i>	23	0.27	668.86	29.08
<i>Engraulis mordax</i>	23	0.27	6792.14	295.31
<i>Bathylagus milleri</i>	21	0.25	392.56	18.69
<i>Reinhardtius hippoglossoides</i>	20	0.24	255.59	12.78
<i>Hippoglossoides</i> spp.	20	0.24	2075.27	103.76
<i>Anoplopoma fimbria</i>	19	0.23	162.16	8.53
Argentinidae	17	0.20	143.56	8.44
<i>Pleuronichthys decurrens</i>	15	0.18	100.99	6.73

Appendix C - Tables

Table 6

Ranked frequency of occurrence (FO) of pelagic fish egg taxa collected in bongo nets from AFSC survey cruises 1972-1996. Average catch (no./10m²) at positive hauls is included. Total number of 60-cm bongo tows = 8368 (includes 312 Tucker trawls). Bolded taxa are covered in Matarese et al. (2003).

Taxon	No. Positive Hauls	% FO	Sum of Catch/10m ²	Avg. Catch/10m ²
Teleost type E*	13	0.16	112.18	8.63
<i>Tetragonurus cuvieri</i>	11	0.13	152.81	13.89
<i>Cololabis saira</i>	10	0.12	313.08	31.31
Teleost type P*	9	0.11	160.21	17.80
<i>Hippoglossus stenolepis</i>	8	0.10	56.96	7.12
<i>Nansenia crassa</i>	7	0.08	56.41	8.06
<i>Gadus macrocephalus</i>	6	0.07	65.49	10.91
<i>Microstoma</i> sp.	4	0.05	29.56	7.39
Teleost type C*	3	0.04	28.20	9.40
<i>Pleuronichthys coenosus</i>	2	0.02	21.18	10.59
<i>Pleuronichthys verticalis</i>	1	0.01	7.72	7.72
Teleost type Q*	1	0.01	7.37	7.37
<i>Bathylagus wesethi</i>	1	0.01	5.79	5.79
<i>Argentina sialis</i>	1	0.01	6.93	6.93
<i>Trachurus symmetricus</i>	1	0.01	79.83	79.83
<i>Hippoglossoides robustus</i>	1	0.01	10.84	10.84
Teleost type H*	1	0.01	6.29	6.29
Gonostomatidae	1	0.01	6.82	6.82
<i>Pleuronectes</i> spp.	1	0.01	3.05	3.05

*Teleost egg types are recognizable by character but remain unidentified.

Appendix C - Tables

Table 7
Pelagic fish egg occurrences covered in Matarese et al. (2003)

Family	Taxon
Engraulidae	<i>Engraulis mordax</i>
Microstomatidae	<i>Nansenia candida</i>
Bathylagidae	<i>Bathylagus milleri</i> <i>Bathylagus ochotensis</i> <i>Leuroglossus schmidti</i>
Stomiidae	<i>Chauliodus macouni</i> <i>Tactostoma macropus</i>
Trachipteridae	<i>Trachipterus altivelis</i>
Macrouridae	<i>Macrouridae</i>
Merlucciidae	<i>Merluccius productus</i>
Gadidae	<i>Gadus macrocephalus</i> <i>Theragra chalcogramma</i>
Scomberesocidae	<i>Cololabis saira</i>
Scorpaenidae	<i>Sebastolobus</i> spp.
Anoplopomatidae	<i>Anoplopoma fimbria</i>
Icosteidae	<i>Icosteus aenigmaticus</i>
Stromateidae	<i>Icichthys lockingtoni</i>
Pleuronectidae	<i>Embassichthys bathybius</i> <i>Glyptocephalus zachirus</i> <i>Hippoglossoides elassodon</i> <i>Hippoglossus stenolepis</i> <i>Isopsetta isolepis</i> <i>Limanda aspera</i> <i>Lyopsetta exilis</i> <i>Microstomus pacificus</i> <i>Parophrys vetulus</i> <i>Platichthys stellatus</i> <i>Pleuronectes quadrituberculatus</i> <i>Psettichthys melanostictus</i> <i>Reinhardtius hippoglossoides</i>

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Acanthopsetta nadesnyi</i>	Spiny flounder	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Agonopsis vulsa</i>	Northern spearnose poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Albatrossia pectoralis</i>	Giant grenadier	Gadiformes	Macrouridae (Grenadiers)
<i>Alepisaurus ferox</i>	Longnose lancetfish	Aulopiformes	Alepisauridae (Lancetfishes)
<i>Ammodytes hexapterus</i>	Pacific sand lance	Perciformes	Ammodytidae (Sand Lances)
<i>Anarhichas orientalis</i>	Bering wolffish	Perciformes	Anarhichadidae (Wolffishes)
<i>Anarrhichthys ocellatus</i>	Wolf-eel	Perciformes	Anarhichadidae (Wolffishes)
<i>Anoplagonus inermis</i>	Smooth alligatorfish	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Anoplarchus insignis</i>	Slender cockscomb	Perciformes	Stichaeidae (Picklebacks)
<i>Anoplarchus purpureascens</i>	High cockscomb	Perciformes	Stichaeidae (Picklebacks)
<i>Anoplogaster cornuta</i>	Fangtooth	Beryciformes	Anoplogastridae (Fangtooths)
<i>Anoplopoma fimbria</i>	Sablefish	Scorpaeniformes	Anoplopomatidae (Sablefishes)
<i>Anotopterus pharaao</i>	Daggertooth	Aulopiformes	Anotopteridae (Daggertooths)
<i>Apodichthys flavidus</i>	Penpoint gunnel	Perciformes	Pholididae (Gunnels)
<i>Aptocyclus ventricosus</i>	Smooth lump sucker	Scorpaeniformes	Cyclopteridae (Lumpfishes and Snailfishes)
<i>Arctozenus risso</i>	White barracudina	Aulopiformes	Paralepididae (Barracudinas)
<i>Argentina sialis</i>	Pacific argentine	Osmeriformes	Argentinidae (Argentines)
<i>Argyropelecus affinis</i>	Slender hatchetfish	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Argyropelecus hemigymnus</i>	Spurred hatchetfish	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Argyropelecus lychnus</i>	Tropical hatchetfish	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Argyropelecus sladeni</i>	Lowcrest hatchetfish	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Aristostomias scintillans</i>	Shiny loosejaw	Stomiiformes	Stomiidae (Loosejaws)
<i>Artedius fenestralis</i>	Padded sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Artedius harringtoni</i>	Scalyhead sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Artedius lateralis</i>	Smoothhead sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Ascelichthys rhodorus</i>	Rosy lip sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Aspidophoroides monopterygius</i>	Alligatorfish	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Atheresthes evermanni</i>	Kamchatka flounder	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Atheresthes stomias</i>	Arrowtooth flounder	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Atherinops affinis</i>	Topsmelt	Atheriniformes	Atherinidae (Silversides)
<i>Atherinopsis californiensis</i>	Jacksmelt	Atheriniformes	Atherinidae (Silversides)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Aulorhynchus flavidus</i>	Tube-snout	Gasterosteiformes	Gasterosteidae (Sticklebacks)
<i>Avocettina infans</i>	Blackline snipe eel	Anguilliformes	Nemichthysidae (Snipe Eels)
<i>Bathophilus flemingi</i>	Highfin dragonfish	Stomiiformes	Stomiidae (Scaleless Black Dragonfishes)
<i>Bathyagonus alascanus</i>	Gray starsnout	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Bathyagonus infraspinatus</i>	Spinycheek starsnout	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Bathyagonus nigripinnis</i>	Blackfin poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Bathyagonus pentacanthus</i>	Bigeye poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Bathylagus bericoides</i>	---	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Bathylagus milleri</i>	Robust blacksmelt	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Bathylagus ochotensis</i>	Popeye blacksmelt	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Bathylagus pacificus</i>	Pacific blacksmelt	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Bathylagus wesethi</i>	Snubnose blacksmelt	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Bathylichnops exilis</i>	Javelin spookfish	Osmeriformes	Opisthoproctidae (Spookfishes)
<i>Bathymaster signatus</i>	Searcher	Perciformes	Bathymasteridae (Ronquils)
<i>Bathysaurus mollis</i>	Highfin lizardfish	Aulopiformes	Synodontidae (Lizardfishes)
<i>Benthalbella dentata</i>	Northern pearleye	Aulopiformes	Scopelarchidae (Pearleyes)
<i>Benthalbella linguoidens</i>	Longfin pearleye	Aulopiformes	Scopelarchidae (Pearleyes)
<i>Blepsias bilobus</i>	Crested sculpin	Scorpaeniformes	Hemitripteridae (Sculpins)
<i>Blepsias cirrhosus</i>	Silverspotted sculpin	Scorpaeniformes	Hemitripteridae (Sculpins)
<i>Boreogadus saida</i>	Arctic cod	Gadiformes	Gadidae (Codfishes)
<i>Bothragonus swani</i>	Rockhead	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Bothrocara hollandi</i>	Bigfin eelpout	Perciformes	Zoarcidae (Eelpouts)
<i>Brama japonica</i>	Pacific pomfret	Perciformes	Bramidae (Pomfrets)
<i>Brosmophycis marginata</i>	Red brotula	Ophidiiformes	Bythitidae (Viviparous brotulas)
<i>Bryozochthys lysimus</i>	Nutcracker prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Bryozochthys marjorius</i>	Pearly prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Caristius macropus</i>	Bigmouth manefish	Perciformes	Caristiidae (Veilfins)
<i>Ceratoscopelus townsendi</i>	Dogtooth lampfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Chaenophryne longiceps</i>	Smoothhead dreamer	Lophiiformes	Oneirodidae (Dreamers)
<i>Chauliodus macouni</i>	Pacific viperfish	Stomiiformes	Stomiidae (Viperfishes)
<i>Chesnonia verrucosa</i>	Warty poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Chilara taylori</i>	Spotted cusk-eel	Ophidiiformes	Ophidiidae (Cusk-Eels)
<i>Chirolophis decoratus</i>	Decorated warbonnet	Perciformes	Stichaeidae (Picklebacks)
<i>Chirolophis nugator</i>	Mosshead warbonnet	Perciformes	Stichaeidae (Picklebacks)
<i>Chitonotus pugetensis</i>	Roughback sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Citharichthys sordidus</i>	Pacific sanddab	Pleuronectiformes	Paralichthyidae (Lefteye Flounders)
<i>Citharichthys stigmaeus</i>	Speckled sanddab	Pleuronectiformes	Paralichthyidae (Lefteye Flounders)
<i>Clevelandia ios</i>	Arrow goby	Perciformes	Gobiidae (Gobies)
<i>Clinocottus acuticeps</i>	Sharpnose sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Clinocottus embryum</i>	Calico sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Clinocottus globiceps</i>	Mosshead sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Clinocottus recalvus</i>	Bald sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Clupea pallasi</i>	Pacific herring	Clupeiformes	Clupeidae (Herrings)
<i>Cololabis saira</i>	Pacific saury	Beloniformes	Scomberesocidae (Sauries)
<i>Coryphaenoides acrolepis</i>	Pacific grenadier	Gadiformes	Macrouridae (Grenadiers)
<i>Coryphaenoides cinereus</i>	Popeye grenadier	Gadiformes	Macrouridae (Grenadiers)
<i>Coryphaenoides filifer</i>	Threadfin grenadier	Gadiformes	Macrouridae (Grenadiers)
<i>Coryphaenoides leptolepis</i>	Ghostly grenadier	Gadiformes	Macrouridae (Grenadiers)
<i>Cottus asper</i>	Prickly sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Cryptacanthodes aleutensis</i>	Dwarf wrymouth	Perciformes	Cryptacanthodidae (Wrymouths)
<i>Cryptacanthodes giganteus</i>	Giant wrymouth	Perciformes	Cryptacanthodidae (Wrymouths)
<i>Cyclothona acclinidens</i>	Benttooth bristlemouth	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Cyclothona atraria</i>	Black bristlemouth	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Cyclothona pallida</i>	Tan bristlemouth	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Cyclothona pseudopallida</i>	Slender bristlemouth	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Cyclothona signata</i>	Showy bristlemouth	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Cyema atrum</i>	Bobtail snipe-eel	Saccopharyngiformes	Cyematidae (Bobtail Snipe Eels)
<i>Danaphos oculatus</i>	Bottlelight	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Dasycottus setiger</i>	Spinyhead sculpin	Scorpaeniformes	Psychrolutidae (Sculpins)
<i>Diaphus theta</i>	California headlightfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Dolichopteryx longipes</i>	Brownsnout spookfish	Osmeriformes	Opisthoproctidae (Spookfishes)
<i>Electrona risso</i>	Chubby flashlightfish	Myctophiformes	Myctophidae (Lanternfishes)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Eleginus gracilis</i>	Saffron cod	Gadiformes	Gadidae (Codfishes)
<i>Embassichthys bathybius</i>	Deepsea sole	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Engraulis mordax</i>	Northern anchovy	Clupeiformes	Engraulidae (Anchovies)
<i>Enophrys bison</i>	Buffalo sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Enophrys dicerous</i>	Antlered sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Eopsetta jordani</i>	Petrale sole	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Eumicrotremus orbis</i>	Pacific spiny lump sucker	Scorpaeniformes	Cyclopteridae (Lumpfishes and Snailfishes)
<i>Gadus macrocephalus</i>	Pacific cod	Gadiformes	Gadidae (Codfishes)
<i>Genyonemus lineatus</i>	White croaker	Perciformes	Sciaenidae (Croakers)
<i>Glyptocephalus stelleri</i>	Long flounder	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Glyptocephalus zachirus</i>	Rex sole	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Gobiesox maeandricus</i>	Northern clingfish	Perciformes	Gobiesocidae (Clingfishes)
<i>Gonostoma atlanticum</i>	Atlantic fangjaw	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Gonostoma gracile</i>	Slender fangjaw	Stomiiformes	Gonostomatidae (Bristlemouths)
<i>Gymnelus viridis</i>	Fish doctor	Perciformes	Zoarcidae (Eelpouts)
<i>Gymnophantherus tricuspidis</i>	Arctic staghorn sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Hemilepidotus gilberti</i>	Banded Irish lord	Scorpaeniformes	Cottidae (Sculpins)
<i>Hemilepidotus hemilepidotus</i>	Red Irish lord	Scorpaeniformes	Cottidae (Sculpins)
<i>Hemilepidotus jordani</i>	Yellow Irish lord	Scorpaeniformes	Cottidae (Sculpins)
<i>Hemilepidotus spinosus</i>	Brown Irish lord	Scorpaeniformes	Cottidae (Sculpins)
<i>Hemilepidotus zapus</i>	Longfin Irish lord	Scorpaeniformes	Cottidae (Sculpins)
<i>Hemitripterus bolini</i>	Bigmouth sculpin	Scorpaeniformes	Hemitripteridae (Sculpins)
<i>Heterostichus rostratus</i>	Giant kelpfish	Perciformes	Clinidae (Kelpfishes)
<i>Hexagrammos decagrammus</i>	Kelp greenling	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Hexagrammos lagocephalus</i>	Rock greenling	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Hexagrammos octogrammus</i>	Masked greenling	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Hexagrammos stelleri</i>	Whitespotted greenling	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Hippoglossoides elassodon</i>	Flathead sole	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Hippoglossoides robustus</i>	Bering flounder	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Hippoglossus stenolepis</i>	Pacific halibut	Pleuronectiformes	Pleuronectidae (Righeye Flounders)
<i>Hygophum reinhardtii</i>	Slender lanternfish	Myctophiformes	Myctophidae (Lanternfishes)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Hypomesus pretiosus</i>	Surf smelt	Osmeriformes	Osmeridae (Smelts)
<i>Hypsagonus mozinoi</i>	Kelp poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Hypsagonus quadricornis</i>	Fourhorn poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Icelinus borealis</i>	Northern sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Icichthys lockingtoni</i>	Medusafish	Perciformes	Centrolophidae (Medusafishes)
<i>Icosteus aenigmaticus</i>	Ragfish	Perciformes	Icosteidae (Ragfishes)
<i>Idiacanthus antrostomus</i>	Pacific blackdragon	Stomiiformes	Stomiidae (Black dragonsfishes)
<i>Idiacanthus fasciola</i>	Ribbon sawtail fish	Stomiiformes	Stomiidae (Black dragonsfishes)
<i>Isopsetta isolepis</i>	Butter sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Katsuwonus pelamis</i>	Skipjack tuna	Perciformes	Scombridae (Mackerels)
<i>Lampadena urophaois</i>	Sunbeam lampfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Lampanyctus ritteri</i>	Broadfin lampfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Lampris guttatus</i>	Opah	Lampriformes	Lampridae (Opahs)
<i>Lepidogobius lepidus</i>	Bay goby	Perciformes	Gobiidae (Gobies)
<i>Lepidotetta bilineata</i>	Southern rock sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Lepidotetta polyxystra</i>	Northern rock sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Leptagonus decagonus</i>	Atlantic poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Leptagonus frenatus</i>	Sawback poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Leptagonus leptorhynchus</i>	Longnose poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Leptocottus armatus</i>	Pacific staghorn sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Lestidiops ringens</i>	Slender barracudina	Aulopiformes	Paralepididae (Barracudinas)
<i>Leuroglossus schmidti</i>	Northern smoothtongue	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Leuroglossus stilbius</i>	California smoothtongue	Osmeriformes	Bathylagidae (Blacksmelts)
<i>Limanda aspera</i>	Yellowfin sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Limanda proboscidea</i>	Longhead dab	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Liopsetta glacialis</i>	Arctic flounder	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Liparis callyodon</i>	Spotted snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Liparis florae</i>	Tidepool snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Liparis fucensis</i>	Slipskin snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Liparis gibbus</i>	Variegated snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Liparis mucosus</i>	Slimy snailfish	Scorpaeniformes	Liparidae (Snailfishes)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Liparis pulchellus</i>	Showy snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Loweina rara</i>	Dwarf lanternfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Lumpenella longirostris</i>	Longsnout prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Lumpenus maculatus</i>	Daubed shanny	Perciformes	Stichaeidae (Pricklebacks)
<i>Lumpenus sagitta</i>	Snake prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Luvarus imperialis</i>	Louvar	Perciformes	Luvaridae (Louvars)
<i>Lyopsetta exilis</i>	Slender sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Macropinna microstoma</i>	Barreleye	Osmeriformes	Opisthoproctidae (Spookfishes)
<i>Magnisudis atlantica</i>	Duckbill barracudina	Aulopiformes	Paralepididae (Barracudinas)
<i>Malacobottus zonurus</i>	Darkfin sculpin	Scorpaeniformes	Psychrolutidae (Sculpins)
<i>Mallotus villosus</i>	Capelin	Osmeriformes	Osmeridae (Smelts)
<i>Melamphaes lugubris</i>	Highsnout bigscale	Stephanoberyciformes	Melamphaidae (Bigscales)
<i>Merluccius productus</i>	Pacific hake	Gadiformes	Merlucciidae (Hakes)
<i>Microgadus proximus</i>	Pacific tomcod	Gadiformes	Gadidae (Codfishes)
<i>Microstomus pacificus</i>	Dover sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Mola mola</i>	Ocean sunfish	Tetraodontiformes	Molidae (Molas)
<i>Myoxocephalus polyacanthocephalus</i>	Great sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Nannobrachium regale</i>	Pinpoint lampfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Nansenia candida</i>	Bluethroat argentine	Osmeriformes	Microstomatidae (Pencilsmelts)
<i>Naucrates ductor</i>	Pilotfish	Perciformes	Carangidae (Jacks)
<i>Nautichthys oculofasciatus</i>	Sailfin sculpin	Scorpaeniformes	Hemitripteridae (Sculpins)
<i>Nautichthys pribilovius</i>	Eyeshade sculpin	Scorpaeniformes	Hemitripteridae (Sculpins)
<i>Nautichthys robustus</i>	Shortmast sculpin	Scorpaeniformes	Hemitripteridae (Sculpins)
<i>Nectoliparis pelagicus</i>	Tadpole snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Nemichthys scolopaceus</i>	Slender snipe eel	Anguilliformes	Nemichthiyidae (Snipe Eels)
<i>Nezumia stelgidolepis</i>	California grenadier	Gadiformes	Macrouridae (Grenadiers)
<i>Occella dodecaedron</i>	Bering poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Odontopyxix trispinsosa</i>	Pygmy poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Oligocottus maculosus</i>	Tidepool sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Oligocottus snyderi</i>	Fluffy sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Oneirodes bulbosus</i>	Bulbous dreamer	Lophiiformes	Oneirodidae (Dreamers)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Ophiodon elongatus</i>	Lingcod	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Opisthocentrus ocellatus</i>	Ocellated blenny	Perciformes	Stichaeidae (Pricklebacks)
<i>Opostomias mitsuii</i>	Pitgum dragonfish	Stomiiformes	Stomiidae (Scaleless Black Dragonfishes)
<i>Oxylebius pictus</i>	Painted greenling	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Pallasina barbata</i>	Tubenose poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Paraliparis holomelas</i>	Ebony snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Paricelinus hopliticus</i>	Thornback sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Parophrys vetulus</i>	English sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Parvilux ingens</i>	Giant lampfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Peprilus simillimus</i>	Pacific pompano	Perciformes	Stromateidae (Butterfishes)
<i>Percis japonica</i>	Dragon poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Pholis laeta</i>	Crescent gunnel	Perciformes	Pholididae (Gunnels)
<i>Phytichthys chirus</i>	Ribbon prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Platichthys stellatus</i>	Starry flounder	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Plectobranchus evides</i>	Bluebarred prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Pleurogrammus monopterygius</i>	Atka mackerel	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Pleuronectes quadrituberculatus</i>	Alaska plaice	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Pleuronichthys coenosus</i>	C-O sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Pleuronichthys decurrens</i>	Curlfin sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Podothecus acipenserinus</i>	Sturgeon poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Poroclinus rothrocki</i>	Whitebarred prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Poromitra crassiceps</i>	Crested bigscale	Stephanoberyciformes	Melamphaidae (Bigscales)
<i>Protomyctophum crockeri</i>	California flashlightfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Protomyctophum thompsoni</i>	Northern flashlightfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Psettidichthys melanostictus</i>	Sand sole	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Psychrolutes paradoxus</i>	Tadpole sculpin	Scorpaeniformes	Psychrolutidae (Sculpins)
<i>Psychrolutes phrictus</i>	Blob sculpin	Scorpaeniformes	Psychrolutidae (Sculpins)
<i>Psychrolutes sigalutes</i>	Soft sculpin	Scorpaeniformes	Psychrolutidae (Sculpins)
<i>Ptilichthys goodei</i>	Quillfish	Perciformes	Ptilichthyidae (Quillfishes)
<i>Radulinus asprellus</i>	Slim sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Radulinus boleoides</i>	Darter sculpin	Scorpaeniformes	Cottidae (Sculpins)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Reinhardtius hippoglossoides</i>	Greenland halibut	Pleuronectiformes	Pleuronectidae (Righteye Flounders)
<i>Rhamphocottus richardsoni</i>	Grunt sculpin	Scorpaeniformes	Rhamphocottidae (Sculpins)
<i>Rhinogobiops nicholsii</i>	Blackeye goby	Perciformes	Gobiidae (Gobies)
<i>Rhinoliparis barbulifer</i>	Longnose snailfish	Scorpaeniformes	Liparidae (Lumpfishes and Snailfishes)
<i>Rimicola muscarum</i>	Kelp clingfish	Perciformes	Gobiesocidae (Clingfishes)
<i>Ronquilus jordani</i>	Northern ronquil	Perciformes	Bathymasteridae (Ronquils)
<i>Ruscarius meanyi</i>	Puget Sound sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Sardinops sagax</i>	Pacific sardine	Clupeiformes	Clupeidae (Herrings)
<i>Scomber japonicus</i>	Chub mackerel	Perciformes	Scombridae (Mackerels)
<i>Scopeloberyx robustus</i>	Longjaw bigscale	Stephanoberyciformes	Melamphaidae (Bigscales)
<i>Scopelosaurus harryi</i>	Scaly paperbone	Aulopiformes	Notosudidae (Waryfishes)
<i>Scorpaenichthys marmoratus</i>	Cabezon	Scorpaeniformes	Cottidae (Sculpins)
<i>Sebastes aleutianus</i>	Rougheye rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes auriculatus</i>	Brown rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes aurora</i>	Aurora rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes babcocki</i>	Redbanded rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes caurinus</i>	Copper rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes crameri</i>	Darkblotched rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes diploproa</i>	Splitnose rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes elongatus</i>	Greenstriped rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes emphaeus</i>	Puget Sound rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes entomelas</i>	Widow rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes flavidus</i>	Yellowtail rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes goodei</i>	Chilipepper	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes helvomaculatus</i>	Rosethorn rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes jordani</i>	Shortbelly rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes melanops</i>	Black rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes melanostomus</i>	Blackgill rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes miniatus</i>	Vermilion rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes mystinus</i>	Blue rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes paucispinis</i>	Bocaccio	Scorpaeniformes	Scorpaenidae (Rockfishes)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Sebastes pinniger</i>	Canary rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes polyspinis</i>	Northern rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes proriger</i>	Redstripe rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes rastrelliger</i>	Grass rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes reedi</i>	Yellowmouth rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes rufus</i>	Bank rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes saxicola</i>	Stripetail rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastes zacentrus</i>	Sharpchin rockfish	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastolobus alascanus</i>	Shortspine thornyhead	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Sebastolobus altivelis</i>	Longspine thornyhead	Scorpaeniformes	Scorpaenidae (Rockfishes)
<i>Serrivomer jesperseni</i>	Crossthroat sawpalate	Anguilliformes	Serrivomeridae (Sawtooth Eels)
<i>Stellerina xyostema</i>	Pricklebreast poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Stenobrachius leucopsarus</i>	Northern lampfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Sternopyx diaphana</i>	Longspine hatchetfish	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Sternopyx pseudobscura</i>	Highlight hatchetfish	Stomiiformes	Sternopychidae (Hatchetfishes)
<i>Stichaeus punctatus</i>	Arctic shanny	Perciformes	Stichaeidae (Pricklebacks)
<i>Symbolophorus californiensis</i>	California lanternfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Syphurus atricaudus</i>	California tonguefish	Pleuronectiformes	Cynoglossidae (Tonguesoles)
<i>Synchirus gilli</i>	Manacled sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Syngnathus leptorhynchus</i>	Bay pipefish	Syngnathiformes	Syngnathidae (Pipefishes and Seahorses)
<i>Synodus lucioceps</i>	California lizardfish	Aulopiformes	Synodontidae (Lizardfishes)
<i>Tactostoma macropus</i>	Longfin dragonfish	Stomiiformes	Stomiidae (Scaleless Black Dragonfishes)
<i>Tarletonbeania crenularis</i>	Blue lanternfish	Myctophiformes	Myctophidae (Lanternfishes)
<i>Tetragonurus cuvieri</i>	Smalleye squaretail	Perciformes	Tetragonuridae (Squaretails)
<i>Thalassenchelys coheni</i>	---	Anguilliformes	Chlopsidae (False Morays)
<i>Thaleichthys pacificus</i>	Eulachon	Osmeriformes	Osmeridae (Smelts)
<i>Theragra chalcogramma</i>	Walleye pollock	Gadiformes	Gadidae (Codfishes)
<i>Trachipterus altivelis</i>	King-of-the-salmon	Lampriformes	Trachipteridae (Ribbonfishes)
<i>Trachurus symmetricus</i>	Jack mackerel	Perciformes	Carangidae (Jacks)
<i>Trichodon trichodon</i>	Pacific sandfish	Perciformes	Trichodontidae (Sandfishes)
<i>Triglops forficatus</i>	Scissortail sculpin	Scorpaeniformes	Cottidae (Sculpins)

Table 8.

Taxonomic dictionary and information of the complete list of taxa included on the IIS website.

Scientific Name	Common Name	Order	Family (Common)
<i>Triglops macellus</i>	Roughspine sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Triglops pingeli</i>	Ribbed sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Triglops scepticus</i>	Spectacled sculpin	Scorpaeniformes	Cottidae (Sculpins)
<i>Ulcina olriki</i>	Arctic alligatorfish	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Xeneretmus latifrons</i>	Blacktip poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Xeneretmus leiops</i>	Smootheye poacher	Scorpaeniformes	Agonidae (Poachers and Alligatorfishes)
<i>Xiphister atropurpureus</i>	Black prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Xiphister mucosus</i>	Rock prickleback	Perciformes	Stichaeidae (Pricklebacks)
<i>Zaniolepis frenata</i>	Shortspine combfish	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Zaniolepis latipinnis</i>	Longspine combfish	Scorpaeniformes	Hexagrammidae (Greenlings)
<i>Zaprora silenus</i>	Prowfish	Perciformes	Zaproridae (Prowfishes)

Appendix C - Tables

Table 9

Definitions of symbols used for designating photophore groups in stomiiform fishes (Moser, 1996).

Deep-bodied sternoptychids		Other stomiiforms	
Code	Definition	Code	Definition
SO	Subopercle photophore which is equivalent to posteriormost photophore in opercular series of gonostomatids.	SO	Sympyseal photophores (organs) located at tip of lower jaw.
PO	Photophore located anterior (<u>pre</u>) to <u>orbit</u> .	Orb	Photophores associated with the eye located anterior and posterior of orbit.
PTO	Photophore located <u>posterior to orbit</u> , may be equivalent to upper photophore of opercular series of gonostomatids.	Op	Photophores of <u>opercle</u> series, generally three coded as follows: 1/(1+1).
PRO	Pre <u>opercular</u> photophore.	Br(BRP)	Photophores located on the <u>branchiostegal</u> membranes.
Br	Same as gonostomatid definition.	Is (I)	Photophores located on the <u>isthmus</u> .
Is	Same as gonostomatid definition.	IP	Photophores of the ventral series found from the isthmus to the base of the pectoral fin.
AB	Photophores of ventral series located abdominally between pectoral fin base and pelvic fin base and equivalent to PV in gonostomatids, plus a few posterior photophores of the IP series.	PV	Photophores of the ventral series found from the pectoral fin base to the pelvic (ventral) fin base.
PAN	Photophores found anterior (<u>pre</u>) to <u>anal</u> fin may be equivalent to VAV or VA in gonostomatids.	VAV	Photophores of the <u>ventral</u> series found from the pelvic (ventral) fin base to the anal fin base.
AN	Photophores found above <u>anal</u> fin.	AC	Photophores of the ventral series found from the anal fin base to caudal fin base.

Appendix C - Tables

Table 9

Definitions of symbols used for designating photophore groups in stomiiform fishes (Moser, 1996).

Deep-bodied sternoptychids		Other stomiiforms	
Code	Definition	Code	Definition
SC	Photophores found on lower (<u>sub</u>) caudal peduncle. Together with AN group may be equivalent to AC in gonostomatids.	IC	Summary of photophores of the ventral series from isthmus to caudal fin base (IP+PV+VAV+AC).
SAB	Photophores located above (<u>supra</u>) to the <u>abdominal</u> series and may be equivalent to VAL in gonostomatids (SAB lacking in <i>Sternopyx</i>).	IV	Summary of photophores of the ventral series from isthmus to pelvic (ventral) fin base (IP+PV).
SP	Photophores located above (<u>supra</u>) the pectoral fin and may be equivalent to OV in gonostomatids.	OV	Photophores of the lateral series from the opercle to pelvic (ventral) fin base.
		VAL (VALA)	Photophores of the lateral series from the pelvic (ventral) fin base to the anal fin base.
		OA (OAA, OAB)	Summary of lateral photophores from the opercle to anal fin base (OV+VA).
		OAC (OC)	Entire lateral series on body just dorsal to ventral series and extending from opercular border, or just medial to it, over anal fin to caudal fin base.
		ODM	Photophores (<u>organs</u>) found dorsal to the lateral midline (found only in <i>Gonostoma gracile</i>).

Table 10

Collection data for original illustrations by Recruitment Processes Program at Alaska Fisheries Science Center.

Taxon	SL (mm)	Cruise	Station number	Gear*	Date	Location or N°	W°
<i>Bathyagonus nigripinnis</i>	21	1OM01	23	MBT	24-Jul-01	56.01	169.04
<i>Dasycottus setiger</i>	17	3MF79	57	6B5	01-Jun-79		Bering Sea
<i>Clupea pallasi</i>	28			Dip net	08-May-93	47.56	123.00
<i>Clupea pallasi</i>	35			Beach Seine	22-Jun-93	47.57	122.55
<i>Gadus macrocephalus</i>	22	5MF91	C0012A	Methot	24-Jul-91	55.30	160.20

* Gear

6B5 = 60-cm bongo net, 0.505-mm mesh

MBT = Methot Beam Trawl

References

Text Content References

These references pertain to the content section. The references, citations, and footnotes for the data are in the footnote section for each taxon. A complete list of those references can be found on the Citations page.

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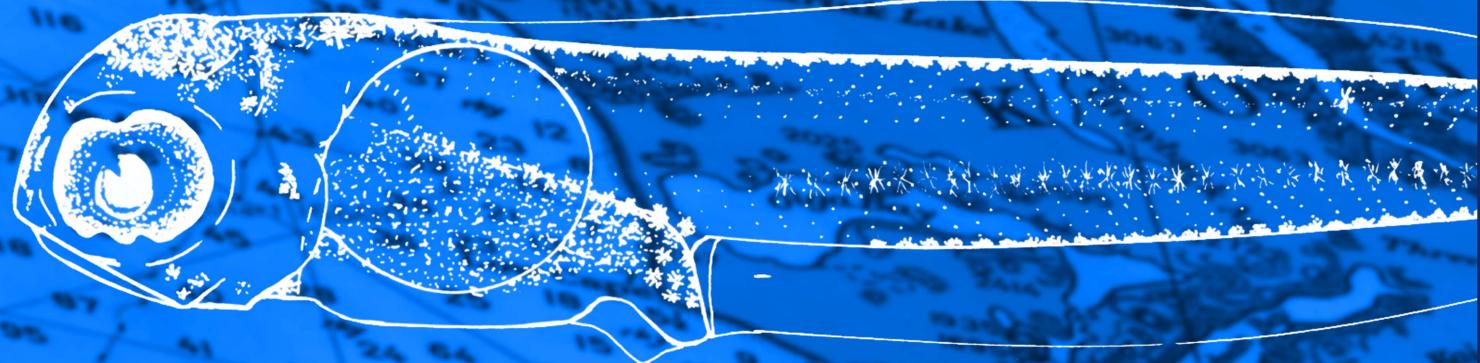
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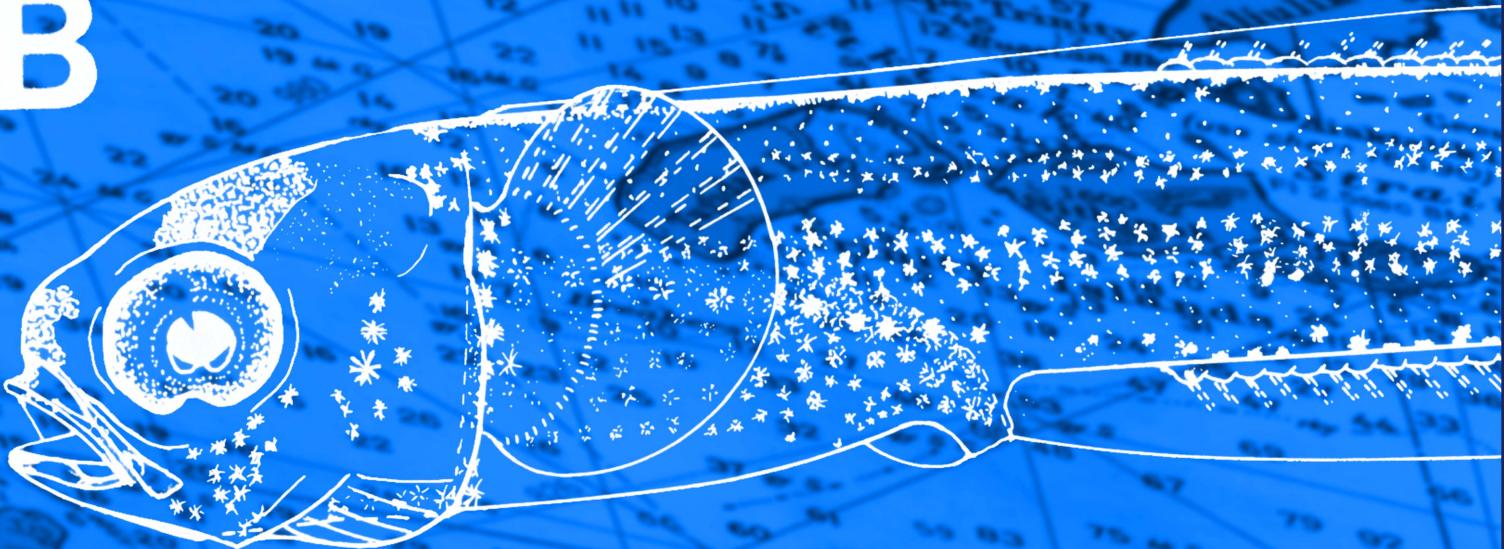
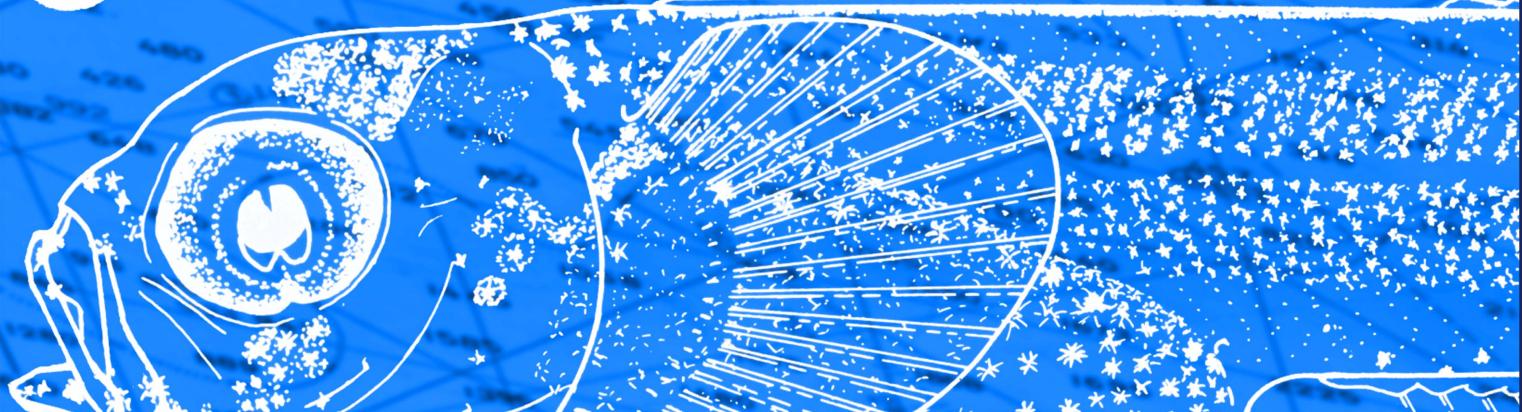
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A

Postanatal ventral midline
present throughout dev

B**C**

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<i>Sebastes flavidus</i>	493	<i>Trichodon trichodon</i>	1057
<i>Sebastes goodei</i>	497	<i>Triglops forficatus</i>	729
<i>Sebastes helvomaculatus</i>	501	<i>Triglops macellus</i>	733
<i>Sebastes jordani</i>	505	<i>Triglops pingeli</i>	737
<i>Sebastes melanops</i>	509	<i>Triglops scepticus</i>	741
<i>Sebastes melanostomus</i>	513	<i>Ulcina olriki</i>	849
<i>Sebastes miniatus</i>	517	<i>Xeneretmus latifrons</i>	853
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<i>Sebastes saxicola</i>	553		
<i>Sebastes zacentrus</i>	557		
<i>Sebastolobus alascanus</i>	561		
<i>Sebastolobus altivelis</i>	565		
<i>Serrivomer jesperseni</i>	85		
<i>Stellerina xyosterna</i>	845		
<i>Stenobrachius leucopsarus</i>	333		
<i>Sternoptyx diaphana</i>	213		
<i>Sternoptyx pseudobscura</i>	217		
<i>Stichaeus punctatus</i>	1013		
<i>Symbolophorus californiensis</i>	337		
<i>Syphurus atricaudus</i>	1225		

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Alligatorfish	777	Bluethroat argentine	109
Antlered sculpin	657	Bobtail snipe-eel	89
Arctic alligatorfish	849	Bocaccio	525
Arctic cod	389	Bottlelight	209
Arctic flounder	1185	Broadfin lampfish	313
Arctic shanny	1013	Brown Irish lord	677
Arctic staghorn sculpin	661	Brown rockfish	457
Arrow goby	1081	Brownsnout spookfish	145
Arrowtooth flounder	1133	Buffalo sculpin	653
Atka mackerel	597	Bulbous dreamer	413
Atlantic fangjaw	185	Butter sole	1165
Atlantic poacher	813	Cabezon	721
Aurora rockfish	461	Calico sculpin	637
Bald sculpin	645	California flashlightfish	325
Banded Irish lord	665	California grenadier	381
Bank rockfish	549	California headlightfish	293
Barreleye	149	California lanternfish	337
Bay goby	1089	California lizardfish	265
Bay pipefish	449	California smoothtongue	137
Benttooth bristlemouth	165	California tonguefish	1225
Bering flounder	1157	Canary rockfish	529
Bering poacher	825	Capelin	157
Bering wolffish	1041	Chilipepper	497
Bigeye poacher	793	Chub mackerel	1101
Bigmouth manefish	937	Chubby flashlightfish	297
Bigmouth sculpin	753	C-O sole	1209
Black bristlemouth	169	Copper rockfish	469
Black prickleback	1017	Crescent gunnel	1037
Black rockfish	509	Crested bigscale	433
Blackeye goby	1085	Crested sculpin	745
Blackfin poacher	789	Crosthroat sawpalate	85
Blackgill rockfish	513	Curlfin sole	1213
Blackline snipe eel	77	Daggetooth	281
Blacktip poacher	853	Darkblotched rockfish	473
Blob sculpin	873	Darkfin sculpin	865
Blue lanternfish	341	Darter sculpin	713
Blue rockfish	521	Daubed shanny	989

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Deepsea sole	1137	Kelp greenling	573
Dogtooth lampfish	289	Kelp poacher	805
Dover sole	1193	King-of-the-salmon	349
Dragon poacher	837	Lingcod	589
Duckbill barracudina	277	Long flounder	1145
Dwarf lanternfish	317	Longfin dragonfish	233
Dwarf wrymouth	1025	Longfin Irish lord	681
Ebony snailfish	917	Longfin pearleye	253
English sole	1197	Longhead dab	1181
Eulachon	161	Longjaw bigscale	437
Eyeshade sculpin	761	Longnose lancetfish	285
Fangtooth	441	Longnose poacher	821
Fish doctor	957	Longnose snailfish	921
Flathead sole	1153	Longsnout prickleback	985
Fluffy sculpin	701	Longspine combfish	605
Fourhorn poacher	809	Longspine hatchetfish	213
Ghostly grenadier	377	Longspine thornyhead	565
Giant grenadier	361	Louvar	1093
Giant kelpfish	1065	Lowcrest hatchetfish	205
Giant lampfish	321	Manacled sculpin	725
Giant wrymouth	1029	Masked greenling	581
Grass rockfish	541	Medusafish	1105
Gray starsnout	781	Mosshead sculpin	641
Great sculpin	693	Mosshead warbonnet	981
Greenland halibut	1221	Northern anchovy	93
Greenstriped rockfish	481	Northern clingfish	1073
Grunt sculpin	609	Northern flashlightfish	329
High cockscomb	965	Northern lampfish	333
Highfin dragonfish	225	Northern pearleye	249
Highfin lizardfish	261	Northern rock sole	1173
Highlight hatchetfish	217	Northern rockfish	533
Highsnout bigscale	429	Northern ronquil	949
Jack mackerel	929	Northern sculpin	685
Jacksmelt	421	Northern smoothtongue	133
Japan eelpout	953	Northern spearnose poacher	769
Javelin spookfish	141	Nutcracker prickleback	969
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Opah	345	Red brotula	357
Pacific argentine	105	Red Irish lord	669
Pacific blackdragon	241	Redbanded rockfish	465
Pacific blacksmelt	125	Redstripe rockfish	537
Pacific cod	397	Rex sole	1149
Pacific grenadier	365	Ribbed sculpin	737
Pacific hake	385	Ribbon prickleback	1001
Pacific halibut	1161	Ribbon sawtail fish	245
Pacific herring	97	Robust blacksmelt	117
Pacific pomfret	933	Rock greenling	577
Pacific pompano	1113	Rock prickleback	1021
Pacific sand lance	1061	Rockhead	797
Pacific sanddab	1117	Rosethorn rockfish	501
Pacific sandfish	1057	Rosylip sculpin	625
Pacific sardine	101	Roughback sculpin	629
Pacific saury	425	Rougheye rockfish	453
Pacific spiny lumpsucker	885	Roughspine sculpin	733
Pacific staghorn sculpin	689	Sablefish	569
Pacific tomcod	401	Saffron cod	393
Pacific viperfish	221	Sailfin sculpin	757
Padded sculpin	613	Sand sole	1217
Painted greenling	593	Sawback poacher	817
Pearly prickleback	973	Scaly paperbone	257
Penpoint gunnel	1033	Scalyhead sculpin	617
Petrale sole	1141	Scissortail sculpin	729
Pilotfish	925	Searcher	945
Pinpoint lampfish	309	Sharpchin rockfish	557
Pitgum dragonfish	229	Sharpnose sculpin	633
Popeye blacksmelt	121	Shiny loosejaw	237
Popeye grenadier	369	Shortbelly rockfish	505
Pricklebreast poacher	845	Shortmast sculpin	765
Prickly sculpin	649	Shortspine combfish	601
Prowfish	1053	Shortspine thornyhead	561
Puget sound rockfish	485	Showy bristlemouth	181
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Slender cockscomb	961	Tidepool sculpin	697
Slender fangjaw	189	Tidepool snailfish	893
Slender hatchetfish	193	Topsmelt	417
Slender lanternfish	301	Tropical hatchetfish	201
Slender snipe eel	81	Tubenose poacher	833
Slender sole	1189	Tube-snout	445
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Slimy snailfish	905	Vermilion rockfish	517
Slipskin snailfish	897	Walleye pollock	405
Smalleye squaretail	1109	Warty poacher	801
Smooth alligatorfish	773	White barracudina	269
Smooth lump sucker	881	White croaker	941
Smootheye poacher	857	Whitebarred prickleback	1009
Smoothhead dreamer	409	Whitespotted greenling	585
Smoothhead sculpin	621	Widow rockfish	489
Snake prickleback	993	Wolf-eel	1045
Snubnose blacksmelt	129	Yellow Irish lord	673
Soft sculpin	877	Yellowfin sole	1177
Southern rock sole	1169	Yellowmouth rockfish	545
Speckled sanddab	1121	Yellowtail rockfish	493
Spectacled sculpin	741		
Spiny flounder	1125		
Spinycheek starsnout	785		
Spinyhead sculpin	861		
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Spotted cusk-eel	353		
Spotted snailfish	889		
Spurred hatchetfish	197		
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Stripetail rockfish	553		
Sturgeon poacher	841		
Sunbeam lampfish	305		
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